State / UT Specific Action Plans (SSAP) on Water: Towards Water Security, Safety and Sustainability: 2050 DRAFT TEMPLATE 23.10.2017

Total No. of Pages = 565 (including last blank page)

Annexure: Terms and Definitions used (including Basin, Sub-basin, Availability, Supply, Demand and Consumption etc.)

Note:

- Chapter wise templates are model only. States/UTs are free to customize these templates to their local context and can change the language of headings/sub-headings/ performance indicators as per need as long as it is as per standard template, has performance indicators has scientific basis and serves towards calculating the Water Budget.
- All are welcome to identify errors and suggest improvements.

Useful Documents

National Reports

Water Resources	National Water Policy
	National Action Plan for Climate Change
	National Water Mission Documents
	Report of Steering Committee on Water Resources for Eleventh 5 Yr Plan.2007-12 Planning Commission
	Report of the Working Group On Water Resources for the XI Five Year Plan (2007-12)
Climate-Precipitation (Rainfall/ Snow)	Respective Nodal officers will provide the details directly to the States.
Glaciers	Do
Springs	Do
River Basins	Do
Projects- Irrigation / Multi-purpose	Do
Wetlands	Do
Tanks –Urban and Rural	Do
Coastal zone	Do
Ground Water	Do
Waste Water	Do
Forestry	Do
Wildlife	Do
Horticulture	Do
Animal Husbandry	Do
Fisheries	Do
Industries	Do
Infrastructure	Do
Establishments/ Institutions	Do
Rural Water Supply	RAJIV GANDHI NATIONAL DRINKING WATER MISSION, National Rural Drinking Water Programme, Movement towards Ensuring People's Drinking Water Security in Rural India, Framework for Implementation, Department of Drinking Water Supply, Ministry of Rural Development, Government of India
Urban Water Supply	(Manual on water supply and treatment, may 1999, published by the Ministry of Urban Development, Copy is available at http://www.mdws.gov.in/sites/default/files/Manual_on_Water_Supply_and_Treatment_CPHEEO_MoUD_1999.pdf)
Water Quality	Report of the Expert Group on Water Quality Monitoring Systems for Protecting the National Water Resources, April 2002, NRCD, MoEF&CC

State Plans/ Reports:

a. State Water Policy
b. State Action Plan on Climate Change
c. State Agriculture Plan
d. State Irrigation Plan and District Irrigation Plans
e. State Drinking Water Plan
f. State Human Development Index
g. NABARD- State Focus Paper and District Potential Linked Plan

Standard template of **Each Chapter – Sub Headings**
(of Supply/Demand / Quality Chapters/Sub-chapters)

1. Subject Matter (May include sub heading, data, graphs etc.)
2. Water Budgeting: Availability, Utilizable, Supply (Sector wise and Source wise), Demand (Sector wise) and Consumption (Sector wise).

Availability	Utilizable	Demand	Supply	Consumption

The relevant tables of chapter 9 of this chapter/ component should be provided in the Annexure of this chapter. The summary table of these chapter 9 tables will be the above /main chapter table.

3. Issues and Challenges
4. Problem Tree / Root cause Analysis: Cause, Effect and Interventions
5. Governance / Management:
    a. Statute / Law / Policy/ Regulations if any
    b. Institutions governing / managing / monitoring the resources and Institutional structure.
    c. Areas of Peoples/Private Participation if any
    d. Water Financing and Economics
6. Measurement, Monitoring and Data Constraints/ Management
7. Performance Indicators:
    a. Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently.
    b. Status of various Performance Indicators – **for comparison across Districts/ Plants/ Units/ Products etc.**

Category of Indicators (Illustrative)	Indicator	Bench Mark	District.1/ Industry.1	District.2/ Industry.2	District.3/ Industry.3
Water Measurement					
Water Conservation					
Water Demand Management					
Water Productivity					
Water Quality					
Participatory Water Management					
Water Economics					
Others					

Note: The Performance Indicators should also include SDGs.

8. Reforms undertaken/ being undertaken/ proposed if any
9. Road map of activities / tasks proposed for
    a. Better governance
    b. Better source / supply management
    c. Better demand management /improved Water Use Efficiency
    d. Water Quality
    e. Water Economics and Financing
    f. Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

Executive Summary

Chapter 1

STATE SPECIFIC ACTION PLAN: INTRODUCTION

1.1 Background

- Brief of National Action Plan on Climate Change (NAPCC) with Annexure
- Brief of State Action Plan on Climate Change with Annexure
- State Water Policy Goals
- Brief of National Water Mission (NWM)
- Brief of State Specific Action Plan (SSAP) for water sector –Rationale
- Hydrological Cycle in the context of State.(One page)

1.2 Objectives of SSAP for water sector

1. Critical analysis of existing water scenario based on current and past data / information-both on availability and development (supply side) and use (demand side).
2. Critical review of existing water policies, regulations, institutions and various ongoing interventions / Schemes / Programmes on Water being undertaken by various government and non-government agencies including the best practices.
3. To identify current and future development needs, challenges; vulnerable areas and communities; and explore possible solutions and strategies for sustainable development and management.
4. To evolve and formulate performance indicators for each of the water cycle/ dimension component including Sustainable Development Goals.
5. To formulate annual State / UT Water Budgets.
6. To designate one State Department as responsible for enabling, coordinating and supervising all aspects of water- Quantity (supply side, demand side) and quality dimensions / components of Water / Water Cycle in the State with a responsibility to formulate annual State/ UT Water Budgets.
7. To document assessment / Impact of Climate Change on the State-resources, livelihoods and growth from Water perspective and the development of possible scenario on Water.
8. To formulate a strategic action plan including location and context specific contingency plans to manage the impact of climate change.
9. To formulate a comprehensive and integrated water plan for WATER SECURITY, SAFETY AND SUSTAINABILITY TILL 2050 with equity through convergence, synergy and role / accountability of all stakeholders - Government and Non-Government agencies including civil society.

1.3 Expected Outcomes

Part	Outcomes
I	1. Annual State / UT Water Budgeting (to be undertaken annually)
	2. One State Government Department to be designated as responsible for coordinating and monitoring water resources in the State comprehensively.
	3. Institutional Mechanism to monitor the development and use of Water resources comprehensively at State level including measurement at Supply and Demand side and strict monitoring of Quality and fixation of accountability.
II	4. Contingency Plan to address Climate Change impact on Water
III	5. SSAP on Water Security, Safety and Sustainability till 2050

1.4 Stakeholders of SSAP on Water in the State

- Nodal State Government Department, State Nodal Institution and State Nodal Officer,
- Steering Committee of SSAP for water sector (Annexure)
- Monitoring Committee of SSAP for water sector (Annexure)

Chapter 2
ABOUT THE STATE: From Water Perspective

2.1 Location

- Physiography, Topography & Geology
- Administrative Units / Profile- Divisions, Districts, Sub-Districts, Blocks/Talukas, Urban and Rural bodies (District/Middle/Village Panchayats), Habitations etc.
- Demographic profile including marginalized groups- SC, ST, Minority (5 Major minority groups as per statute with break up), Women, Disabled etc.

2.2 Environment

- Natural Resources
- Forests
- Flora and Fauna
- Aquatic life
- Others

2.3 Land Use Pattern and Land Cover

2.4 Economy

2.4 Drinking and Domestic use

2.5 Agriculture, Livestock, Fisheries & other water based farming systems

- Soil Profile / Classification- District /Sub-District wise
- Soil erosion and run off status with maps -Annexure
- Agro-ecological/ Climatic zones with Annexure
- Aquifer zones and what is being practiced and the gap identification.
- Gap between recommended and existing cropping / farming methods:
  - Recommended cropping pattern/ farming system as per Agro-climatic zone and
  - Cropping Intensity and other parameters
  - Existing Cropping /farming System with Annexure
  - Existing Cropping Pattern / Plantation/ Farming system with Annexure
- Area wise & Crop wise Irrigation Status:
  - Irrigation based classification
  - Analysis of Rain fed Vs Irrigated agriculture with Tables and graphs with Annexure
  - Trend analysis of Production and Productivity of Major Crops
  - Crop water productivity/production data with Annexure
  - Irrigation water availability at Critical Stages for different Crops with Annexure
  - Crop wise Irrigated Area and source of irrigation with Annexure
  - Land holding category, area covered and irrigation with Annexure
  - Crop productivity in rain fed agriculture and irrigated agriculture
- Measurement systems of Water in Agriculture / Farming
- Field Water Management: Watering / Irrigation Methods and coverage- Crop wise, Watershed wise, Block wise, District wise.
- Water harvesting:
- Watershed data and maps
    - List of Gauged and un-gauged watershed
    - Watershed based water availability and water consumption data
    - Water use efficiency
  - Crop wise, Watershed wise, Block wise, District wise etc.
- Technology and Innovation in improving Water Use Efficiency
  - Drainage System

- Condition
- Drainage water Quality
- Reuse of drainage water

- Agrarian crisis and Water-Droughts/ Floods/ Water quality issues
- Other Green cover
- Fuel wood/Biomass yield
- Fodder
- Livestock-Kinds, numbers, issues etc.
- Fisheries
- Others

2.6 Infrastructure

2.7 Industries

- Total number, types & capacities of industries (including categorization of water intensive industries); details of industrial clusters located etc.
- Status of water cess and water pricing for industries

2.8 Service Sector

- Transportation-Railways, Road ways, Airways, water ways

2.9 Urbanization-Cities, Towns and Villages

2.10 Tourism - water recreation/sports

2.11 Traditional Water Structures

2.12 Human Development Index, indicators and trends

2.13 Socio economic overview

2.14 Historical events/ Timelines having impact on Water in the State

2.15 Extreme events/ Disasters

(Note: Data source should be provided and refer District Agriculture Plans, District Irrigation Plans)

Note.2: Avoid duplication of data if similar data is provided in any of the chapter. Then provide reference. Else it can also be vice versa.

Illustrative Sources for Information for the Report

State Profile	Gazetteer, Census Report and other sources of State Government
Physiography etc.	
Demography	Census of India
Environment	
Land Use Pattern	Revenue record, State Agriculture Plan, PPR, Land Use Plan etc.
Economy	Economic Survey
Drinking Water	
Crop Statistics	Departments of Agriculture/Horticulture etc. Agricultural Statistics at a Glance 2015
Livestock & Fisheries	Livestock / Fisheries Census of India, Dept. of Animal Husbandry, Fisheries and others
Climate	IMD, Regional ICAR Centers, SAUs
Soil Profile	SLUSI, NBSS, Indian Institute of Soil Science, Department of Land Resources
Soil Erosion	ICAR regional centre and sediment monitoring station
Irrigation	Departments of Irrigation, Agriculture, Horticulture etc. Agriculture statistics, irrigation statistics of CWC, Indian statistics, open government data platform
Production/Productivity	State Agriculture Dept.
Water harvesting & Water sheds	Departments of Agriculture, Panchayat and Rural Development

Chapter 3

Development Vision of the State - Opportunities and Challenges: From Water Perspective

(Targets if available)

3.1. Quantitative: Measurable targets if any

Sector	Sub-Sector	Vision Goals / Targets	Approx. Water requirement over a period (Measurable)			
			2020	2030	2040	2050
Forestry & Wildlife	1. Forestry					
	2. Wildlife					
Farm Sector	3. Agriculture					
	4. Horticulture					
	5. Animal Husbandry					
	6. Fisheries					
Industry & Infrastructure	7. Thermal Power Plants					
	8. Textiles and Jute					
	9. Paper and Pulp					
	10. Iron and Steel					
	11. Heavy Engineering & Automobile					
	12. Pharmaceuticals					
	13. Fertilizers					
	14. Food Processing					
	15. Mining					
	16. Infrastructure					
	17. Construction					
	18. Water Transport					
	19. Road / Bus Transport					
	20. Railways/ Metro Rail					
	21. Airports					
	22. Tanneries					
	23. Sugar					
	24. Beverages					
	25. Special Economic Zones SEZ					
	26. IT/ Electronic Industry					
	27. Chemical Industry					
Establishments & Institutions	28. Educational Institutions/ Universities					
	29. Schools					
	30. Hospitals					
	31. Govt. Office and Campuses					
	32. Private Offices					
	33. Hotels					
	34. Restaurants					
	35. Sports Establishments /Golf Courses					
	36. Retail/Malls					
	37. Convention Centre, Wedding Halls					
Drinking water and Domestic use	Rural Water Supply and Domestic use					
	Urban Water Supply and Domestic use					
Water Quality	Water Quality					

3.2. Qualitative: Non-measurable targets if any

Sector	Sub-Sector	Vision Goals / Targets	Approx. Water requirement over a period Qualitative (Non Measurable)			
			2020	2030	2040	2050
Forestry & Wildlife						
Farm Sector						
Industry & Infrastructure						
Establishments & Institutions						
Drinking water and Domestic use						
Water Quality						

SDG Goal 6: Ensure availability and sustainable management of Water for all

Target No.	Target	Indicators*	Chapter
6.1	By 2030, achieve universal and equitable access to safe and affordable drinking water for all	Proportion of population having access to safe drinking water	Drinking Water Supply and Domestic Use – Rural & Urban
6.3	By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally	Proportion of wastewater (domestic and industrial) being recycled and reused	Waste Water
6.4	By 2030, substantially increase water use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	Percentage Ground Water withdrawal against availability	Ground Water
		Per capita storage (m3/person)	Irrigation Projects
		Per capita availability of water (m3/person)	River Basins
6.5	By 2030, implement integrated water resources management at all levels including through trans-boundary cooperation as appropriate	Percentage of River basins brought under Integrated Water Resources Management.	River Basins
6.6	By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	Area under over-exploited blocks	Ground Water
		Number of over exploited blocks	Ground Water
		Percentage sewage load treated in major rivers	River Basins Waste Water
6.7	Support and strengthen and participation of local communities in improving water and sanitation management	Percentage of developed Irrigated Command Area brought under WUAs	Irrigation Project
		Percentage of developed Irrigated Command Area managed by WUAs	Irrigation Project
		Proportion of villages with Village Water & Sanitation Committee (VWSC)	Drinking Water Supply and Domestic Use – Rural & Urban

*State are free to develop suitable indicators for each of SDG

Chapter 4
Water Resources (Source, Demand and Quality)

4.1 WATER: SUPPLY/ SOURCE Side

4.1.1 Climate – Precipitation (Rainfall/ Snow)

1.0 Subject Matter (May include sub heading, data, graphs etc.)

Describe the General Climate (Mean pattern and Variability) of the **State** in brief, on the seasonal time scale by considering the climate parameters viz. Rainfall, Temperature and Potential Evapo-transpiration (PET). Such information is necessary for planning the hydrological and agricultural activities. Show the spatial patterns as given below:

Map of the State (with Basins/ Sub-basins) showing

1) Seasonal Rainfall:
   a. Average Rainfall
   b. Coefficient of Variation (Standard Deviation/Mean*100)
2) Seasonal Mean Temperatures
3) Seasonal Potential Evapo-transpiration (PET)

Note: Seasons are defined as Winter (Jan-Feb); Pre-monsoon (Mar-Apr-May); Monsoon (Jun-Jul-Aug-Sept); Post monsoon (Oct-Nov-Dec)

Table: Mean Monthly Rainfall, Temperature and PET

Month	Rainfall, mm	Max Temp, °C	Min Temp, °C	PET, mm/day
Jan				
Feb				
Mar				
Apr				
May				
Jun				
Jul				
Aug				
Sep				
Oct				
Nov				
Dec				
Annual				

2.0 Availability and Utilizable Water

Table A1 consist of total precipitation falling on the land surface within the various basins/sub-basins of the State. Interception losses due to vegetation, forests etc must be deducted to arrive at the total precipitation reaching the land surface which finally leads to surface flow, surface storage and infiltration into the ground surface to increase soil moisture content and recharge ground water also.

A1. Precipitation (including Snowfall): (MCM)			**REMARKS**
Basin/Sub-basin (Area in Km^2)	**(mm)**	**(MCM)**	
Basin A/ Sub-basin			
Basin B/ Sub-basin			
Basin C/ Sub-basin			
TOTAL			

Table B1 is that portion of precipitation from table A1 within the State Boundary that can be directly harvested in-situ for various local uses. For example, roof top rain water harvested for drinking purpose is an utilizable portion of the precipitation. Similarly, gain in soil moisture from the precipitation in the agricultural land in crop root zone which can be utilized for growing crops round the year (as rain-fed or natural supplement to irrigation) is also an utilizable fraction of the total precipitation.

B1. Utilization from Precipitation (From Table A1) (MCM)		**REMARKS**
Total Soil Moisture* gained through Precipitation useful for agriculture round the year		
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
Directly Harvested Precipitation for various uses round the year		
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

*Methods for estimating the soil moisture gain needs to be identified. One simple method could be to look for the satellite based soil moisture estimates available on daily basis from VEDAS portal hosted on the Space Application Centre (SAC), ISRO Ahmedabad (https://vedas.sac.gov.in/vedas/node/115)

3.0 Issues and Challenges

	Automatic weather stations	*Manual Observatories*
Development and testing of sensors for improved accuracy		
Timely forecasting of monsoon onset and its intermittent spells		
Calibration and Maintenance of Instruments		
Trained man power for maintenance		

Technology initiative to achieve Last mile connectivity	**District_1**	**District_2**	**…**	
Mobile apps				
Dedicated Website Portal				

4.0 Problem Tree / Root Cause Analysis: Cause, Effect and Interventions

5.0 Governance/Management

a. Statute / Law / Policy/ Regulations if any
b. Institutions governing / managing / monitoring the resources and Institutional structure.
c. Areas of Peoples/Private Participation if any
d. Schemes & Financing [Relevant tables on Water Financing and Economics may be looked into Chapter 7 and filled up with appropriate data/information]

6.0 Measurement, Monitoring and Data Constraints/ Management

7.0 Performance Indicators:

a. Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently.

WMO Criteria for Rainfall Gauging Stations Network: The network should be well distributed and should not be dense in any side. WMO recommended network design from the perspective of water resources development is given in the following table 4.2.17

Table: 4.2.17: WMO Criteria for Network Design

Physiographic Unit	Minimum densities per station (area in km^2 per station)	
	Non-recording	Recording
Coastal	900	9000
Mountainous	250	2500

Interior plains	575	5750
Hilly/undulating (up to 1km)	575	5750
Small islands	25	250
Urban areas	--	10-20
Polar/arid	10000	100000

Status of various Performance Indicators– **for comparison across Districts/ Plants/ Units/ Products etc.**

Category of Indicators	***Indicator***	***Unit***	***Bench Mark***	***Dist.1***	***Dist.2***	***Dist.3***
Instrumentation	Whether the observatory is Manual / Automatic	**Y/N**				
	Whether forecasting of rainfall is available well in advance vis-a-vis regional or global standards?	**Y/N**				
	Whether the accuracy of forecasting of data is good vis-a-vis regional or global standards? (Reliability indicator)	**Y/N**				
	Whether the rain gauge is recording or non-recording type	Recording/ non-recording				
	Whether the observatory has • Hygrometer for measuring humidity • Anemometer for measuring wind speed • Pyranometer for measuring solar radiation • Evaporimeter / Atmometer for measuring evaporation	 **Y/N** **Y/N** **Y/N**				
	Whether the data on heat waves and cold waves data is available? (How much/How many/ How often)	**Y/N**				
	Whether the data on other forms of precipitation like snow fall in high altitude regions is available? (How much/How many/ How often)	**Y/N**				
	Whether the data on sea water temperature (at surface, on bottom and at gear), ocean currents (speed and direction) and sea state (wave height) is available? (How much/How many/ How often)	**Y/N**				
	Whether PET map/data is available?	**Y/N**				
	Whether weather data is available online	**Y/N**				
	Accessibility to data	**Y/N**				

8.0 Reforms undertaken/ being undertaken/ proposed if any.

9.0 Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity.

ANNEXURE

1. *Normal Rainfall (50 years average) of Basin/sub Basin*
    - Daily, Weekly: As per table 1 given below

Table 1: Basin/sub-basin wise normal (50 years average) rainfall in mm– Daily & Weekly basis

Day	Sub-basin 1	Sub-basin 2	Sub-basin 3		Sub-basin n
1					
2					
3					
4					
5					
6					
7					
Week 1 Total	-------	-------			-----
Week 1 Avg.	-------	-------			------
8					
9					
--					
Week 2 Total					
Week 2 Avg.					

365					
366					

Note: Methodology for computation of areal (basin/sub-basin/district) average rainfall is described in ANNEXURE -A

- Monthly, Seasonal, Annual: As per table 2 given below

Table 2: Basin/sub-basin wise normal (50 years average) rainfall in mm –Monthly, Seasonal and Annual basis

Month	Sub-basin 1	Sub-basin 2	Sub-basin 3		Sub-basin n
Jan					
Feb					
Mar					
Apr					
May					
Jun					
Jul					
Aug					
Sep					
Oct					
Nov					
Dec					
Monsoon (JJAS)					
Post- monsoon (OND)					
Winter (JF)					
Pre-monsoon (MAM)					
Annual					

2. *Rainfall of Basin/ sub Basin for the Current Year (C) and Previous Year (P)*

- Daily : Monsoon Season (June – Sept) : As per table 3 given below

Table 3: Basin/sub-basin wise rainfall (mm) for the Current (C) and Previous (P) year – Daily & Weekly basis for Monsoon season (June – Sept)

Day	Sub-basin 1		Sub-basin 2		Sub-basin 3				Sub-basin n	
	P	C	P	C	P	C	P	C	P	C
Jun 1										
Jun 2										
Sep 29										
Sep 30										

- Weekly: As per table 4 given below

Table 4: Basin/sub-basin wise rainfall (mm) for the Current (C) and Previous (P) year– Weekly basis for whole water year

Week	Sub-basin 1		Sub-basin 2		Sub-basin 3				Sub-basin n	
	P	C	P	C	P	C	P	C	P	C
1										
2										
3										
50										
51										
52										

- Monthly , Seasonal , Annual: As per table 5 given below

Table 5: Basin/sub-basin wise rainfall (mm) for the Current (C) and Previous (P) year –Monthly, Seasonal and Annual basis

Week	Sub-basin 1		Sub-basin 2		Sub-basin 3				Sub-basin n	
	P	C	P	C	P	C	P	C	P	C
Jan										
Feb										
Mar										
Apr										
May										
Jun										
Jul										
Aug										
Sep										

Oct										
Nov										
Dec										
Monsoon (JJAS)										
Post- monsoon (OND)										
Winter (JF)										
Pre-monsoon (MAM)										
Annual										

3. *Station / District wise Normal Rainfall (50 Years)*

- Daily Monsoon Season, Weekly Monsoon & Non Monsoon both: As per table 6 given below

Table 6: Station & District wise normal (50 years average) rainfall in mm – Daily & Weekly basis

District rainfall		**Days**													
		Day-1	**Day-2**	**Day-3**		**Day-7**	**Total Week 1**	**Avg. Week 1**	**Day-8**	**Day- 9**	**…**	**Day-14**	**Total Week 2**	**Avg. Week 2**	**---**
Stations	**Stn-1**						**N1**	**N1/7.0**					**N2**	**N2/7.0**	**---**
	Stn-2														
	Stn-3														
	Stn n														
District Daily Avg.		**Avg.1**	**Avg.2**	**Avg.3**			**Dist. Weekly Total**	**Dist. Weekly Avg.**							

- Monthly, Seasonal, Annual: As per table 7 given below

Table 7: District wise rainfall (mm) for the Current (C) and Previous (P) year–Monthly, Seasonal and Annual basis

Months	Sub-basin 1		Sub-basin 2		Sub-basin 3				Sub-basin n	
	P	C	P	C	P	C	P	C	P	C
Jan										
Feb										
Mar										
Apr										
May										
Jun										
Jul										
Aug										
Sep										
Oct										
Nov										
Dec										
Monsoon (JJAS)										
Post- monsoon (OND)										

Winter (JF)										
Pre-monsoon (MAM)										
Annual										

4. *Station/ District wise rainfall for the Current Year (C) and Previous Year (P)*

- Daily Monsoon Season only: As per table 8 given below:

Table 8: District wise rainfall (mm) for the Current (C) and Previous (P) year–Daily basis for Monsoon months (June-Sept)

Day	District 1		District 2		District 3				District n	
	P	C	P	C	P	C	P	C	P	C
1										
2										
3										
4										
363										
364										
365										
366										

- Weekly Monsoon and Non-Monsoon both : As per table 9 given below:

Table 9: District wise rainfall (mm) for the Current (C) and Previous (P) year–Weekly basis

Week	District 1		District 2		District 3				District n	
	P	C	P	C	P	C	P	C	P	C
1										
2										
3										
50										
51										
52										

- Monthly, Seasonal, Annual: As per table 10 given below

Table 10: District wise Rainfall (mm) for the Current (C) and Previous (P) year –Monthly, Seasonal and Annual basis

Day	District 1		District 2		District 3				District n	
	P	C	P	C	P	C	P	C	P	C
Jan										
Feb										
Mar										
Apr										
May										
Jun										

Jul										
Aug										
Sep										
Oct										
Nov										
Dec										
Monsoon (JJAS)										
Post- monsoon (OND)										
Winter (JF)										
Pre-monsoon (MAM)										
Annual										

5. *Extreme Rainfall*

- Highest Rainfall (1,2,3 day max): As per table 11 given below

Table 11: Extreme rainfall (maximum rainfall for 1-3 days duration)

S. No.	Station Name	District Name	Lat	Long	Extreme Rainfall (1 day max)		Extreme Rainfall (2 day max)		Extreme Rainfall (3 day max)	
					mm	date	mm	date	mm	date

- Average Number of Heavy rainy days (> 6.5cm/day): As per table 12 given below

Table 12: Extreme rainfall Average Number of Heavy rainy days (> 6.5cm/day)

S. No.	Station Name	District Name	Lat	Long	Average Number of Heavy rainy days (> 6.5 cm/day)

- Decadal variability- frequency of excess and deficit rainfall years : As per table 13 given below

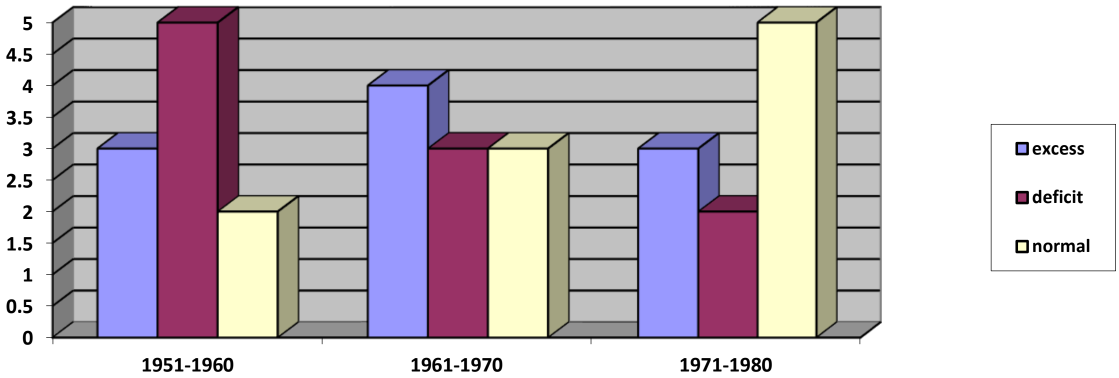
Table 13: Decadal variability - Frequency of Excess and Deficit rainfall years

Decade	Excess Yrs	Deficit Yrs	Normal Yrs
1951-1960			
1961-1970			
1971-1980			

1981-1990			
1991-2000			
2001-2010			
2011-2015			

Note: Excess year is defined as (seasonal rainfall > mean + s.d.) and deficit rainfall year is defined as (seasonal rainfall < mean - s.d.) otherwise, it is a normal year

Plot a bar diagram showing decadal variations in number of Excess, Deficit and normal years (A sample plot given below)



6. *Station wise daily weather parameters (Tmax, Tmin, RHmax, RHmin, Sunshine hour, Solar radiation) for the Current (C) yea*r : As per table 14

Table14: Station wise daily weather parameters (Tmax, Tmin, RHmax, RHmin, Sunshine hour, Solar Radiation) for the Current (C) year

Day	Max Temp, °C	Min Temp, °C	RHmax, %	RHmin, %	Wind Speed, km hr^{-1}	Sunshine hour, hr	Solar radiation, MJ m^{-2} day^{-1}	Pan evaporation, mm day^{-1}
Station 1								
1								
2								
3								
4								
5								
6								
364								
365								
366								
Station 2								
1								
2								
3								
4								
5								
6								
364								
365								

366								

7. *Station wise daily weather parameters (Tmax, Tmin, RHmax, RHmin, Sunshine hour, Solar radiation) for the Previous (P) yea*r: As per table 15

Table 15: Station wise daily weather parameters (Tmax, Tmin, RHmax, RHmin, Sunshine hour, Solar radiation) for the Previous (P) year

Day	Max Temp, °C	Min Temp, °C	RHmax, %	RHmin, %	Wind Speed, km hr^{-1}	Sunshine hour, hr	Solar radiation, MJ m^{-2} day^{-1}	Pan evaporation, mm day^{-1}
Station 1								
1								
2								
3								
4								
5								
6								
364								
365								
366								
Station 2								
1								
2								
3								
4								
5								
6								
364								
365								
366								
Station 3								
1								
2								
3								
4								
5								
364								
365								

366								

8. *Station wise Potential evapo-transpiration (PET) for the Current Year (C) and Previous Year (P)*

- Daily : As per table 16 given below

Table 16: Station wise PET* (mm/day) for the Current (C) and Previous (P) year Daily basis

Day	Station 1		Station 2		Station 3				Station n	
	P	C	P	C	P	C	P	C	P	C
1										
2										
3										
4										
363										
364										
365										
366										

* *PET can be obtained from IMD monograph for 144 locations of the country (presently). In the absence of PET from IMD monograph, it can be estimated from different weather data using different methods depending upon the data availability. Methodology is described in ANNEXURE -A*

- Weekly : As per table 17 given below

Table 17: Station wise PET* (mm/day) for the Current (C) and Previous (P) year weekly basis

Week	Station 1		Station 2		Station 3				Station n	
	P	C	P	C	P	C	P	C	P	C
1										
2										
3										
4										
51										
52										

- Monthly, Seasonal, Annual: As per table 18 given below

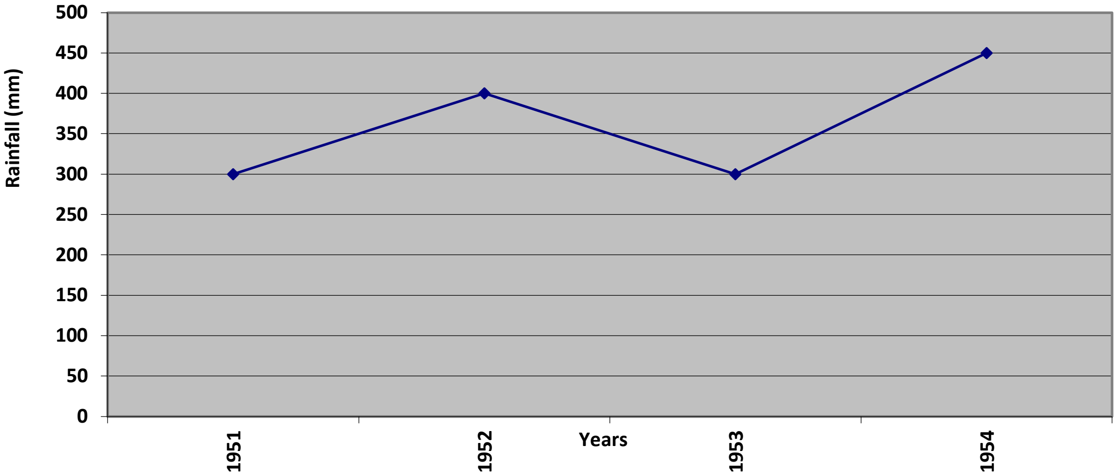
Table 18: Station wise PET (mm/day) for the Current (C) and Previous (P) year –Monthly, Seasonal and Annual basis

Day	Station 1		Station 2		Station 3				Station n	
	P	C	P	C	P	C	P	C	P	C
Jan										
Feb										
Mar										
Apr										
May										
Jun										
Jul										
Aug										
Sep										
Oct										
Nov										
Dec										
Monsoon (JJAS)										

Post- monsoon (OND)										
Winter (JF)										
Pre-monsoon (MAM)										
Annual										

9. *Trend Analysis of State and Sub-Division Level (give time series plots):* Trend Analysis: (A sample plot is given below)

- Time Series plots and Fitted Linear Trends in
  - ✓ Annual Rainfall (mm)
  - ✓ Annual Mean Maximum Temperatures (^{o}C)
  - ✓ Annual Mean Minimum Temperatures (^{o}C)
  - ✓ Annual PET (mm)



10. *Other extreme events including cyclone during last 10 years: As per table 19 given below*

Table 19: Other Extreme Events

Extreme Annual Maximum Temperature (Highest of daily Max T)						
Year	District 1	District 1	District 3	District 4		District n
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
Extreme Annual Minimum Temperature (Lowest of daily Min T)						
Year	District 1	District 1	District 3	District 4		District n
1						
2						
3						
4						
5						
6						
7						

8						
9						
10						
Average Number of Hot Days during Summer Season (Suitable threshold such as 40°C)						
Year	District 1	District 1	District 3	District 4		District n
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
Average Number of Cold Days during Winter Season (Suitable Threshold such as 10°C)						
Year	District 1	District 1	District 3	District 4		District n
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
Cyclone						
Year	District 1	District 1	District 3	District 4		District n
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

ANNEXURE- A

Computation procedure

Areal rainfall:

- **Computation Procedure for district/Sub-basin rainfall:**

Arithmetic Average Method: The estimate of District/ sub-basin rainfall by Arithmetic Mean Method is done using:

$$P_{Dist} = \sum P_i / m$$

Where P_i is the rainfall of i^{th} station and m is the no. stations in a district.

District Rainfall		DAYS								
		Day 1	Day 2	Day 3	...	...	...	...	...	Day (n)
STATIONS	Stn. 1	...	...	...	...	...	...	...	...	...
	Stn. 2	...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...	...	...
	Stn. (m)	...	...	...	...	...	...	...	...	...
District Averages		Avg. 1	Avg. 2	Avg. 3	...	...	...	...	...	Avg. (n)

District Rainfall for (n) no. of days = Avg.1+Avg.2+Avg.3+ … +…+…+…+Avg.(n)

Same procedure may be adopted for computing sub-basin rainfall.

- **Computation Procedure for state rainfall:**

The estimate of State rainfall is made by taking Area Weighted Average of rainfall of Districts, taking the district areas as weights.

$$P_{State} = \sum (P_{Dist} \text{ x } A_{Dist})/ A_{State}$$

State Rainfall (mm.)		Rainfall for a given period of time		
		District Rainfall (mm.) for given the period	District Area (Sq. Km.)	Rainfall x Area
DISTRICTS	Dist. 1	r_1	a_1	r_1xa_1
	Dist. 2	r_2	a_2	r_2xa_2
	Dist. 3	r_3	a_3	r_3xa_3
	...	...	...	...
	...	...	...	...
	...	...	...	...
	...	...	...	...
	...	...	...	...
	Dist. (m)	...	...	...
		TOTAL	SUM1	SUM2

State Rainfall (mm) = SUM2 / SUM1

Data may also be obtained from IMD and other agencies for computation. Same procedure to be followed as mentioned above for computation of monthly/seasonal normal rainfall. The 4 seasons are; (i) Winter (Jan to Feb); (ii) Pre-Monsoon (March to May); (iii) Monsoon (June to Sept.) and (iv) Post Monsoon (Oct to Dec).

The same procedure may be adopted for other weather parameter for basin/sub-basin and district wise computation.

POTENTIAL EVAPO-TRANSPIRATION

1. PAN EVAPORATION METHOD

The pan evaporation is related to the reference evapo-transpiration by an empirically derived pan coefficient:

$$ET_o = K_p * E_{pan}$$

Where, ET_o reference evapo-transpiration [mm/day], K_p pan coefficient [-], and E_{pan} pan evaporation [mm/day].

Pan coefficients (K_p) for Class A pan for different pan siting and environment and different levels of mean relative humidity and wind speed are given in Allen et al. (1998)

2. FAO-56 PENMAN-MONTEITH EQUATION

This is commonly used and most standard procedure for calculating PET which takes into account both advection and Radiation terms of energy transport. The International Commission on Irrigation and Drainage (ICID) and the Food and Agricultural Organization (FAO) Expert Consultation Committee on revisions of FAO methodologies for crop water requirements recommended the FAO-56 Penman Monteith (FAO-56 PM) method as the standard method for estimation of reference potential evapo-transpiration (ETo) (Allen et al. 1998). The FAO-56 PM method to estimate ETo can be written as (Allen et al, 1998):

$$ET_o = \frac{0.408\Delta(R_n - G) + \gamma\frac{900}{T+273}u_2(e_s - e_a)}{\Delta + \gamma(1 + 0.34U_2)} \qquad (1)$$

where, ETo is the reference evapo-transpiration (mm day^{-1}); R_n is the net radiation at the crop surface (MJ m^{-2} day^{-1}); G is the soil heat flux density (MJ m^2 day^{-1}); T is the mean daily air temperature at 2 m height, (°C); u_2 is the wind speed at 2 m height (m s^{-1}); e_s is the saturation vapor pressure (kPa); e_a is the actual vapor pressure (kPa); (e_s-e_a) is the vapor pressure deficit (kPa); Δ is the slope vapor pressure curve (kPa °C^{-1}); and γ is the psychrometric constant (kPa °C^{-1}).

The methodology for computation of potential evapo-transpiration using FAO-56 Penman Monteith method is available in **FAO Irrigation and drainage paper 56** (Allen et al. 1998). The methodology for computation of potential evapo-transpiration and weekly PET maps are also available in Khambete & Biswas (1992)

The FAO-CROPWAT, a decision support tool, is freely downloadable software (http://www.fao.org/land-water/databases-and-software/cropwat/en/) and can be used for the calculation of crop water requirements and irrigation requirements based on soil, climate and crop data. The FAO- CLIMWAT climatic database (http://www.fao.org/land-water/databases-and-software/climwat-for-cropwat/en/) provides observed agro-climatic data of over 5000 stations worldwide, and can to be used in combination with the computer program CROPWAT, and allows the calculation of crop water requirements, irrigation supply and irrigation scheduling for various crops for a range of climatological stations worldwide.

Extreme Climate Parameters (Deshpande et al. 2015):

Obtain Daily Climate Parameter values for at least 30 years data. Estimate Yearly extreme Value of rainfall. Plot the extreme value on the map of the state and draw a smooth pattern.

Repeat the procedure for Maximum temperature data (Highest of Daily Maximum Temperature) and Minimum temperature data (Lowest of minimum Temperature values).

Using daily Maximum Temperature data, count the number of days with maximum temperature exceeding the threshold value (can be taken as 40°C) during Summer Season (MAM). And then calculate the average of all year values and plot these values on the map and draw smooth isolines.

Using daily Minimum Temperature data, count the number of days with minimum temperature going below the threshold value (can be taken as 10°C) during winter Season (DJF). And then calculate the average of all year values and plot these values on the map and draw smooth isolines.

Trend Analysis (Rajeevan et al. 2008)

Calculate Yearly values of different climate parameters for state as a whole such as Annual Rainfall, Annual Mean Maximum/Mean Minimum Temperatures and PET as the weighted average of district level annual values of the corresponding climate parameters (Taking district area as the weights). Then plot the time series of these climate parameters and fit a linear trend line to examine the temporal changes in these values over the observed data period.

References:

i. *Allen, R. G., Pereira, L.S., Raes, D., Smith, M. (1998). "Crop evapo-transpiration: Guidelines for computing crop water requirements" FAO Irrigation and drainage paper 56, Rome, Italy.*

ii. *Deshpande N. R., Kothawale D.R. and Kulkarni A (2015): Changes in climate extremes over major river basins of India,Int. Jr. Climatol , DOI: 10.1002/joc.4651*

iii. *Khambete N. N.and Biswas B C (1992): Weekly Potential Evapo-transpiration over India' Meteorological Monograph, Agrimet / No. 14/ 1992*

iv. *Rajeevan M, Bhate J, Jaswal Ak (2008). Analysis of variability and trends of extreme rainfall events over India using 104 years of gridded daily rainfall data. Geophys. Res. Lett.* ***35:*** *L18707, doi: 10.1029/2008GL035143.*

4.1.2 Glaciers

1.0 Subject Matter: *(about importance of glacier in state water resources and impact of climate change on glacier)*

- **Annexure : Location of glaciers on map**
  - Glacier area (Total)
  - Minimum and maximum length
  - Glacier classification (type of glaciers)
  - Snout location (altitude)

2.0 Availability and Utilizable Water

Table A3 is for glacial melts within the State Boundary which is a vital input for Chapter 9.

A3. Inflow from Glacial Melts of the Basin/Sub-basin within the State Boundary: (MCM)		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

3.0 Issues and Challenges

- *Reduction in size of glaciers and snow cover may be mentioned.*
- *Monitoring of glacier due to inaccessibility, tough terrain and weather condition may be included.*

4.0 Problem Root Cause Analysis for issues and challenges:

- *Climate change or general rise in atmospheric temperature is the main cause of shrinkage of glacier/snow cover besides other factors linked with anthropogenic activities.*
- *Change in precipitation (snow) pattern together with aspects, slope conditions and debris cover etc could be other causes of shrinkage of glacier.*

5.0 Governance / Management of Glacier:

a. Institutions governing / managing / monitoring the resources and Institutional structure: **(monitoring agency)**

GSI, WIHG, NCOAR Goa, Universities, State Remote Sensing Centre, Space Application Centre, Ahmedabad, NRSA, Hyderabad, State Irrigation Department, CWC, DST, MoEF&CC, GBPNIHESD, etc

b. Areas of Peoples/Private Participation/NGO if any

NGOs may contribute in awareness programmes of climate changes.

c. Schemes & Financing for monitoring [Relevant tables on Water Financing and Economics may be looked into Chapter 7 and filled up with appropriate data/information]

Ministry of Water resources, Ministry of Science and Technology, State councils of Science and technology, Dept of Space, MoEF&CC, etc

6.0 Constraints in Measurement, Monitoring and Data collection/ Management

i. *No man-power is deputed for measurement and monitoring, except discharge measurement in downstream for hydropower projects.*
ii. *Inaccessibility to glacier, tough terrain and weather condition.*
iii. *Lack of trained manpower.*
iv. *Lack of standard infrastructure and logistics.*
v. *No centralized data base centre.*
vi. *Lack of meteorological stations.*
vii. *Measurement and monitoring only by academic institutions.*
viii. *Only project mode studies, no long term programs for glacier monitoring*
ix. *Limited knowledge about dependence of mountain people on glaciers*

7.0 a) Bench Marking, if any

b) Performance Indicators: (for comparison across State/District/Basin)

Indicator	*Unit*	*District -1*	*District-2*	*District -3*
Change in number of glaciers	numbers			
Change in snow cover	In km^2 / m^2			
Change in accumulation area	In km^2 / m^2			
Change in ablation area	In km^2 / m^2			
Average change in snout position	In meter (+) positive (-) Negative			
Change in Precipitation over last 10 to 20 years	In cm/mm			
Change in ratio between accumulation and ablation	ratio			
Change in flow /melt water	cumecs			

8.0 Reforms undertaken / being undertaken / proposed, if any

9.0 Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task / activity

Activities	***Agency responsible***	***Time frame***	***Outcome***
Glacier mapping	State Remote Sensing Agencies	Annual	Areal data on glacier distribution

ANNEXURE

- Summary table of glacier

State	*No. of Glaciers*	*Total surface area of glacier*	*Approx. Ice volume*	*Major Rivers*	*Snow line (altitude)*

(Glacier distribution in Himalayan region based on Glacier inventory (GSI, 2009))

- Present status of glaciers in numbers in state

District/Basin	*<2km²*	*2-5km²*	*5-10km²*	*10-15 km²*	*15-20 km²*	*>20km²*
1						
2						
3						

- Change in number of glaciers in last 20-25 years

District/Basin	*Unit* Km^2/m^2	*2000*	*2005*	*Change in 5 year %*	*2010*	*Change in 10 year %*	*2015*	*Change in 15 year %*	*Last 2 yrs*	*Change in 17 year %*
1										
2										
3										

- Reduction or Shrinkage of glaciers in numbers and percent wise across the State in last 20-25 years

District/Basin	*<2km²*	*2-5km²*	*5-10km²*	*10-15 km²*	*15-20 km²*	*>20km²*

	Nos.	*%*	*Nos.*	*%*	*Nos.*	*%*	*Nos.*	*%*	*%*	*Nos.*	*%*	*Nos.*
1	60	30	30	20	20	15	10	5	10	5	8	3
2												
3												

- Change in snow cover in last 20-25 years

District/Basin	*Unit* Km²/m²	*2000*	*2005*	*Change in 5 year %*	*2010*	*Change in 10 year %*	*2015*	*Change in 15 year %*	*Last 2 yrs*	*Change in 17 year %*
1										
2										
3										

- Change in Accumulation area

District/Basin	*Unit* Km²/m²	*2000*	*2005*	*Change in 5 year %*	*2010*	*Change in 10 year %*	*2015*	*Change in 15 year %*	*Last 2 yrs*	*Change in 17 year %*
1										
2										
3										

- Change in Ablation area

District/Basin	*Unit* Km²/m²	*2000*	*2005*	*Change in 5 year (%)*	*2010*	*Change in 10 year (%)*	*2015*	*Change in 15 year (%)*	*Last 2 yrs*	*Change in 17 year (%)*
1										
2										
3										

- General Change in Snout position of glaciers

District/Basin	*Unit* In meter	*2000*	*2005*	*Change in 5 year (%)*	*2010*	*Change in 10 year (%)*	*2015*	*Change in 15 year (%)*	*Last 2 yrs*	*Change in 17 yeer (%)*
1										
2										
3										

- Change in ratio between accumulation and ablation

District/Basin	*Unit* Ratio	*2000*	*2005*	*Change in 5 year (%)*	*2010*	*Change in 10 year (%)*	*2015*	*Change in 15 year (%)*	*Last 2 yrs*	*Change in 17 year (%)*
1										
2										
3										

- Precipitation (Snow fall) Basin/District wise

District/Basin	*Precipitation*	*Discharge from glacier basin in cumec/cusec*	*% of precipitation enters into glacier basin*
1			
2			
3			

- Change in Precipitation district/basin

District/Basin	*Unit* mm/ cm	*1995- to 2000*	*Change in 5 year (%)*	*2000 to 2005*	*Change in 5 year (%)*	*2005 to 2010*	*Change in 10 year (%)*	*2010 to 2015*	*Change in 15 year (%)*	*Change in Last 2 yrs*	*Change in 17 year (%)*
1											
2											
3											

- Basin wise availability of water from glacier basin (time scale to be specified as per need)/ Sediment load to be added

District/Basin	*Availability In cumec/cusec **	*Utilizable In cumec/cusec **
1		
2		
3		

**** Cubic meter per second or cubic feet per second***

- Mapping of glacial lakes (basin wise)

District/Basin	*Number of glacial lakes*	*Size of lakes/ area In sq km*	*Change in size of lakes/ annual*	*Potential risk of GLOF in terms of downstream population*
1				
2				
3				

4.1.3. Springs (Only Perennial Springs)

1.0 Subject Matter: Springs – Introduction, distribution and discharge (Geo reference Map)

The details of distribution of perennial springs in the district and state on map and precipitation and discharge – basin wise and district wise are given in table 1 and 2 respectively.

Table 1: Distribution of Perennial springs in the District and State on map

Number of Springs based on discharge type, Inventory made and Numbers measured (Meizer Scale)																			
Basin	District	Type 1			Type 2			Type 3			Type 4			Type 5			Total		
		N	I	M	N	I	M	N	I	M	N	I	M	N	I	M	N	I	M

Note: N: Total number of Springs; I: No. of springs for which inventory is made; M: No. of springs for which discharge is measured.

Table 2: Precipitation and Discharge – Basin wise and District wise

Basin	*Precipitation*	*Discharge in Spring*	*% of precipitation enters into the Springs (in Volume)*	*Remarks*
District	*Precipitation*	*Discharge in Spring*	*% of precipitation enters into the Springs (in Volume)*	*Remarks*

2.0 Availability (monthly) of water & Utilizable Water from spring:
The details are given in table 3

Table 3: Availability (monthly) of Water from spring in the State in a Water Year

Month	*Available (in LPM or LPD)*	*Utilizable (in LPM or LPD)*	*Demand (in LPM or LPD)*	*Supply (in LPM or LPD)*	*Consumption (in LPM or LPD)*
June					
….					
May					

Availability of Water from springs, nallahs:

A4. *Inflow from Springs, Nallahs from upstream State/ Country or within the State: (MCM)		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

** [The water availability from the springs may be assessed from the inventory available with the State Government Agencies or from the National Wetland Inventory Assessment (NWIA) available with the India-WRIS or SAC, ISRO Ahmedabad for the entire country.]*

Table B2 indicates that portion of the springs and Nallahs/small streams which is utilized or under use within the State Boundary. The glacial melts already appears in the rivers/streams & gets stored in reservoirs en-route and therefore not considered separately.

B2. Utilization from Springs, Nallahs (MCM) (From Table A4)		**REMARKS**
In Basin A/ Sub-basin		
In Basin B/ Sub-basin		
In Basin C/ Sub-basin		
TOTAL		

3.0 Issues and Challenges:
Issues:

a. Inaccessible or difficult terrain of spring source area

b. Conflict of Interest in the spring land ownership : As per table 4 given below

Table 4: Ownership of the Spring Land (Govt./Individual/Community)

Basin	District	Ownership of Springs- in numbers			
		Government	Community	Individual	Others

c. Difficulties in continuous monitoring of spring (discharge and other parameters)

d. Change in biophysical landscape and spring health

e. Role of Change in Land Use Land Cover leading to drying of spring : As per table 5 given below:

Table 5: Land Use and Land Cover change pattern in Spring-shed/ Recharge area

Basin	District	% of Catchment Area under								
		Forest		Agriculture		Grazing/ Scrub		Settlement		Observations
		CY-5	CY	CY-5	CY	CY-5	CY	CY-5	CY	

f. Role of hydro-geological setup in perennial spring along with eco-hydrological changes

g. Impact of deforestation, rainfall intensity, rise in temperature, seismicity, landslide, etc. in decline of discharges of springs.

h. Developmental activities (Road constructions, Industries, Tunneling, HEPs development, Mining etc.)

i. Demand in various Sectors, Rise in water demand/ Use*: Give details of use of spring water for consumption in Farm Sector, Industry/Infrastructure, Establishments/Institutions, Drinking/Domestic Use (Urban/Rural) and Forestry Sector.: Table 6 to 12*

Table 6: Usage of Springs Water

Basin	District	Drinking Water				Irrigation		
		No. of Springs	No. of hamlets	No. of families	Discharge Qty	No. of Springs	No. of Land holdings	Irrigated Area

Table 7: Source Wise Previous Year/ Average Annual Water Supply:

C1. Farm Sector (MCM) Within the Basin/ Sub-basin A (Chapter 4.2.2)													
Source	Sub Source	Rain-fed Crops	Agriculture Irrigated Crops					Horticulture		Animal Husbandry (Livestock, Birds and Others)	Fishery & Others	TOTAL
			Rice	Wheat	Sugarcane	Cotton	All other crops	Banana	All other crops/ plantation			
Surface Water	Springs, Nallahs											

Table 8: Drinking Water (DW) Usage

Basin	District	No. of Springs Used for usage for DW		
		DW Quality	Not fit for DW as on date	No. of Springs whose water has become unfit during the last 5 Yrs.

Table 9: Source Wise Previous Year/ Average Annual Water Supply:

C4: Drinking Water & Domestic Use: Rural (MCM) Within the Basin/ Sub-basin A (Chapter 4.2.5.1)					
Source	**Sub Source**	**District 1**	**District 2**	**District 3**	**TOTAL**
Surface Water	Springs, Nallahs				

Table 10: Source Wise Previous Year/ Average Annual Water Supply:

C5. Drinking Water & Domestic Use (Urban) (MCM) Within the Basin/ Sub-basin A (Chapter 4.2.5.2)						
Source	**Sub Source**	**City A**	**City B**	**City C**	**Towns**	**TOTAL**
Surface Water	Springs, Nallahs					

Table 11: Source Wise Previous Year/ Average Annual Water Supply:

C6. Forestry Sector (MCM) Within the Basin/ Sub-basin A (Chapter 4.2.1)					
Source	**Sub Source**	**Rain-fed Forestry**	**Irrigated Forestry**	**Wildlife**	**TOTAL**
Surface Water	Springs, Nallahs				

Table 12: Un-tapped potential

Basin	District	Total No. of Springs	No. springs tapped for DW	No. of Springs tapped for Irrigation	Springs not tapped for DW/ Irrigation	
					No.	Qty of Discharge

j. Decline in spring discharges / time series if available (with probable reasons) : Table 13 given below

Table 13: Drying of springs (amongst measured) across the Districts

Basin	*District*	*2000*	*2010*	*Cr.Yr.-5*	*Cr.Yr-1*	*Current Yr*
	District.1					
	District.2					
	District.3					

Note: Cr.Yr-1= Current Year-1 i.e., Previous Year; Cr.Yr-5 = Five Year back data

k. Pollution from domestic, sewage and industrial waste: Table 14 given below

Table 14: Pollution details

Basin	District	Pollution Sources			
		Domestic	Industrial	Farm Fertilizers and Pesticides	Others

l. Lack of sewage disposal system or mining activity or disposal of solid waste could be cause of pollution

m. Role of negligence or lack of interest in spring conservation

Challenges:

a. Mapping of all spring area/recharge areas for conservation and management (Data base creation for background information). Primary and secondary data field creation on springs in the region.

b. How to rejuvenate the dried springs: Table 15 as given below

Table 15: Recharge zone characteristics
Basin/ Sub-basin:

Physiography and structures	
Rock types	
Land Use	
Land Cover	
Slope	
Aspect	
Altitude (meters)	
Soil depth (cm)	
Spring type	

c. Management of water distribution from springs: Table 16 and 17 respectively given below

Table 16: Conservation

Basin	*District*	*Name of Scheme for conserving Springs*			
		RD	*Panchayat*	*Others*	

Basin	*District*	*Total No. of Springs*	*Total Investment under various Scheme*	*Conservation measures are taken up*		*Springs that have shown increase in discharge*	
				Number	*%*	*Number*	*%*

Table 17: Vulnerability assessment (Basin-wise and District-wise)

Basin	***District***	***Components***	***Sector***	***Indicators***
		Climatic Exposure	Rainfall	Mean annual rainfall
			Temperature	Annual mean temperature
		Sensitivity	Water sources	Other types of water sources
			Irrigation	% Rain-fed farming
			Livelihoods	% Farming populations
			Human Health	Population
		Adaptive Capacity	Economic capacity	Poverty rate
			Environmental capacity	Population density
			Physical/Developmental connectivity	Rural connectivity and Industrial development
		Social Awareness	Human capacity	Education level & corresponding % in population
			Water literacy / capacity	Socially aware population w. r. t. spring conservation & rejuvenation

d. Reducing pollution and enhance permeability of infiltration of spring recharge zones

4.0 Problem / Root Cause Analysis

5.0 Constraints in Measurement, Monitoring and Data Management: These may include:

i. Accessibility to spring source is difficult due to distance and terrain conditions, etc.
ii. No manpower deputed for discharge or water quality measurement due to lack of sufficient manpower.
iii. Lack of trained manpower (Para Hydro-geologists)
iv. Lack of potable water quality measuring kit, discharge measuring equipments and standard infrastructure.
v. No centralized data base and analytical support etc.

6.0 Governance / Management of springs:

a. Institutions governing / managing / monitoring the resources and Institutional structure.

b. Areas of Peoples/Private Participation/NGO if any:
This may include people's or community participation in maintenance of water distribution system from springs and creation of re-charge structure, water storage structure and water conservation structures in the spring catchment.

c. Water (Springs) Financing and Economics *(for springs development, construction and maintenance, recharge etc.):* [Relevant tables on Water Financing and Economics may be looked into Chapter 7 and filled up with appropriate data/information] Spring tapping schemes in numbers and their financing may be given here. (This may be supported by tables giving name of scheme, no. of beneficiaries, cost and source of finance (Govt. / Public Private Partnership (PPP)/ Community participation/driven etc.)

d. Best practices/ Success stories in measurable terms.

7.0 Performance Indicators: for comparison across district/basin/state

a. Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently. If not available, it should be listed as a constraint/ limitation in data management.

b. Performance Indicators

District/State/Basin	Units	District.1	District.2	District.3	Dist.4
I. Measurement					
• Total No. of Springs	Number				
• % Springs whose inventory is completed	%				
• % of Springs whose discharge is measured	%				
II. Quantity					
• Number and % of Springs got dried in/during last 5 years					
• Number and % of Springs got seasonal from perennial (% decline or dry period)					
III. Usage					
• No of Springs not tapped for DW/Irrigation					
IV. Water budget					
• % of precipitation enters into the Springs in Volume in identified recharge zone	mm or cum				
• Discharge trend over the last 5 Years against total no. of springs where discharge is measured. (Annual as well as seasonal discharge variation)	% increase				
	% decrease				
• % Springs not tapped for DW / Irrigation					
V. Threat					
• No. of Sheds affected by deforestation					
• No. of Sheds affected by seismicity					
• No. of Sheds affected by landslides					
• No. of Sheds affected by rise in temperature					
VI. Quality					
• % of Springs for Water Quality parameters are measured					
• Number and % of Springs not fit for DW					
• Number of Springs whose water has become unfit for DW during the last 5 Years					
VII. Conservation					
• % Springs Sheds having conservation management plans	%				

• % of Spring shed where Conservation has been undertaken (Please specify conservation techniques (Engineering/Vegetative/ Social measures) in separate annexure)	%				
• % Spring sheds where conservation has undertaken but discharge has not increased. (Please specify the probable causes in separate annexure)	%				
• % Springs where Forest catchment area has declined					
• % Springs where settlement in catchment area has increased					
VIII. Peoples participation					
• % of Springs for which campaign has been undertaken					
IX. Financing					
• Amount invested per spring development during the previous year					

8.0 Reforms undertaken/ being undertaken/ proposed if any

9.0 Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity.

4.1.4 River Basins

1.0 SUBJECT MATTER: River Water Resources: Trend, Mapping and Seasonality

River Basins/ Sub-Basins and Watersheds : River Network (Text and GIS based Map/Data with Datum, Projection & Coordinate system, Spatial Resolution, Shape Files etc.)

The main river in the basin/sub-basin and its tributaries/ sub-tributaries of different stream orders may be described here along with the length of the river network, catchment area up to the outlet/ confluence within the State Boundary & average slope of the basin/sub basin as well as the rivers. All these figures/data has to be extracted from GIS based Mapping (Digital Elevation Modeling/ Digital Surface Modeling/ Digital Terrain Modeling) along with the plan-form of the rivers, its meandering, confluences, origin, river islands etc. As per Survey of India regulations Digital Elevation Modeling/ Digital Surface Modeling/ Digital Terrain Modeling may not permitted to prepare and publish for the International Border areas and notified restricted areas like North Eastern States. In such cases, the land slope and terrain definitions may be derived from the available analogue maps in such difficult areas. (Table. 1)

The main task is to delineate all the basins/ sub basins within the State Boundary and mark all the districts superimposed on the basins /sub basins. All the relevant geo-spatial information is to be analyzed in this spatial domain of a basin /sub basin within the State. This is the first and foremost task, one time exercise for all upcoming Water Years.

Table 1: (Area in lakh hectares/ Slope in %)

Basin/ Sub-basin	Name of River and its Stream Order	Tributaries & Sub Tributaries	Stream Order	Length of Channel Network	Catchment Area and its average slope	Average Slope of Channels	Tidal Reach from the Outlet
Basin A/ Sub-basin	River 1 (Stream Order…)	Tributary 1					
		Sub-Tributary 1					
		Sub-Sub-Tributary 1					
		Tributary 2					
Basin B/ Sub-basin	River 2 (Stream Order…)	Tributary 1					
		Tributary 2					

Stream ordering etc. may have been already done for most of the river systems of the country by the scientific organizations like National Institute of Hydrology, India-WRIS Portal, etc. Therefore, it will be easy to collect the secondary data from such sources for most of the river systems.

i. Characteristics of each river including catchment area. (Text)

A brief description of the river basin and its morphological characteristics may be elaborated here for understanding. Actual photographs of certain sample areas/spots in the basin/sub-basin may be annexed for having visual clarity/ visualization. The small hydrological units in the basin e.g. watersheds also need to be demarcated where suitable measures for soil and water conservation such as continuous contour trenches (CCT), staggered contour trenches (SCT), check dams (CD), percolation tanks (PT), etc., may be adopted as per ridge to valley approach. ***All Basins up to Micro-Watershed level have been already delineated by Soil and Land Use Survey of India (SLUSI), working under Ministry of Agriculture & Farmers Welfare, GOI. A Watershed Atlas has been prepared by them. So, it may be easy to collect all information from SLUSI.***

ii. Land Use/ Cover (Sub catchment wise) (Text and GIS based Map)

The land use/cover plays a vital role in the response of a basin/ sub-basin to any rainfall event. Also, the rate of soil loss and amount of sediment generated from a catchment depends on this factor. The percentile coverage of various land use units like agriculture or cropped land, urban/built-up land, waste land and land cover units like forest, shrubs, fallow, desert, rocky terrain, water bodies, etc., within the Basin/ Sub basin affects the various hydrological processes like interception, infiltration, evapo-transpiration, runoff, etc., and considered as important physiographic data which determines water availability apart from topography (slope, elevation) and soil characteristics, depth and antecedent moisture condition. (Table. 2)

Table 2: (Area in lakh hectares)

Basin/ Sub-basin and its Area	Barren Rocky Area	Forests, Plantations	Cropped land	Grass Grazing	Mining	Inland Wetland	Fallow	Rural Areas	Urban Areas	Water Bodies	Desert/ Sandy Areas

iii. Hydrological Data Observation Network (Text and GIS based Map/Data)

The position of all the Hydrological Observation Stations and/or Flood Forecasting Sites in the River Network of each Basin/ Sub-basin and the type of measurement (Gauge, Discharge, Sediment, Quality) also need to be highlighted. The GIS Map should reflect the locations of all Data Observation Points in the Basin (Central/ State etc.) including reservoir inflow forecasting stations superimposed on the entire River Network/ System. Hydrological Data may also be obtained from CWC regarding the H.O. Sites of the Commission. (Table. 3)

Table 3:

Basin/ Sub-basin	Name of River and major tributaries	Total Length of River Network	Number of HO & FF Stations (State/ Central) in a Basin	Type of Measurement (G,D,S,Q)

The river cross sections with bed levels (pre-monsoon, post-monsoon), average bed slope, Highest Flood Level, Stage-Discharge Curve, average velocity at site, sediment/silt load observed, water quality parameters measured etc. available at all the various hydrological observation sites may be included as annexure (or in soft copy, excel sheet)

2.0 Availability & Utilizable Water

i. Basin wise Surface Water Availability within State Boundary: Table 4 given below:

Table 4: Annual Water Availability (BCM) for minimum 30 years (Frequency- Annual Volume in MCM)

Year	(Sub-basin-A, Area) **say XYZ, 1590 Sq. Km**	(Sub-basin-B, Area) **say UVW, 1800 Sq. Km**	(Sub-basin-C, Area) **say ABC, 3500 Sq. Km**	(Sub-basin….., Area) **say STR, 2400 Sq. Km**	(Sub-basin-N, Area) **say QRT, 6400 Sq. Km**	Total Basin Water Availability

The final table A1R as reflected in Chapter 9 has to be got filled up here only wherein the total annual runoff of each basin/ sub-basin will be known at the outlet/mouth of each such unit along the river channel which results due to precipitation (meteorological parameters) and its interaction with physiographic factors like LULC, Type of Soil, Pervious Area, Soil Depth and Antecedent Moisture Condition, Ground Water Table, etc. The annual discharge also includes glacial melts within the State Boundary, if any, and base flows generated round the hydrological year.

A1R. Runoff (including Glacial Melts within State Boundary) (in MCM)		**REMARKS**
Basin/Sub-basin (Area in Km^2)	**Discharge (in MCM) in a Water Year at the Outlet**	
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

i. Water received from the rivers from upstream states: Table 6 given below

Table 6: Annual water received from upstream States (30 years): Unit MCM

Year	Sub-basin-A		Sub-basin-B		Sub-basin-C		Sub-basin…..		Sub-basin…..		Total
	Annual Volume	Upstream State	Annual Volume	Upstream State	Annual Volume	Upstream State	Annual Volume	Upstream State	Annual Volume	Upstream State	

Hydrological Observation Station on the river at the entry point of the State will be having this data; otherwise, upstream site discharge data may help in estimation of the inflow. New sites must be opened at such locations to measure the inflow discharge from upstream State/Country where HO Stations do not exist at present. It may happen that the inflow point is un-gauged i.e. measurement of flow is not done at present or not feasible and the contributing catchment of the flow lies outside the State. Under such circumstances the Rainfall-Runoff Hydrological modeling can be done to have a fair idea of total inflow within the State for any rainfall event. If there are sources of Glacier outside the State, then water available from melting of such glaciers will also be included as inflow. This will be equal to the Outflow of the Upstream State at that point.

A2. Inflow from upstream State/ Country along the River Course: (in MCM)		
Basin/Sub-basin	**(Inflow in MCM)**	**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

iii. Intra basin and Inter basin transfers: Table 7 as given below

Table 7: Intra basin and Inter basin transfers (Annual volumes in MCM) (30 years)

Year	Water Transfer (Inter or Intra basin Transfers considering State Boundary)								Total Import	Total Export	Net Import / Export
	Import / Export (Inter-State, Inter-Basin)	Basin/ Sub-basin	Import / Export (Inter-State, Intra-Basin)	Basin/ Sub-basin	Import / Export (Intra-State, Inter-Basin)	Basin/ Sub-basin	Import / Export (Intra-State, Intra-Basin)	Basin/ Sub-basin			

Table A11 will include the total quantity of water transferred through Canals etc. from water surplus Basin/Projects in other States round the Water Year. This water would also be entering through some basin/sub-basin within the State and need to be considered in that spatial unit accordingly. The intra-basin transfer is internal redistribution of water resources within the State and may also be brought out in the annexure. The State Boundary, Basin boundary and Transfer Links has to be looked into to ascertain whether its inter-basin/inter-state, intra-basin/inter-state, inter-basin/intra-state or intra-basin/ intra-state water transfer. The last two indicates redistribution of internal water resources only.

A11. Inter-basin transfers (IBT) from Projects in other States (Import): (MCM)		**REMARKS**
In Basin A/ Sub-basin		
In Basin B/ Sub-basin		
In Basin C/ Sub-basin		
TOTAL		

Table B9 indicates that portion of the Inter-Basin Transfer through Canals earmarked for the State through which it is passing. For example, a Trans-boundary canal may carry discharge for two or three recipient States and in such cases utilizable/utilized portion of water for a State is the portion earmarked for that State only.

B9. Utilization of Inter-basin Water transfers from Projects in other States (Import) (MCM) (From Table A11)		**REMARKS**
In Basin A/ Sub-basin		
In Basin B/ Sub-basin		
In Basin C/ Sub-basin		
TOTAL		

The volume of water exported to other States/Countries through the Inter-basin Transfer Link after catering to certain demands in the present State need to be tabulated here as Outflow.

D1. Inter-basin transfers to other States (Export) (MCM)		**REMARKS**
Project A in Basin A/ Sub-		
Project B in Basin B/ Sub-		
Project C in Basin C/ Sub-		
TOTAL		

iv. Environmental Flows: Table 8 and 9 given below

The estimation of spatio-temporal requirements of e-flows in the various stretches of river network has to be ascertained and compared with the natural flow/supply/releases in the streams. This exercise has to be carried out for each of the Sub-basins.

Table 8: *Environmental Flow: Demand and Supply (Annual volume in MCM) for reporting Year 20XX

Location 1		Location 2		Location 3		Location N		Basin Total	
Requirement	Releases	Requirement	Releases	Requirement	Releases	Requirement	Releases	Requirement	Releases

* If data for pre-monsoon, monsoon and post monsoon season is available the same may be provided

Table 9: Status of Environmental Flow estimation for the Reporting Year

S. No.	River Basin/ Sub-basin	Key Stretches/ Hotspots	Status of e-flow assessment				Timeline for e-flow integration with River Basin Plan	Key agencies involved
			e-flow recommendation		e-flow assessment yet to initiate	Capacity needed for e-flow studies		
			Wet season e-flows (MCM)	Dry season e-flows (MCM)				

v. Water Quality: Table 10 given below

Table 10: Water Quality status in the basin for the Reporting Year

S. No.	Basin / Sub-basin	Key locations	Water Quality Status	Key Issues					Plan for addressing pollution	Key agencies involved
				Domestic Sewage generated	Domestic Sewage treated/ reused	Industrial Effluents generated	Industrial Effluents treated/ reused	Number of major drains out falling into the river		

Water Quality is a very significant aspect of Water Resource. Within river basins or sub-basins, there may be a spatio-temporal variability in the water quality of various stretches of stream segments. The same may be mapped for various time periods within the year and comparison may be done among the various years to get an idea of the degradation/improvement in health of the river ecosystem particularly at hotspots or critical locations. Percentage reuse of sewage & effluent after treatment is a very good indicator of surface water quality.

vi. Water Yield: Detailed Hydrological Analysis of Sub basins/ Availability of Water in Sub basins (Text and Table 11.)

Table 11: Water Availability in the Sub-basins (Annual): in MCM

Name of Sub-basin	Runoff from rainfall / snowmelt within the Sub-basin	Inflow from upstream Countries/ States	Water mandatorily to be released for downstream States as per Agreements / Tribunal Award	Groundwater Availability in the Dynamic Zone	Water available through Desalination	Water Availability	Rate of sediment flow	Total Sediment flow per year	Catchment Area Treatment (CAT)	
									Area treated through Watershed development	Rate of sediment flow after CAT

vii. The total discharge flowing out of the State Boundary through various basin/sub-basins need to be entered in Table D2. Of course if the total annual water flowing out from the System through the rivers is more than the desirable amount, then the additional volume of water can be treated as Utilizable Water for the State, which is now running down because of non-storage or non-utilization or interstate water sharing commitments with the downstream states, if any.

D2. Discharge flowing out to downstream States (MCM)			**REMARKS**
		Desirable*	
Basin A/ Sub-			
Basin B/ Sub-			
Basin C/ Sub-			
TOTAL			

***** Desirable e-flow: There is no single 'best' EF methodology that can be universally applied under all circumstances. The e-flows estimates vary significantly from one method to other. The Building Block Method (BBM) is essentially a prescriptive approach, designed to construct a flow regime for maintaining a river in a predetermined condition and is also recommended by the MoEF&CC.

Outflows greater than Desirable Quantity (e.g. considering Inter-State/International Water Sharing Tribunal Award/Treaty) can be considered Utilizable Water for the State under consideration if appropriately harnessed by useful interventions within the Basins.

3.0 Issues and Challenges (Text)

i. Status of Aquatic Biodiversity in the State: Occurrence & Threats (Text and Table 12)

Table 12: Status of Aquatic Biodiversity: Occurrence and Threats

S. No.	River Basin/ Sub-Basin	Key Endemic & Threatened Species	Status (Rare, Endangered, Threatened)	Population and Distribution Range	Key threats to species and their habitats [1] in respective Distribution Ranges	Plans for mitigating threats in specific Distribution Range	Key Agency involved

Note: Endemic species are those that are exclusive to a particular distribution range or are native to a region (country/state/landscape). Threatened species are those whose population is on a declining trend and have been accorded legal protection under the IW (P) Act, 1972.

ii. Flood Management (Table 13), Urban Flooding.

Table 13: Flood Management in the Basin/ Sub-basin

S. No.	River Basin/Sub-Basin	Type of Floods (GLOFs, cloud burst; rainfall, drainage congestion, dam break)	Vulnerable districts with flood prone area	Total number of vulnerable villages	Population impact on an annual basis	Status of Flood early warning systems	Flood mitigation strategies (Past, present and future)			
							Structural	Capital investments; Annual O&M	Non structural	Capital investments; Annual O&M

iii. Water Quality Degradation
iv. Drought Management
v. Catchment Area Treatment (CAT) through Watershed Development

4.0 River basin Problem Tree/ Root Cause Analysis: Cause, Effect & Interventions (Text)

5.0 Governance / Management

a. Statute / Law / Policy/ Regulations if any:
   i. Constitutional Provisions, Water related Acts & Laws (Text)
   ii. State Water Policy and other policy related to water etc. (Text)
   iii. Water Regulation & Inter-State Water Sharing Agreements, Tribunal Awards, if any (Text)
   iv. Water Tariff structures/ Water Pricing in domestic, industrial and irrigation sector (Table 14.)

Table 14: Water Tariff Structure

S. No.	Name of Basin/ District	Domestic Sector		Industrial Sector		Irrigation Sector	
		Rate Rs/1000 litres	Agency to collect charges	Rate Rs /1000 litres	Agency to collect charges	Rate Rs / 1000 m3	Agency to collect charges

b. Institutions governing the resources and structure
   i. Institutions on Water Governance: Authority, Departments, HODs, Boards etc (Text)
   ii. Existing Institutional/ Manpower Structure of various Departments related to Water (Text)
   iii. Role & Responsibilities of various Government Departments responsible for the development of water resources, allocation of water among various sectors and efficient utilization of water in different sectors (Text)
   iv. Status about the follow-up and implementation of National Water Policy and other surface water management guidelines: (Text)
   v. Status of Water Use Efficiency targets that were set by NCIWRDP in 1998-1999 and constraints in achieving them (Text)

c. Areas of Peoples/Private Participation if any: Partnership with stakeholders- Watershed Committees, WUA, and Public-Private Partnership (PPP) (Text)

d. Schemes & Financing (Text): [Also, relevant tables on Water Financing and Economics may be looked into Chapter 7 and filled up with appropriate data/information]

6.0 Measurement, Monitoring and Data Constraints / Management

a) Hydrological Observation network (Text and GIS based Map)
b) Other Network (Text and GIS based Map)
c) Database Management System details (Text)
d) Data Constraints (Text)
e) Sediment monitoring and management: Reservoir sediment monitoring and management, river morphological changes may also be included. This should cover the issue of sand mining as well (Text)
f) State-level data dissemination protocol (for sharing the data from State-owned observation stations) based on Hydro-Meteorology Data Dissemination Policy 2013 (Text)

7.0 Performance Indicators: For Comparison across Basins/Sub-Basins: Table A

Table A: Key Performance Indicators for River Basins/Sub-basins (every water year)

Performance Indicator	Norm / Benchmark , if any	Basin A/ Sub-basin	Basin B/ Sub-basin	…..
Measurement/ Water Quantity				
Number of H.O. Sites per unit catchment area (nos. / Sq. km.)				
Number of H.O. Sites per unit length of river network (nos. / km)				
Unutilized surface water flowing out of basin as % of total water availability at outlet (%)				
Unutilized surface water flowing out of basin as % of total utilizable water at outlet (%)				
Ground Water				
Average depth of Ground Water Table in the basin/ sub-basin (in M) Pre Monsoon (as per land use)				
Average depth of Ground Water Table in the basin/ sub-basin (in M) Post Monsoon (as per land use)				
Groundwater withdrawal as a percentage of groundwater recharge (%)	< 100%			
Problems and Issues				
Percentage of basin area as flood prone (%)				
Percentage of basin area as drought prone (%)				
% of over-exploited and critical blocks to total blocks (%)	0%			
Land Use - Land Cover				
Rain-fed cropped area as a percentage of basin area (%)				
Irrigated agriculture area as percentage of basin area (%)				
Area cultivated by standard cropping as per agro-climatic zoning to the total area under cultivation (%)	100%			
Agricultural Area as percentage of basin area (%)				
Urbanized area as percentage of basin area (%)				
Forest Area as percentage of basin area (%)				
Surface water irrigated area as a percentage of basin area (%)				
Ground water irrigated area as a percentage of basin area (%)				
Water Quality				
Average Water Quality Index considering relevant WQ Parameters				
Whether regular monitoring of silt load done in rivers (Y/N)	Y			
Rate of soil loss in the basin/sub-basin (T/Ha/year)				
Waste Water				
Percentage of domestic waste water treated (%)	100%			
Percentage of domestic treated water reused/recycled (%)	100%			
Percentage of Industrial effluent treated (%)	100%			
Percentage of treated Industrial effluent reused/recycled (%)	100%			

Percentage of untreated wastewater flowing into the river (%)	0 %			
Water Productivity				
Total live storage created so far, as % of water availability (%)				
Per capita live storage created (cum. /person)				
Per capita water availability (m3/person/year)	>1700 m3/person/year			
Water Management Plans				
Percentage of river basin brought under IWRM (%)	100%			
Percentage of river basin brought under Catchment Area Treatment Plan (%)	100%			
Water Conservation				
No. of water bodies restored as % of total no. of water bodies identified for restoration (%)	100%			
Economic Indicators				
Investment per Hectare in River Basin/Sub-basin for Soil and Water Conservation in the previous year				
Policy				
Whether National Water Policy is being implemented?				
Is the State having its own State Water Policy?				

8.0 Reforms undertaken/being undertaken/Proposed, if any (Tex): For e.g. HP-I, HP-II, NHP etc.

9.0 Road Map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity, if any (Text)

a. Better Governance
b. Better Source/ Supply Management
c. Better Demand Management
d. Water Quality & Sediment Flow Management
e. Water Economics & Financing
f. Sustainable Water Budgeting

4.1.5. PROJECTS- IRRIGATION & MULTI PURPOSE (MP)

1.0 Subject Matter (May include sub heading, data, graphs etc.)

a. Details of completed irrigation/MP Projects and Irrigation potential created and utilized by them. (Table 8 with a GIS based map)
b. Details of ongoing irrigation/MP Projects and Irrigation potential to be created by them. (Table 9 with a GIS based map)
c. Details of planned/proposed irrigation/MP Projects and Irrigation potential planned to be created by them. (Table 10 with a GIS based map)
d. Details of completed, ongoing and planned/proposed ERM (Extension, Renovation and Modernization) Projects and irrigation potential restored. (Table 11)
e. The extent of area covered by micro irrigation in each project may be given.

2.0 Availability & Utilizable Water (Tables 1 to 7 and Annexure Tables 12 to 14)

Table 1

A5. Storage in Major Reservoir/Projects (MCM) as on 1st June (Cultivable Command Area > 10000 Hectares)		**REMARKS**
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
TOTAL		

Table 2

A6. Storage in Medium Reservoir/Projects (MCM) as on 1st June (CCA in between 2000 & 10000 Hectares)		**REMARKS**
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
TOTAL		

Table 3

A7. Storage in Minor Reservoir/Projects (MCM) as on 1st June (CCA < 2000 Hectares)		**REMARKS**
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
TOTAL		

Total and Live Storage data in all Major/Medium/Minor projects (in MCM) as on 31st May of the previous year also may be provided in 3 similar tables as above for closing the water balance of the last year.

Table 4

B3. Utilization of Surface Water: Major Projects* (MCM)		**REMARKS**
Abstractions/Withdrawals during filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
Live Storage available after filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		

Inflow during post filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
TOTAL		

similar exercise to be carried out for under construction and proposed projects after their commissioning

Table 5

B4. Utilization of Surface Water: Medium Projects* (MCM)		**REMARKS**
Abstractions/Withdrawals during filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
Live Storage available after filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
Inflow during post filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
TOTAL		

similar exercise to be carried out for under construction and proposed projects after their commissioning

Table 6

B5. Utilization of Surface Water: Minor Projects* (MCM)		**REMARKS**
Abstractions/Withdrawals during filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
Live Storage available after filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
Inflow during post filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
TOTAL		

similar exercise to be carried out for under construction and proposed projects after their commissioning

The water that is lost from the System through evaporation from water bodies would come in this Table 7 as another Outflow from the System Boundary in an annual scale.

Table 7

D4. Evaporation ** from all Surface Water Bodies (MCM) in a Water Year		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

*** Evaporation from the open water surfaces like Reservoirs, lakes, ponds, tanks and wetlands can be estimated using one of the standard methods like Pan Evaporation Method, Priestly-Taylor or any other standard and simple methods.*

Evaporation from smaller water bodies may be clubbed together for ease and simplicity.

3.0 Issues and Challenges (Text)

4.0 Problem Tree/ Root cause Analysis: Cause, Effect and Interventions (Text)

5.0 Governance/ Management:

a. Statute/ Law/ Policy/ Regulations if any (Text)
b. Institutions governing/ managing/ monitoring the resources and Institutional structure. (Text)
c. Areas of Peoples/Private Participation if any (Text)
d. Schemes & Financing (Text) [Also, relevant tables on Water Financing and Economics may be looked into Chapter 7 and filled up with appropriate data/information]

6.0 **Measurement, Monitoring and Data Constraints/ Management: (Text)**

Annexure may include various Project Details like Area-Elevation-Capacity Tables/Curves, Reservoir Operation Rule Curve, Spillway Rating Curve, Canal Head-works discharge data or utilization data, Evaporation data, Bathymetry Data on Sedimentation of reservoirs etc.

7.0 Performance Indicators: For comparison across Projects/ Districts (Table A)

Table A: Performance Indicators for Projects (Every Water Year)

Performance Indicator	Norm/ Benchmark	Project 1	Project 2	…	Project N
Measurement/ Water Quantity					
Whether measurement of flow through Canals is in practice? (Y/N)	Y				
Whether flow measuring devices are installed on canal/distribution network? (Y/N)					
Whether flow measuring devices are calibrated before rotation start in every year? (Y/N)					
Whether measurement of water abstracted through Intake Wells is done? (Y/N)					
Whether measurement of water lifted through pumps is carried out for Lift Schemes? (Y/N)					
Water spilled downstream as % of Total Water Availability at that location (%)					
Percentage of actual evaporation losses to live storage (%)					
Percentage of unutilized water to live storage (%)					
% of distributaries where volumetric measurement is in place (%)					
Percentage of Dead Storage filled up with sediment (%)					
Whether Internal Water Audit was undertaken last year? (Y/N)					
Whether Third Party Water Audit was undertaken last year? (Y/N)					
Ground water utilized as % of total water used in irrigation (in Kharif Season)					
Ground water utilized as % of total water used in irrigation (in Rabi Season)					
Ground water utilized as % of total water used in irrigation (in Hot Weather Season)					
Productivity Indicators					
Whether design crop cycle is being practiced in the command? (Y/N)					
Agriculture Productivity of different crops (T/Ha)					
Water Productivity of different crops per unit irrigation water supplied (T/cum)					
Economic Productivity of different crops (Rs./Ha/cum)					
Irrigation Water Demand / Irrigation Water Supply (%)					

Performance Indicator	Norm/ Benchmark	Project 1	Project 2	…	Project N
Measurement/ Water Quantity					
Whether measurement of flow through Canals is in practice? (Y/N)	Y				
Whether flow measuring devices are installed on canal/distribution network? (Y/N)					
Whether flow measuring devices are calibrated before rotation start in every year? (Y/N)					
Whether measurement of water abstracted through Intake Wells is done? (Y/N)					
Whether measurement of water lifted through pumps is carried out for Lift Schemes? (Y/N)					
Percentage Area of Command covered under micro irrigation (%)					
Irrigation Potential Utilized/ Irrigation Potential Created (%)	100 %				
Annual water supplied per unit of irrigated area (MCM/Thousand Ha)					
Area irrigated per unit of water supplied in Kharif Season (Ha/MCM)					
Area irrigated per unit of water supplied in Rabi Season (Ha/MCM)					
Area irrigated per unit of water supplied in Hot Weather Season (Ha/MCM)					
Water Quality					
Reservoir Water Quality Parameters					
Water Use Efficiency Indicators					
Whether in areas under micro-irrigation, installation of Drip/ Sprinkler has been completed? (Y/N)					
Average surface water use efficiency in irrigation (%)					
Average ground water use efficiency in irrigation (%)					
% Length of Canals as Lined Canals (%)					
Reservoir Storage/Diversion Efficiency (%)					
Conveyance Efficiency (%)					
On-Farm Water Use Efficiency (%)					
Drainage Efficiency (%)					
% of area irrigated on volumetric basis, though may be charged on area basis					
Peoples Participation Indicators					
Percentage of developed irrigation command brought under WUAs (%)	100 %				
Percentage of developed irrigation command managed by WUAs (%)	100 %				
Whether Tail-enders is getting adequate water? (Y/N)					
Whether irrigation from tail to head is being practiced? (Y/N)					
% of Irrigation Service Fee retained by WUAs compared to fees collected by them (%)					
Financial Indicators					
Whether Irrigation Cess is being collected? (Y/N)					
Cost Recovery Ratio	1.0				
O&M Cost per unit command area					
O&M Cost per unit water supplied					
Revenue generated per unit water supplied					
Cost incurred for generating per unit energy (Crores/ MW)					

8.0 Reforms undertaken/ being undertaken/ proposed if any (Text)

9.0 Road map of activities/ tasks proposed for better governance with timelines and agencies responsible for each task/ activity. (Text)

a. Better Governance
b. Better source/ supply management
c. Better demand management
d. Water Quality
e. Water Economics & Financing
f. Sustainable Water Budgeting

Annex 8

Details of Completed Projects (as on 1st of June of the present water year)

S. No.	Basin/ Sub-basin	Name of Project and Type (Major/ Medium/ Minor)	CCA	Taluka and District	FRL	MDDL / DSL	Capacity at FRL	Capacity at MDDL / DSL	Live Storage	IP created	IP utilized	Hydropower potential generated	Area covered under Micro irrigation	Spillway Capacity	Design Flood	Total Storage as on 1st June	Withdrawals during the filling season	Live Storage after filling season	Total inflow during post filling season
					(m)	(m)	(MCM)	(MCM)	(MCM)	Lakh Ha	Lakh Ha	MW	Lakh Ha	m3/s	m3/s	MCM	MCM	MCM	MCM
	Basin/ Sub-basin A	Project 1																	
		Project 2																	

Annex 9

Details of Ongoing Projects (as on 1st of June of the present water year)

S. No.	Basin/ Sub-basin	Name of Project and Type of Project (Major/ Medium/ Minor)	Taluka and District	FRL	MDDL / DSL	Capacity at FRL	Capacity at MDDL / DSL	Live Storage	IP creation envisaged	Hydropower potential envisaged	Area proposed to be covered under Micro irrigation	Spillway Capacity
				(m)	(m)	(MCM)	(MCM)	(MCM)	Lakh Ha	MW	Lakh Ha	m3/s

Annex 10

Details of Proposed Projects (as on 1st of June of the present water year)

S. No.	Basin/ Sub-basin	Name of Project and Type	Taluka and District	FRL	MDDL / DSL	Capacity at FRL	Capacity at MDDL / DSL	Live Storage	IP creation envisaged	Hydropower potential envisaged	Design Flood	Spillway Capacity
				(m)	(m)	(MCM)	(MCM)	(MCM)	Lakh Ha	MW	m3/s	m^3/s

Annex 11

Details of Completed, Ongoing, and Proposed ERM Projects (as on 1st of June of the present water year)

S. No.	Basin/ Sub-basin	Name of Project and Type	Nature of Project (Extension / Renovation / Modernization)	Taluka and District	Serves Tribal / DP Area	Start Year	Year of completion	Total Cost	IP Restored / proposed to be restored	Expenditure per unit of IP restoration	Central Funding
								Crore Rs	Lakh Ha	Lakh Rs / Ha	Crore Rs

Annex 12

Annual Water Availability, Sector wise Demand and Supply for Major Projects (MCM): For the reporting water year on annual basis

S. No.	Basin/ Sub-basin	Name of the Project	Annual Water Availability	Farm Sector			Domestic Sector (Rural & Urban)		Industries & Infrastructure		Establishments & Institutions		e-flow	Spillage downstream	Evaporation Losses	Total Water Supplied	Total Water remaining as on 31st May
				Demand	Supply	Area Irrigated	Demand	Supply	Demand	Supply	Demand	Supply				MCM	MCM

Annex 13

Annual Water Availability, Sector wise Demand and Supply for Medium Projects (MCM): For the reporting water year on annual basis

S. No.	Basin/ Sub-basin	Name of the Project	Annual Water Availability	Farm Sector			Domestic Sector (Rural & Urban)		Industries & Infrastructure		Establishments & Institutions		e-flow	Spillage downstream	Evaporation Losses	Total Water Supplied	Total Water remaining as on 31st May
				Demand	Supply	Area Irrigated	Demand	Supply	Demand	Supply	Demand	Supply				MCM	MCM

Annex 14

Annual Water Availability, Sector wise Demand and Supply for Minor Projects (MCM): For the reporting water year on annual basis

S. No.	Basin/ Sub-basin	Name of the Project	Annual Water Availability	Farm Sector			Domestic Sector (Rural & Urban)		Industries & Infrastructure		Establishments & Institutions		e-flow	Spillage downstream	Evaporation Losses	Total Water Supplied	Total Water remaining as on 31st May
				Demand	Supply	Area Irrigated	Demand	Supply	Demand	Supply	Demand	Supply				MCM	MCM

4.1.6 WETLANDS

1.0 Subject Matter

Objective: To derive the water demand for maintenance of ecosystem level processes for wetlands and aquatic ecosystems (henceforth termed wetlands).

Definition of wetlands: “wetland" means an area of marsh, fen, peat land or water; whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters, but does not include river channels, paddy fields, human-made water bodies/tanks specifically constructed for drinking water purposes and structure specifically constructed for aquaculture, salt production, recreation and irrigation purposes [Wetlands Conservation and Management Rules, 2017, Clause 2 (1) g)]

Status and extent of wetlands and aquatic ecosystems and their usage

Maps depicting wetlands, urban and rural settlements, land use land cover, drainage and Protected Areas shall be prepared for each District

a) Status of wetlands- State wise (**Table 1**)
b) Status of wetlands – District wise (**Table 2**)
c) Status of aquatic species – State wise population trend of select species (**Table 3)**
d) Sector wise water allocation for maintenance of ecosystem level processes and other common users (**Table 4)**
e) Status of geo-tagging information on wetlands along with Class of Wetlands

2.0 Availability & Utilizable Water Temporal & Spatial basis is to be considered.

a. Availability: Total volume of water available in wetlands(**Table 5**)
b. Utilizable: Total water utilizable in terms of quality (Designated Best Use Water Quality Criteria) and quantity (**Table 6**)
c. Demand: Water availability as per the natural hydro period of a given water body or for wetlands 60-75% of the natural mean monthly water volume at human used wetlands, 90-100% of the natural mean monthly water volume in notified wetlands or wetlands in protected areas for maintenance of ecosystem level processes (**Table 7**)
d. Supply: The amount of water available in wetlands after consumptive use by humans (**Table 8)**
e. Consumption: The amount of water required from wetlands for maintenance of ecosystem level processes (**Table 9)**

Table 10 is related to the Storage Volume in water bodies like lakes, wetlands etc. The approximate volume of water available in these storage spaces as on 1st of June of the Water Year needs to be ascertained from the surface water area and average depth of water on the said date.

Table 10

A9. Storage* in Wetlands (MCM) as on 1st June		**REMARKS**
In Basin A/ Sub-basin		
In Basin B/ Sub-basin		
In Basin C/ Sub-basin		
TOTAL		

***** There is District-wise inventory of ponds, tanks, wetlands (including lakes) and other water resources available from the NWIA database available on India-WRIS and VEDAS for the entire country. The same may be used to estimate the Storage of Water in these sources. (https://vedas.sac.gov.in/vedas/node/59 & http://www.moef.gov.in/division/national-wetland-inventory-and-assessment-nwia)

For table 11, the utilizable surface water from wetlands etc can be assessed by considering the abstractions round the year and remaining storage as on the last day of the Water Year i.e. 31st May. Eventually, these water bodies again gets filled up during the monsoon in the next Water Year and water is available for utilization.

Table 11

B7. Utilizable Surface Water: Wetlands (Considering Tables A1 & A9) (MCM)		**REMARKS**
Abstractions/Withdrawals round the year		
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		

Storage* remaining after fulfilling all abstractions/withdrawals, losses etc. as on 31st May the next		
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

*There is District-wise inventory of ponds, tanks, wetlands (including lakes) and other water resources available from the NWIA database available on India-WRIS and VEDAS for the entire country. The same may be used to estimate the Storage of Water in these sources. (https://vedas.sac.gov.in/vedas/node/59 & http://www.moef.gov.in/division/national-wetland-inventory-and-assessment-nwia)

The water that is lost from the System through evaporation from water bodies would come in this Table 12 as another Outflow from the System Boundary in an annual scale.

Table 12

D4. Evaporation ** from all Surface Water Bodies (MCM) in a Water Year		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

*** Evaporation from the open water surfaces like Reservoirs, lakes, ponds, tanks and wetlands can be estimated using one of the standard methods like Pan Evaporation Method, Priestly-Taylor or any other standard and simple methods.*

Evaporation from smaller water bodies may be clubbed together for ease and simplicity.

3.0 Issues and Challenges (including - Issues related to loss in ecological functions, temporal variations in biodiversity and water quality. Further changes in the wetland area over a temporal scale needs to be assessed)

4.0 Problem Tree / Root cause Analysis: Cause, Effect and Interventions

Following defined categories and/or any other State-specific parameter(s) shall be explained and Root-cause, their effects and interventions adopted to address those issues may be provided.

5.0 Governance / Management

a. Statute / Law / Policy/ Regulations if any

i. Wetlands (Conservation and Management) Rules, 2017
ii. Guidelines for National Lake Conservation Plan, 2008
iii. National Plan for Conservation of Aquatic Ecosystems (NPCA), 2016
iv. Provision under National Environmental Policy, 2006
v. Provision under The Forest (Conservation) Act, 1980
vi. Provision under The Wildlife (Protection) Act, 1972
vii. Provision under Environmental (Protection) Act, 1986
viii. Construction and Demolition Waste Management Rules, 2016;
ix. Manufacture, Storage and Import of Hazardous Chemical Rules, 1989
x. Rules for Manufacture, Use, Import, Export and Storage of Hazardous Micro-organisms Genetically engineered organisms or cells, 1989
xi. Hazardous Wastes (Management, Handling and Trans-boundary Movement) Rules, 2008;
xii. E-Waste (Management) Rules, 2016
xiii. Any other

b. Institutions governing / managing / monitoring the resources and Institutional structure. (State Wetland Committee (Composition; decisions taken); District Wetland Committees

i. National Wetlands Committee (NWC) [Wetlands (Conservation and Management) Rules, 2017, Clause 6
ii. Central Wetland Regulatory Authority (CWRA)
iii. Lake Development Authority (LDA)
iv. Lake Conservation Authority (LCA)
v. State Wetlands Authority or Union Territory Wetlands Authority
vi. Irrigation and water resource Department

vii. Central Pollution Control Board (CPCB)/ State Pollution Control Board (SPCB)
viii. Pollution control committees (where applicable)
ix. Municipal Council/Corporation
x. Forest Department/Wildlife Department
xi. Local level institutions (Role of Panchayati Raj System, if any)
xii. Self Help Group, NGOs
xiii. NABARD, ADB
xiv. Any other

c. Areas of Peoples/Private Participation if any

i. Participatory management of water resources, if any
ii. Local level institutions/Panchayati Raj System in water resource management, if any
iii. Interdepartmental collaboration in wetland management, if any
iv. Any other

d. Schemes & Financing [Also, relevant tables on Water Financing and Economics may be looked into Chapter 7 and filled up with appropriate data/information]

i. Central Government schemes under National Committee on Aquatic Ecosystems (NCAE) etc.
ii. State Government aid projects
iii. UNDP funded projects
iv. World Bank aided projects
v. Local level site-specific projects such as MGNREGA

6.0 Measurement, Monitoring and Data Constraints/ Management

Following defined categories and/or any other State-specific parameter(s) shall be explained and interventions adopted to address those issues may be provided.

a. Description of the area: Boundary, geology, climate, demography
b. Maps depicting wetlands, urban and rural settlements and Protected Areas
c. Monitoring protocol: Monitoring of hydrological parameters like depth and water spread area;
d. monitoring of biodiversity in terms of aquatic fauna, flora and migratory water birds;
e. Monitoring of water quality in terms of Designated-Best-Use Criteria (DBU) described by Central Pollution Control Board
f. Assessment methods
g. Periodicity of assessment
h. Wetlands status reporting frequency (Report shall be submitted to NWC, CWRA, LCA as per their jurisdiction) **(Table 13)**
i. Document control and data management: Availability, Transparency and Circulation
j. Monitoring agency
k. Availability of trained manpower
l. Any other

7.0 Performance Indicators:

a) Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards

Category	Indicator	Bench Mark	District1	District2
Measurement & Statute	Number of wetlands notified as protected			
	% of notified wetlands geo tagged			
	Number of wetlands that are covered under Integrated Management Plan [Wetlands (Conservation and Management) Rules, 2017, Clauses 2 (1) e) & 5 (4) g) and h)]			
	Number of wetlands that do not have Integrated Management Plan [Wetlands (Conservation and Management) Rules, 2017, Clauses 2 (1) e) & 5 (4) g) and h)]			
	Number of Wetlands of the State not notified yet			
	Whether Identification of lakes having area >10.0 ha is completed			

Category	Indicator	Bench Mark	District1	District2
	Number of wetlands in which Physical, Chemical and Microbiological parameters are being monitored as per EPA, 1986			
	Number of wetlands in which biodiversity in terms of aquatic major fauna, flora and migratory water birds are monitored			
Water Demand Management	Number of wetlands where abstraction exceeds inflow			
	Extraction of water from wetlands (cubic meter per annum)			
	Number of wetlands that dry-up during summer			
Problems	Number of wetlands reported shrinkage in 'Zone of influence' due to anthropogenic causes			
	% & Number of lakes with shrinkage in catchment			
	0-25%			
	25-50%			
	50-75%			
	75-100%			
	Number of wetlands reported encroachment			
	Number of wetlands where prohibited activities are still continued			
	Number of Lakes where regulated activities are still not regulated.			
Water Quality	Number of wetlands categorized on Designated Best Use (DBU)Class A			
	Number of wetlands categorized on DBU Class B			
	Number of wetlands categorized on DBU Class C			
	Number of wetlands categorized on DBU Class D			
	Number of wetlands categorized on DBU Class E			
	Number of wetlands not categorized on DBU Criteria			
	Number of wetlands wherein water quality have degraded from DBU Class B and C to DBU Class D or E			
Waste Water / Pollution	Number of wetlands affected by Sewage			
	Number of wetlands affected by Industrial effluents			
	Number of wetlands affected by other source of wastewater i.e. *dhobi ghats*, cattle wallowing, etc.			
	Number of wetlands with STPs/ sewage treatment system			
	Number of wetlands with solid waste management system			
	Number of wetlands affected due to eutrophication (Problem due to excessive nutrients)			
	Number of wetlands with Biochemical Oxygen Demand (BOD) of 3 mg/L or less			
	Number of wetlands with Dissolved Oxygen concentration of 6 mg/L or more			
	Number of wetlands beyond the ideal range pH between 7.5 to 8.5			

Category	Indicator	Bench Mark	District1	District2
	% Coastal Wetlands that have shown decline in salinity significantly			
Status Assessment: Biodiversity	Number of wetlands where biodiversity (aquatic plants and animals) is assessed			
	Number of species locally extinct due to change in water quality and quantity			
	Number of species re-appeared due to rejuvenation of water quality and availability			
	No. of wetlands where population decline reported in migratory water bird congregation			
	No. of wetlands where population increase reported in migratory water bird congregation			
	% and Number of Lakes where Bio-diversity (Aquatic plants and Animals) is badly affected			
Participatory management in aquatic ecosystem conservation	Number of wetlands where people's participation is involved in Conservation.			
	Number of wetlands where mass awareness campaign is conducted			
	Number of wetlands reclaimed/rejuvenated through participatory management			
Source Augmentation (Restoration of wetlands)	Number of wetlands where restoration work has been taken up			
	Number of wetlands restored as compared to total number of wetlands identified for restoration.			
	Number of wetlands restored as compared to total number of wetlands identified for restoration.			
Water economics of aquatic ecosystems	Investment per hectare in the current year for wetland restoration (Rs.)			
	Revenue generated through wetland tourism (Rs.)			
	Revenue generated out of ecosystem goods and services (Rs.)			

b) Status of various Performance Indicators- for comparison across Wetlands/ Districts/ Plants/ Units/ Products etc.

The performance Indicators described above shall be evaluated in terms of deviation from norms/bench marks for spatial and temporal comparisons

8.0 Reforms undertaken/ being undertaken/ proposed if any

a. Reforms in terms of following cases may be evaluated. Any other approach may also be incorporated.

b. Table 11. Reforms undertaken/ being undertaken/ proposed for management of wetland for maintenance of ecosystem level process – District-wise (Current Year)
c. Table 12. Reforms undertaken/ being undertaken/ proposed for management of wetland for maintenance of ecosystem level process – Wetland-wise (Current Year)

9.0 Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity.

Sl. No.	Proposed tasks	Methodology adopted	Probable outcome	Agency responsible	Proposed timeline

ANNEXURE

Information Sources

i. National Wetland Atlas
ii. State Wetlands Authority or Union Territory Wetlands Authority
iii. Lake Development Authority (LDA)
iv. Lake Conservation Authority (LCA)
v. Central and State Pollution Control Board
vi. Forest Department/Wildlife Department
vii. Irrigation and Water Resource Department
viii. Department of Science and Technology
ix. Groundwater Board
x. State Statistical Department
xi. State Biodiversity Board
xii. Biodiversity Management Committee (BMCs)
xiii. People's Biodiversity Register (PBRs)
xiv. Village Panchayat, blocks and Tehsil Office

Table 1: Status of wetlands – State wise

Sl. No.	Evaluation criteria		2000	2010	2017
1.	Total number of wetlands inside Protected Areas	Natural			
		Manmade (Dam, barrage, water hole etc.)			
2.	Total number of wetlands outside Protected Areas	Natural			
		Manmade (Dam, barrage, water hole etc.)			
3.	Total water spread area for wetlands inside Protected Areas	Natural			
		Manmade (Dam, barrage, water hole etc.)			
4.	Total water spread area for wetlands outside Protected Areas	Natural			
		Manmade (Dam, barrage, check dam etc.)			
5.	Total catchment area for wetlands (Hectare) inside Protected Areas	Natural			
		Manmade (Dam, barrage, water hole etc.)			
6.	Total catchment area wetlands (Hectare) outside Protected Areas	Natural			
		Manmade (Dam, barrage, water hole etc.)			
7.	Number of wetlands used for drinking water/house-hold usage				
8.	Number of wetlands used for Municipal drinking water supply				

Sl. No.	Evaluation criteria		2000	2010	2017
9.	Number of wetlands used for Irrigation				
10.	Number of wetlands used for Industrial water supply				
11.	Number of wetlands declared as Ramsar Sites				
12.	Number of wetlands located in Eco-sensitive area				
13.	Number of wetlands under UNESCO World Heritage Sites				
14.	Wetlands notified [Wetlands (Conservation and Management) Rules, 2017, Clause 5 (4) b) & c)]				
15.	Comprehensive digital inventory prepared for number of wetlands [Wetlands (Conservation and Management) Rules, 2017, Clause 5 (4) d)]				
16.	Integrated management plan prepared for number of wetlands [Wetlands (Conservation and Management) Rules, 2017, Clause 5 (4) h)]				
17.	Demarcation of 'Zone of influence' for number of wetlands [Wetlands (Conservation and Management) Rules, 2017, Clause 7 (1) b)]				
Level of Threat					
18.	Total number of wetlands lost due to habitat destruction and encroachments through drainage and landfill				
19.	Total number of wetlands where water spread area is reduced due to siltation				
20.	Total number of wetlands where water spread area is reduced due to residential and/or agricultural encroachment/landfills etc.				
21.	Total number of wetlands where municipal waste water is discharged				
22.	Total number of wetlands where industrial effluent is discharged				
23.	Total number of wetlands contaminated with heavy metal and pesticide pollution				
24.	Total number of wetlands need restoration (due to reduced water availability, over-abstraction of water, pollution, draught, anthropogenic factors and other causes like climate shifts)				
25.	Total number of wetlands under Designated-Best-Use Water Quality Criteria(http://www.cpcb.nic.in/Water_Quality_Criteria.php)	Class A			
		Class B			
		Class C			
		Class D			
		Class E			
		Un-assessed			

Table 2: Status of wetlands – District wise

Sl. No.	Evaluation criteria		Dist. 1	Dist. 2	Dist.3
1.	Total number of wetlands inside Protected Areas	Natural			
		Manmade (Dam, barrage, water hole etc.)			
2.	Total number of wetlands outside Protected Areas	Natural			
		Manmade (Dam, barrage, water holes etc.)			
3.	Total water spread area for wetlands inside Protected Areas	Natural			
		Manmade (Dam, barrage, water holes etc.)			
4.	Total water spread area for wetlands outside Protected Areas	Natural			
		Manmade (Dam, barrage, check dam etc.)			
5.	Total catchment area for wetlands (Hectare) inside Protected Areas	Natural			
		Manmade (Dam, barrage, water holes etc.)			
6.	Total catchment area wetlands (Hectare) outside Protected Areas	Natural			
		Manmade (Dam, barrage, water holes etc.)			
7.	Number of wetlands used for drinking water/house-hold by locals				

Sl. No.	Evaluation criteria		Dist. 1	Dist. 2	Dist.3
8.	Number of wetlands used for Municipal drinking water supply				
	Number of wetlands used for Irrigation				
	Number of wetlands used for Industrial water supply				
9.	Numbers of wetlands declared as Ramsar Sites				
10.	Numbers of wetlands located in Eco-sensitive area				
11.	Numbers of wetlands under UNESCO World Heritage Sites				
12.	Numbers of wetlands having socio cultural or religious value				
13.	Wetlands notified [Wetlands Conservation and Management Rules, 2017, Clause 5 (4) b) & c)]				
14.	Comprehensive digital inventory prepared for number of wetlands [Wetlands Conservation and Management Rules, 2017, Clause 5 (4) d)]				
15.	Integrated management plan prepared for number of wetlands [Wetlands Conservation and Management Rules, 2017, Clause 5 (4) h)]				
16.	Demarcation of 'Zone of influence' for number of wetlands [Wetlands Conservation and Management Rules, 2017, Clause 7 (1) b)]				
Level of threat					
17.	Total number of wetlands lost due to habitat destruction and encroachments through drainage and landfill				
18.	Total number of wetlands with discharge of waste water and industrial effluents				
19.	Total number of wetlands contaminated with heavy metal and pesticide pollution				
20.	Total number of wetlands with reduced water spread area due siltation				
21.	Total number of wetlands need restoration (due to reduced water availability, over-abstraction of water, pollution, draught, anthropogenic factors and other causes like climate shifts)				
22.	Total number of wetlands under Designated-Best-Use Water Quality Criteria(http://www.cpcb.nic.in/Water_Quality_Criteria.php)	Class A			
		Class B			
		Class C			
		Class D			
		Class E			
		Un-assessed			

Table 3: Status of aquatic species – State wise population trend of species of conservation significance

Fauna			**Name of important species**	**Global status***	**Local status****	**2000**	**2010**	**2017 (CY)**
Aquatic and semi-aquatic mammals		Otters	1.					
			2.					
Birds	Resident	Herons	1.					
			2.					
		Cranes	1.					
			2.					
		Waders	1.					
			2.					
		Ducks and geese	1.					
			2.					
	Total congregation (Number of birds)							
	Migratory	Herons	1.					
			2.					
		Cranes	1.					
			2.					
		Waders	1.					

Fauna			**Name of important species**	**Global status***	**Local status****	**2000**	**2010**	**2017 (CY)**
			2.					
		Ducks and geese	1.					
			2.					
	Total congregation (Number of birds)							
	Number of ground nesting bird colonies	Congregation (Total number)						
	Number of Heronry around wetlands/river/ stream	Congregation (Total number)						
Reptiles		Freshwater turtles	1.					
			2.					
		Mugger						
		Aquatic snakes	Overall population					
Amphibians		Overall population						
Fish		Total catch of important fish species						
Invertebrates		Total catch of species like freshwater shrimps and prawns						

Global status: According to International Union for Conservation of Nature (IUCN) Red List
*****Local status: According to assessment of Forest Departments***

Table 4: Sector wise water allocation for maintenance of ecosystem level processes and other common users

Sectors	**Total amount of water allocated annually (Cubic meter per annum)**		
	2000	**2010**	**2017**
Maintenance of Ecosystem Processes			
Agricultural/Irrigation sector			
Drinking water supply			
Industrial use			
Municipal/House-hold consumption			
Diversion by any other Hydro-projects			
Any other			

Table 5: Availability

State wise water availability in wetlands	2000	2010	2017
Total mean annual water volume stored in wetlands (cubic meter)			

Table 6: Utilizable

Total water utilizable in terms of quality (Designated Best Use Water Quality Criteria) and quantity	2000	2010	2017
Total number of wetlands under Class A			
Total number of wetlands under Class B			
Total number of wetlands under Class C			
Total number of wetlands under Class D			
Total number of wetlands under Class E			
Not assessed			

Table 7: Demand

Year	Water availability as per the natural hydro period of a given water body or for wetlands 60-75% of the natural mean monthly water volume at human used wetlands, 90-100% of the natural mean monthly water volume in notified wetlands in protected areas for maintenance of ecosystem level processes	
	Number of wetlands retaining 75% (Optimum level) of the total natural storage at human used wetlands	Number of wetlands retaining 100% (Optimum level) of the total natural storage in notified wetlands or wetlands in protected areas
2000		
2010		
2017		

Table 8: Supply

Year	The amount of water available in wetlands after consumptive use by humans		
	Total annual mean storage (cubic meter)	Total mean annual volume of water withdrawn from all sectors apart from 'Ecosystem' (cubic meter per annum)	Remaining annual mean storage (cubic meter)
2000			
2010			
2017			

Table 9: Consumption

Sl. No.	**The amount of water required for wetlands for maintenance of ecosystem level processes**	**Percentage (%) of wetlands fulfilling the criteria**		
		2000	**2010**	**2017**
1.	Wetlands retaining 75% (Optimum level) of the total natural storage at human used wetlands Criteria: *60-75% of the natural mean monthly water volume at human used wetlands for maintenance of ecosystem level process.*			
2.	Wetlands retaining 100% (Optimum level) of the total natural storage in notified wetlands or wetlands in protected areas Criteria: *90-100% of the natural mean monthly water volume at notified wetlands and wetlands in Protected Areas for maintenance of ecosystem level processes.*			

Table 10: Wetlands status reporting frequency (Report shall be submitted to NWC, CWRA, LCA as per their jurisdiction)

Sl. No.	**Assessment parameters**	**Assessment / Monitoring frequency**	**Reporting frequency**
1	Water quality	Monthly	Half yearly (June and December of each calendar year)
2	Hydrology (depth and water spread area)	Quarterly	Half yearly (June and December of each calendar year)
3	Biodiversity (Key aquatic fauna like fish and water birds)	Half yearly	Half yearly(June and December of each calendar year)
4	Any abnormal changes in water quality, encroachment, de-watering etc. reported by local community	As and when detected	

Table 11: Reforms undertaken/ being undertaken/ proposed for management of wetland for maintenance of ecosystem level process– District-wise (Current Year)

Sl. No.	Categories	Districts		
		1	2	3…
1.	Wetlands notified [Wetlands (Conservation and Management) Rules, 2017, Clause 5 (4) b) & c)]			
2.	Comprehensive digital inventory prepared for number of wetlands [Wetlands (Conservation and Management) Rules, 2017, Clause 5 (4) d)]			
3.	Integrated management plan prepared for number of wetlands [Wetlands (Conservation and Management) Rules, 2017, Clause 5 (4) h)]			
4.	Demarcation of 'Zone of influence' for number of wetlands [Wetlands (Conservation and Management) Rules, 2017, Clause 7 (1) b)]			
5.	Total number of sensitization workshops/seminars on aquatic ecosystem and biodiversity conservation targeting various stakeholders			
6.	Total number of capacity building workshops on aquatic ecosystem and biodiversity conservation for institutions governing/managing/monitoring the aquatic resources			
7.	% reduction in conversion/land use change for wetlands			
8.	% wetlands revived after deterioration (if any)			
9.	% of wetlands newly designated for regular water quality assessment by State Pollution Control Board or other MoEF&CC recognized agency such as NABL*			
10.	% wetlands restored in terms of Biochemical Oxygen Demand (BOD) of 3 mg/L or less			
11.	% wetlands restored in terms of Dissolved Oxygen concentration of 6 mg/L or more			
12.	New riparian area developed/restored under watershed management			
13.	Man-made interventions: Example/Case studies (Criteria: Restored/rejuvenated biodiversity and ecological service value)			
14.	Any other			

***NABL: National Accreditation Board for Testing and Calibration Laboratories**

Table 12: Reforms undertaken/ being undertaken/ proposed for management of wetland for maintenance of ecosystem level process – Wetland-wise (Current Year) [Wetlands (Conservation and Management) Rules, 2017, Clause 5 (4) e)]

Sl. No.	Name of wetland	Activities restricted in the wetland and its zone of influence	Activities permitted in the wetland and its zone of influence	Activities regulated in the wetland and its zone of influence	Regulation/enforcement authority	Monitoring frequency of regulated activities in the wetland and its zone of influence
1						
2						
3						
4						

4.1.6 Tanks and Ponds

1.0 Subject Matter (May include sub heading, data, graphs etc.) **Tables 1 to 4**

2.0 Availability of water, Utilizable Water

Availability of water in tanks	Utilizable water from the tanks	Demand for various sectors expected from the tanks	Supply for various sectors from the tanks	Consumption/ Consumptive use including recharge to ground water	Overflow from the tanks

Table 5 is related to the Storage Volume in water bodies like ponds, tanks, etc. The approximate volume of water available in these storage spaces as on 1st of June of the Water Year needs to be ascertained from the surface water area and average depth of water on the said date.

Table 5

A8. Storage* in Ponds, Tanks (MCM) as on 1st June		**REMARKS**
In Basin A/ Sub-basin		
In Basin B/ Sub-basin		
In Basin C/ Sub-basin		
TOTAL		

For table 6, the utilizable surface water from ponds, tanks, etc can be assessed by considering the abstractions round the year and remaining storage as on the last day of the Water Year i.e. 31st May. Eventually, these water bodies again gets filled up during the monsoon in the next Water Year and water is available for utilization.

Table 6

B6. Utilizable Surface Water: Ponds, Tanks (Considering Tables A1 & A8) (MCM)		**REMARKS**
Abstractions/Withdrawals round the year		
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
Storage* remaining after fulfilling all abstractions/withdrawals, losses etc. as on 31st May the next		
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

The water that is lost from the System through evaporation from water bodies would come in this Table 7 as another Outflow from the System Boundary in an annual scale.

Table 7

D4. Evaporation ** from all Surface Water Bodies (MCM) in a Water Year		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

*** Evaporation from the open water surfaces like Reservoirs, lakes, ponds, tanks and wetlands can be estimated using one of the standard methods like Pan Evaporation Method, Priestly-Taylor or any other standard and simple methods.*
Evaporation from smaller water bodies may be clubbed together for ease and simplicity.

3.0 Issues and Challenges-Bund maintenance, sluice gates, weirs maintenance, Irrigation Canals, CD & CM works, Encroachments, pollution problems, water hyacinths problems, weeds problems etc.

4.0 Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0 Governance / Management:

a. Statute / Law / Policy/ Regulations if any

b. Institutions governing / managing / monitoring the resources and Institutional structure.

c. Areas of Peoples/Private Participation if any

d. Water Financing and Economics [Relevant tables on Water Financing and Economics may be looked into Chapter 7 and filled up with appropriate data/information]

6.0 Measurement, Monitoring and Data Constraints/ Management

7.0 Performance Indicators:

a. Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently.
b. Status of various Performance Indicators – **for comparison across Districts/**

Category	**Indicator**	**Bench mark / Units**	**District-1**	**District-2**
Water quantity Measurement	% of Tanks geo tagged			
	% of Tanks with telemetric system to measure depth of the water			
	% of Tanks for which Multi-temporal datasets are available			
	% of Tanks where DEMs are prepared for development of catchment areas			
	% of Tanks which measure water level with Water Level Recorders			
	% tanks which measure water based on water balance;			
	% of tanks have gauging equipments			
	% of tanks having depth gauges			
Water Conservation	% of System fed Tanks			
	% of non-system tanks			
	% of Feeder Channel with Encroachments free			
	% of Feeder Channel renovated / restored during the last five years			
	% of Tanks renovated/ restored/ rejuvenated during the last five years			
	% of tanks with stone pitched bunds and recreational facilities			
	% of Tanks with Plantation			
	% of Tanks fully renovated (operational) by taking Action on			
	• De-siltation			
	• Encroachments			
	• Structural			
	• Development work in Tank catchment area			
	% of Tanks partially renovated/ not renovated / restored (operational) Action to be taken on			
	• De-siltation			
	• Encroachments			

	• Structural			
	• Development work in Tank catchment area			
Water demand management	Area in ha increased under irrigated cropped area since the last five years.			
	% increase in cropped area irrigated			
	Number of livestock increased since the last five Years			
	% livestock increase due to water management during last five years			
	Total number of villages served by Tanks			
	Number of new villages served by Tanks during the last five years			
	Total population dependent on the tank for their livelihood (Direct)			
	% increase in population dependent on the tank for livelihood during the last five years			
	Total population dependent on the tank for their livelihood (Indirect)			
	% Increase in population dependent on the tank for livelihood (indirect) during the last five years			
	Total No of Bore wells and Open wells recharged			
	% increase in number of bore wells and dug wells gets recharged during the last five years			
	Cropped area under Bore wells / Open Wells which comes under Tanks influence area.			
	% increase in cropped area under bore wells and dug wells during the last five years			
	% area got energized by electricity, diesel and wind and solar power during the last five years			
Water productivity in Tank Irrigated Area	% Area under Tank Irrigation			
	Crop Intensity in percent			
	Agriculture crop wise- Rice productivity in kg/ha-mm			
	Agriculture crop wise- XXXX productivity			
	% Area reported change in cropping pattern- Water Intensive Crops to Less water consuming crops			
	%Area reported change / improvement in Irrigation method/ technology			
	% Area under drip and Sprinkler Irrigation			
	Animal Husbandry – Dairy Productivity(liters/ha of command)			
	Fodder productivity (tons/ha)			
	Fisheries wise- productivity (kg/ ha of tank water surface)			
	% of tanks used for development of tourism like boating etc			
	Increase in Ground Water table between pre- and post-monsoon in Tank influence area during the last five years			
	% increase in discharge of tube wells in tank influence area during the last five years			

	No. of villages in which tanks are restored but still reported water scarcity for Humans and cattle in summer			
Water quality	% Tanks conducting the prescribed Water Quality tests			
	% of Tanks complied Irrigation Water norms.			
	% of Tanks wherein Water not used for any purpose.			
	% of tanks falling in each category based on "Designated Best Use" classification of CPCB			
Waste Water	Total Waste Water Generated in catchment area (M3/ha)			
	Measures taken to divert waste water not entering into the tanks.			
Financing	Investment in Rs per Ha of command area on renovation/restoration/ rejuvenation of tanks during previous year			
Equity	% & No. of landless families benefitted			
	%& No. of SC and ST families benefitted			
	%& No. of Minority families benefitted			
Peoples Participation	% of Tanks with Water User Association/ Sustainable Committees.			
	% of Tanks protection Committees in Urban areas			
	% of Tanks protection Committees in Rural areas			
	% of Tanks with Water User Association/ Sustainable Committees without SC & ST members.			
	% of Tanks with Water User Association/ Sustainable Committees without Minority members.			
Monitoring	% of tanks Operational online display of Water Quantity			
	% of tanks with Installation of telemetry water level recorders			
	% of tanks Operational online display of Water Quality			

8.0 Reforms undertaken/ being undertaken/ proposed if any

9.0 Road map of activities / tasks proposed for

a. Better governance
b. Better source / supply management
c. Better demand management /improved Water Use Efficiency
d. Water Quality
e. Water Economics and Financing
f. Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

Table 1: Current scenario of Tanks in the State- District wise

District/ Basin	Nature	Tanks category			Administrative Depts.	Total surface Area of the tanks and water storage capacity of the tanks		Numbers of tanks in Chain	Command Area			Other purposes
		Nomenclature	No. of tanks	Potential Command Area (in ha)					Irrigated (ha)	Water utilized (Mm3)	Water use/ha	
	Govt.	Percolation tanks										
		Tanks <100*										
		MI Tanks >100*										
		Anicuts										
		Check Dams										
	Private											
Total												

** varies with each state/ UT*

Table 2: No. of villages served by Tanks for the Current Year

Basin	District	No. of Tanks	No. of villages served by Tanks	No. of villages without tanks

Table 3: Time trend No. of villages served by Tanks

Basin	District	2000			2010			2015		
		No. of Tanks	No. of villages		No. of Tanks	No. of villages		No. of Tanks	No. of villages	
			Served by Tanks	Without tanks		Served by tanks	Without tanks		Served by tanks	Without tanks
Total										

Table 4: Tanks command Area: Time trend across the State

Tank Category	Command Area 2000				Command Area 2010				Command Area CY			
	No	Potential	Utilized	%	N	P	U	%	N	P	U	%
Percolation tanks												
Tanks												
MI Tanks												
Anicuts												
Check Dams												
Open wells / Bore wells In Irrigation tank influence area												
Total												

CY: Current Year

Table 8: Tanks Agriculture Cropped Area: Time trend across the State

Tank Category	Agriculture Cropped Area 2000				Agriculture Cropped Area 2010				Agriculture Cropped Area CY			
	No	Potential	Utilized	%	N	P	U	%	N	P	U	%
Percolation tanks												
MI Tanks> 100 Acres												
MI Tanks< 100 Acres												
Anicuts												
Check Dams												
Open wells / Bore wells In Irrigation tank influence area												
Total												

CY: Current Year

Table 9: Farm productivity over the Years

Sector	Produce	Produce Area	Current Yr Production	Productivity per Ha				
				Unit	2000	2010	2015	CY
Agriculture	Rice / Maize /Wheat /Pulses/ Cotton etc.			T/ha				
	Fodder							
Horticulture	Vegetable							
Livestock	Dairy	No. of Animals	Dairy Production					
Fishery	Aquaculture	Area	Fishery production					

Table 10: No. of Villages where tanks are restored/ renovated/ rejuvenated reported Drought

District	No. of Tanks restored during the last 3 Years	Number of tanks influenced by restoration	No. of villages affected by drought even after restoration

Table 11: Total Tanks under-performing as on 2015

District/ Basin	Total No of tanks	No of Problem free tanks	Number of under Performing Tanks							
			Encroachment	Siltation	Structural					
					Catchment	Field Channels	Bunds	Sluices	Weirs	Canal and Distribution System including CM & CD works

Table 12: Tanks Extinct as on 2015

District/ Basin	Total	Number of extinct Tanks with reason							
		Encroachment	Siltation	Structural					
				Catchment	Field Channels	Bunds	Sluices	Weirs	Canal and Distribution System

Table 13: Total Tanks repair /renovation /restoration /rejuvenation has been undertaken during the last 3 years

District/ Basin	Total Tanks	Units	No of tanks in which Action was taken fully								
			Encroachment removal	Weeds and water hyacinths problems solved	De-Siltation undertaken	Structural					
						Catchment treatment	Field Channels renovated	Bunds strengthened	Sluices renovated	Weirs renovated	Canal and Distribution System renovated
		Nos.									
		% of Total									

4.1.7 COASTAL ZONE

1.0 **Subject Matter** (May include sub heading, data, graphs etc.)

(Should provide background / a bird's view picture and analysis using the following information/ tables)

a) GIS Map with geo tagging
b) Coastal zone mapping (Table 1)
c) Coastal zone challenges (Table 2 & 3)
d) Shoreline changes (Table 4)
e) Availability of water by desalination, if any (Table 5A, 5B)
f) Erosion/ Accretion in Coastal Areas (The coastal district-wise status of coastal erosion/accretion in the State along with indicative maps may be provided. The source of such information as well as the time-frame during which the said information has been derived should also be given. (Maps, Annexure-Table 6)
g) Details pertaining to the status of coastal erosion management in the State as well as the development of Coastal Management Information System (CMIS) may also be provided) (Text)
h) Uses of coastal water, if any (Annexure –Table 7)
i) Discharge in coastal waters, if any (Annexure –Table 8)
j) Area covered by aquaculture and salt pans (Text, Maps)

2.0 **Availability & Utilizable Water:** Temporal & Spatial basis is to be considered. – Additional water availability/ supply in coastal areas may be considered from desalination. (Text)

Table 9 includes that Water which has been added to the System through desalination of saline water from the Sea/Ocean in case of Coastal States. Such additional water volumes need to be considered in those Basin/ Sub-basin considering the location of the Desalination Plant.

Table 9

A10. Water available from Desalination Plants/ Sea Water (MCM)		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

Table 10 would consist of that volume of water available from Desalination Plants after deducting any losses, if any due to leakages, evaporation etc. in respective Basin/Sub-basins.

Table 10

B8. Water Utilization from Desalination Plants/ Sea Water (Considering Table A10) (MCM)		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

3.0 **Issues and Challenges** (Among other issues/challenges, the status of the problem of Salinity Intrusion, the on-going preventive measures and relevant studies may also be included in the Report.) including (Text, Map, Annexure-Table 11 and 12) may include:

- accelerated changes in shoreline: loss of beaches and closures of inlets,
- degradation /changes of coastal habitats and land use- land cover
- increased coastal erosion & flooding due to extreme events and sea level rise
- changes in sediment transport pattern and islands, including coral islands
- pressures of developmental activities along the shoreline (ports, harbors etc)

4.0 **Problem Tree / Root cause Analysis: Cause, Effect and Interventions** (Also include aspects pertaining to the problem of coastal erosion which may include the specific causes, affected areas, vulnerable coastal sites/reaches, protected areas etc. The spatial maps showing protected coastal reaches can be prepared for facilitating planning and prioritization of coastal protection schemes in future. (Text, Maps)

5.0 **Governance / Management:**

a) Coastal zone/area specific Statute / Law / Policy/ Regulations if any
b) *Whether the proposed area / activity attracts the provision of notification of coastal regulation zone, 2011
   i. Presence of State Coastal Zone Management Authority

ii. Status and details of preparation state specific Integrated Coastal Zone Management Plan (ICZMP) may be included in the report

c) Institutions governing / managing / monitoring the coastal resources and Institutional structure.
d) Areas of Peoples/Private Participation if any- viz. presence of Shoreline Management Organization (SMO)
e) Schemes & Financing (may include FMP, NCRMP, ICZMP etc) (Annexure- Table- 13 & 14) [Also, relevant tables on Water Financing and Economics may be looked into Chapter 7 and filled up with appropriate data/information]

6.0 **Measurement, Monitoring and Data Constraints/ Management** (With respect to coastal data, the data inventory pertaining to the coastal and estuarine waters and tidal hydraulics may be included in the Report. Details with respect to the coastal data parameters and data sites under focus may be included. The site-wise coastal data collection being done by the State Govt., Central Govt. and/or research institutes/agencies may also be included along with the completed as well as on-going coastal data collection programmes in the state.) (Text)

7.0 **Performance Indicators: for comparison across Coastal areas / Districts/ Plants/ Units/ Products etc.**

- WATER QUALITY STANDARDS FOR COASTAL WATERS MARINE OUTFALLS, *The Environment (Protection) Rules, 1986 Tables 1.1 to 1.5.*
- COASTAL REGULATION ZONE NOTIFICATION 2011 dated the 6 January, 2011, MINISTRY OF ENVIRONMENT AND FORESTS
- Environment Impact Assessment, 2006 notification dated 14 September, 2006, MINISTRY OF ENVIRONMENT AND FORESTS

Category	**Indicator**	**Bench Marking/ Units**	**District/ Rivers/ Desalination Plants**	**District/ Rivers/ Desalination Plants**	**District/ Rivers/ Desalination Plants**
Water Measurement	Length of coastline under erosion **(District-wise)**				
	Area increase in coastal erosion during the last one year				
	% of tidal rivers included in data collection programme **(River-wise)**				
	% change in beach length / number of beach per coastal district				
	No. of coastal data type included under observation/ 9*				
	No. of Desalination plants				
	Geo-tagging of Desalination Plants				
	Whether the following data is being compiled and monitored viz.,• CRZ and EIA information • Hydrodynamic data (like wind, waves, currents, tides), • Bathymetric and beach profile data (subject to approval) • Land use/land cover data • Coastal geomorphology • Coastal inventory like coastal structures, protection sites, sea walls, etc.				
	Whether Coastal Information and Management System is operational				
Management	Whether Coastal Infrastructure Management Unit (CIMU) established or not	Yes/No			
	Number of Shoreline Management organization (SMO) set up	Yes/No			

	Availability of Shoreline change digital database	Yes/No			
	Compilation of shore protection database from CWC	Yes/No			
	grid wise statistics of shoreline change	Yes/No			
	Hot spot identification and study of coastal processes associated with the shoreline change	Yes/No			
	Atlas preparation	Yes/No			
	Quarterly Performance overview of existing coastal protection measures				
Water Conservation/ Demand Management	Length of coastal Erosion affected area protected during the last 5 Years				
	% of coastal Erosion affected area protected during the last 5 Years				
	Yearly freshwater output (m3)/ Yearly Saline water Input required (m3) **(Desalination Plant-Wise)**				
Water Productivity	Performance of coastal structures= No. of years survived/Design Life				
	Actual yearly freshwater output (m3)/Yearly Design output(m3) **(Desalination Plant-Wise)**				
	Production cost of fresh water (Rs)/ Fresh water output (Kilo Litre) **(Desalination Plant-Wise)**				
	freshwater output (m3)/unit of electricity consumed (kWh) **(Desalination Plant-Wise)**				
Environment Sustainability and Water Quality	% area protected from Salinity ingression/ area liable to be affected by salinity ingression **(District-wise)**				
Participatory Water Management	% of coastline covered by participatory Shoreline Management Organizations (SMO) **(District-wise)**				
Others **Economic/ Financial**	% utilization of fund /allocation of fund for coastal protection **(District-wise)**				
	Per Capita Income of coastal communities **(District-wise)**				
	Contribution to State GDP by Coastal Tourism/ State GDP **(District-wise)**				
	Contribution to State GDP by Coastal Shipping/ State GDP **(District-wise)**				
	Contribution to State GDP by Coastal Fishing/ State GDP **(District-wise)**				

8.0 Reforms undertaken/ being undertaken/ proposed if any

9.0 Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity.

Agencies responsible for collection and analysis of coastal data

Parameter	*Agencies*
1. Wave	
2. Current	
3. Tide	
4. Riverine Data	
5. Wind	
6. Coastal Sediment	
7. Beach Profile	
8. Bathymetry	
9. Shoreline Change	

ANNEXURE

Table 1: Coastal zone mapping: Length, Area, Infrastructure and Problems

Districts/ Basin	Coastal length		Numbers		Numbers			
	Length	Area	**Beaches**	**Inlets**	Desalination plants	Ports	Harbours	Industries
Total								

Table 2: Coastal Zone Challenges-Mapping

District/ Basin	Problems being faced by Coastal area District wise (Yes/ No)									
	Coastal habitat	**Land use/ cover**	**Erosion**	**Ingression**	**Land subsidence**	**Effluent discharge in Sea Water**	**Flooding**	**Sea level rise**	**Changes in Sediment transport**	**Development activities**

Table 3: Damage due to Cyclones during 2000-2017

Cyclone	**Year**	**District.1**	**District.2**	**District.3**

Table 4: Shoreline change during 2000-2017

District/ Basin	Erosion Area (Sq. Km)	Erosion Length (km)	Accretion Area Sq. Km	Accretion length Km	Stable length

Shoreline Vulnerability Assessment –District wise
(For details to contact ICMAM/MoES)

District wise Classify shoreline change rates based on Linear Regression Rate statistics as erosion/accretion/stable/artificial coast

Desalination:

Table 5A: Details of **Operational** Desalinization Plants

Sl. No.	Location of Desalination Plant	Technology	Output(MLD)	Commissioned (in Year)	Total cost of Plant (Crore)	Cost Rs per litre
						NA

Table 5B: Proposed/ongoing (under construction) Desalination Works

Sl. No.	Location of Desalination Plant	Project Proponent	Technology	Output (MLD)	Total cost of Plant (Rs Crore)	Remarks

Erosion

Table 6: Format for coastal erosion and protection status

District/ Basin	Erosion				Protection works undertaken				
	No. of Talukas/ Blocks/ Mandals	Length	Geo-tagging done	No. of persons affected	No. of Talukas/Blocks /Mandals	Length	Geo-tagging done		% of erosion protected.
							Starting Point of Work	End point of Works	

Table 7: Format for data on Use of coastal waters

Sl. No.	Purpose used	Quantity used (m^3)	Mode of intake

Discharge in Coastal Water

Table 8: Format for data on Discharge in coastal waters

District/ Basin	Industrial discharge in coastal areas (m^3/day)	domestic discharge in coastal areas (m^3/day)	Quality of discharge water	Mode of discharge	Monitoring mechanism
Total					

Salinity ingression & Ground Water Contamination
Salinity ingression and contamination of ground water- coastal areas affected and its distance from the coast

Table 11: Format for providing details of salinity affected costal sites/reaches:

Sl. No	Year	Reach	Taluka, Coastal District	Salinity Affected area in Ha.

Table 12: Details of Protection Works for Prevention of Salinity Ingress:

Sl. No.	Location (Taluka, District)	Length of Embankment/Barrier (in km)			Sluice (in no)		
		Existing	Under Construction	Proposed	Existing	Under Construction	Proposed

- (Documentation of the project/issues specific studies carried out by various agencies with respect to coastal areas as well as the completed and on-going initiatives may also be included in the Report.)
- The physical and financial progress of the coastal protection schemes undertaken in the past/ongoing may also be included in the Report.

Table 13: Financial Progress of past/on-going Anti-Sea Erosion/ coastal protection Schemes:

Sl. No.	Year/ Period	Funds Allocated* (Rs. Crore)	Funds Utilized (Rs. Crore)

(* Source: State/Centre/External Assistance etc.)

Table 14: Physical Progress of past/on-going Anti-Sea Erosion/ coastal protection Schemes:

Sl. No.	Name of Scheme	Cost of the Scheme	Coastal length protected	Population benefitted	Status (Completed /in progress)

4.1.9 GROUND WATER RESOURCES

4.1.9.1 Describe general Geology and Hydrogeology State.

Write a brief about major geology, aquifer systems and general yield ranges (Annexure-4.1.8 A)

Maps: Hydrogeology, Thickness of weathering, general yields to be incorporated

Write brief about Ground Water Occurrence, development and number of wells (No. of Dug wells, Dug cum bore wells (DCB), No. of Bore wells/No. of Tube wells etc) drilled by different agencies in the District. If available, information of discharge of wells, well efficiencies (derived from pumping tests) may be included **(Annexure-4.1.9 (i) and Annexure – 4.1.9(ii))**

Well Census data/data on Ground Water abstraction Structures by Irrigation Sector **(Annexure-4.1.9 (iii))**

4.1.9.2 Ground water regime monitoring

(i) Existing network of monitoring wells of CGWB /State Departments may be given in Annexure
(ii) A brief write up on the existing water level scenario including depth to water level maps for two seasons (pre and post monsoon) to be included in the main chapter
(iii) Long term trend of water level (decadal)
(iv) Data Constraints (Soil moisture, Geochemical concentration, Recharge of Groundwater, Collapse of hand dug wells, shortage of manpower, siltation of wells, shortage of funds from the govt. non availability of credit system to the farmers.)
(v) **Monitoring of recharge due to grey water, sewage and effluent.**
(vi) **Annexure 4.1.9 B to 4.1.9E**
(vii) ***Map showing locations of Monitoring wells***

4.1.9.3 Dynamic Ground Water Resources

(i) A brief write up on the annual replenishable ground water resources, net annual availability, annual ground water draft of the state (as on 31st March, 2013) and categorization of blocks (over exploited, critical , semi critical and safe) in the state
(ii) Past ground water development district wise - 2002, 2011.
(iii) **Annexures-4.1.9 F to 4.1.9 J**
(iv) *Map on Dynamic ground water resources to be incorporated*
(v) Map showing number of over exploited blocks/Mandals

4.1.9.4 Groundwater quality issues

(i) A brief note to be given on areas/districts/ basins with ground water having concentration of parameters (<Arsenic, Fluoride, Salinity (EC), Iron, heavy metals, others etc) beyond permissible limit for drinking water given by BIS.
(ii) Periodicity of collection of samples for basic constituents and heavy metals.
(iii) Averages/Ranges of Basic constituents in Ground water
(iv) Areas impacted by different ground water quality issues
(v) **Annexure – 4.1.9 K (i) to 4.1.9 L (vi)**
(vi) ***Map showing areas under ground water contamination***

4.1.9.5 Ground water Conservation and Augmentation

(i) Write brief write up about ground water augmentation practiced adopted under various Central and State Schemes, its effective implementation, monitoring and impact assessment.
(ii) Roof top rain water harvesting and artificial recharge in Cities and Municipalities etc
(iii) Total number of Minor irrigation tanks and catchment area, tank spreads and area irrigated under the MI tanks
(iv) Map showing location of Artificial Recharge structures constructed under various schemes
(v) Map showing minor irrigation tanks location
(vi) Annexures 4.1.9 M to 4.1.9 P

4.1.9.6 Groundwater issues and challenges

The ground water quantity and quality issues are to be highlighted and may be analyzed in terms of:

(i) **Problems posed by nature**: Quantitative (Low rain fall areas, low ground water yields) and qualitative aspects (summaries to be given). Details already given earlier.

(ii) **Problems caused by anthropogenic activities**: intensive ground water development (OE/Critical/ Semi Critical)/intensive surface water irrigation/intensive mining activities/growing urban complexes/industrial establishments and its impact on ground water quantity and quality.

(iii) **Problems caused by socio-economic condition**: size and nature of land holdings, backward population, electricity supply

(iv) **Problems due to lack of scientific input**: drilling techniques, cropping pattern, inefficient irrigation practices.

(v) **Administrative issues:** State ground water cell, enactment of legislation for control and State Ground Water Regulatory Authorities. Development of groundwater resources, pricing policy for ground water users, Reviving dugwells/borewells for artificial recharge etc, Convergence of activities in recharging ground water etc.,

4.1.9.2 Ground water Management and regulation and Governance

i. **Ground water Regulation:** Law / Policy/ Regulations if any. Whether any ground water Act for regulation of Groundwater use/ management exists in the state. If so, provide the gist of the act and also indicate any deficiency that exists in the law.

ii. Ground water Governance

Water Resources/GW Resource Information System

i. Status of Water Resources Information System
ii. Existing system of Informatics/Dash boards on surface and ground water resources, reservoir water levels, ground water levels, drafts etc.
iii. Geo-tagging of ground water abstraction structures, Artificial Recharge structures
iv. Information on Monitoring wells, ground water levels, Pre monsoon, post monsoon and ranges of water levels in the basin/District
v. Water level and quality measurements through wells, piezometers, DWLR with telemetry, ground water elevation
vi. Refer (Annexure-4.9 (i) to (viii)) and Annexure – 4.9 (i) to 4.9 (vi)

Over-Exploitation of Ground Water Resources:

- Existing Gross Ground Water draft for all Sectors and Stage of GW development
- Sector wise high and low development/consumption of ground water
- Measures taken for arresting over exploitation of ground water
- **Refer (Annexure 4.3 (i) to (v))**

Irrigation efficiency, Crop water budgeting and More crops per drop:

- District wise irrigation by ground water
- Type of Crops and areas under ground water Irrigation
- Micro irrigation adopted and ground water user efficiency
- **Refer (Annexure-ix to x)**

Sustainable ground water development and management

- Integrated Watershed management program
- Recharge structures Check dams, Percolation tanks and farm ponds and others constructed under IWMP and NREGS and its impact
- Quantum of Water Harvested and expected ground water recharge
- Rain water harvesting and artificial recharge to ground water
- Existing Minor irrigation tanks, de-silting and quantum of water harvested and expected ground water recharge and increase in area under irrigation etc.,
- Operation and Maintenance of AR Structures
- **Refer (Annexure 4.5 (i) to 4.5 (v)**

Waste Water:

- Quantum of Waste water generated from domestic sector (urban areas)
- Status of Recycling and Re Use of waste water
- **Refer (Annexure 4.7 (xi))**

Qualitative

- Ground water quality of the District/State
- Parameters analyzed to assess the ground water quality major and trace elements
- Areas identified with high Arsenic, fluoride and Nitrate, salinity and polluted within the district
- Mitigation strategies adopted or being adopted to address the issues of ground water quality in the district/State
- **Refer Annexures 4.4 (i) to 4.4 (vi)**

Capacity Building of Various Stake holders:

- No. of Departments /NGOs directly or indirectly involved in dealing ground water in the District/State
- Capacity building of various Stakeholders

4.1.9.3 Performance Indicators: for comparison across Districts/ Plants/ Units/ Products etc.

i. Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently.

ii. Status of various Performance Indicators

Performance Indicators

Category of Indicators	Indicator	Bench Mark/ Units	District.1	District.2
Measurement system	Density of piezometers for GW monitoring (excess/deficient) compared to required numbers			
	Number of Piezometers fitted with Automatic Water Level recorders			
	Number of Piezometers are directly under telemetric level of Monitoring			
	No. of groundwater abstraction structures in irrigation Sector			
	Number and Percentage of Ground Water abstraction structures under monitoring with water Meter in Irrigation Sector			
	No. of artificial recharge structures geo tagged			
	Total number of GW abstraction structures geo tagged in Drinking Water			
	Total number of GW abstraction structures geo tagged in Irrigation sector			
	Total number of GW abstraction structures geo tagged in Farm sector- Animal Husbandry, Fisheries etc. other than Irrigation			
	Total number of GW abstraction structures geo tagged in Industry sector			
	Total number of GW abstraction structures geo tagged in Forestry			
	Total number of GW abstraction structures geo tagged in Wildlife			
	Average depth to water level (m)			
	Average yearly water level fluctuation (m) (rise/fall)			
Ground Water Conservation, Harvesting and Augmentation	Total Rainfall in the previous Year			
	% of total Rainfall infiltrates/ percolation			
	Quantum of total rainfall infiltrates/ percolation			
	% of Rainfall going run off			
	% of Rainfall going in Evapo transpiration			
	Number of water harvesting structures constructed or rejuvenated as compared to the target (sanctioned projects under IWMP, RKVY, MGNREGS and other schemes)			
	Percentage of water harvesting structures constructed or rejuvenated as compared to the target (sanctioned projects under IWMP, RKVY, MGNREGS and other schemes)			
	Volume of rain water harvested in all RWHs of the district (MCM)			
	Volume of ground water recharge (MCM)			

	Percent of areas showing rising GW levels			
	Number and Percentage of safe blocks to total blocks			
	Micro Irrigation: Area covered under Sprinklers and Drip irrigation			
	% of area irrigated under Micro irrigation			
	Number of Government Establishments adopting Water efficient techniques like recycling and re using of waste water			
	Number of Private Establishments adopting Water efficient techniques like recycling and re using of waste water			
	Number of artificial recharge structures			
GW Demand	Total number of GW extraction points registered			
	No. of Dug wells			
	No. of Bore wells			
	Dug cum bore wells			
	Number of GW extraction points not registered			
	% of GW points registered			
	% GW points increased registration coverage compared the last year			
	Total no of industries (all types)			
	Number and Percentage of Industries being regulated under existing ground water Laws			
	Number and Percentage of packaged drinking water units NOC granted and are under monitoring			
	% of Establishments undertaken water audit in the last 5 years			
	% share of GW in water use in the District			
GW Balance/ Budget	Area under over exploitation			
	% of District Area under over exploitation			
	Area increased / decreased when compared the last GW survey			
	Number of over-exploited blocks/Mandals to total blocks/Mandals as per latest assessment			
	Number of over-exploited blocks/Mandals to total blocks as per the previous assessment			
	Change in number of Over exploited blocks/Mandals (Increased/decreased) (Latest GW assessment vs Previous GW assessment)			
	Number of over exploited blocks notified for regulation			
	Net ground water availability (MCM) (Latest GW Assessment)			
	Net Ground water Availability (MCM) (Previous assessment)			
	Change in Net GW availability (MCM) (Increase/Decrease) (Latest Vs Previous GW assessment)			
	Existing Stage of ground water development (in %) (Latest GW assessment)			
	Stage of ground water development (in %) (Previous assessment)			
	Change in Stage of ground water development (in %) (Increase/decrease) (Latest vs Previous GW assessment)			
	Long term trend of groundwater level (Decadal)			
	Area irrigated from ground water sources (ha)			
	Increase/Decrease in area irrigated from ground water sources (previous year to Current year)			
Ground Water Quality	No of habitations affected with different groundwater contamination like As, F, Salinity			
	No of habitations which have been provided with alternate water supply where there is contamination of GW			
Waste Water	% of Waste water generated recycled and Re used w.r.to water supplied			
	% of waste water recycled and Re used			

	Number and percentage of establishments (Govt. or private) having storm water management structures			
Participatory Ground Water Management	No. of Water User associations / Ground Water Mgt Committees			
	Number and Percentage of wells under Participatory ground water management			
	No of NGOs involved			
	Online monitoring of GW for public dissemination and feedback			
Investment	Annual investment for GW conservation, augmentation and public awareness per ha or MCM			

ANNEXURE

Annexure-4.1.9 A
Format for General Hydrogeology of the District example)

State/basin	District	Geology	Principle aquifers/System	Type of aquifer (Consolidated/Semi Consolidated/ Un consolidated	Area	General Yield range (lps)
	Example	BGC	Granites, Gneisses		80%	1 to 3
	Example	Indo Gangetic Alluvium	Sand, Gravel		20%	3 to 20

Annexure-4.1.9 (i)
Format for Ground Water Structures

Basin	District	Total No. of Wells drilled	Agency	Maximum depth drilled/explored (m)	Geology/ Principal Aquifer system	Total No. of Piezometers	Agency	Maximum depth drilled/ explored (m)	Geology / Principal Aquifer system

Annexure-4.1.9 (ii)
Well Census data/Data on Ground Water abstraction Structures in Irrigation Sector

Basin	District	No. of Dug Wells	Acreage/Irrigated area (acre)	No. of Bore wells/tube wells	Acreage/Irrigated area (acre)	No. of Springs	Acreage/Irrigated area (acre)

Basin	District	Total Wells	Purpose of wells	Well Type (Construction)-Irrigation	Ayacut Area	Water Quality - Irrigation	Mode of Lift - Irrigation	Dry/Disused Wells - Irrigation	Percentage of Irrigation wells	Period of Construction - Irrigation
			Irrigation	Domestic	Industrial	Others	Open	Bore	Dug/Bore	Tube

Ayacut Area		Water Quality - Irrigation			Mode of Lift - Irrigation				Dry/Disused Wells - Irrigation				
Ayacut (Acre)	Average Ayacut / Well (Acre)	Good	Moderate	Poor	Electrical	Diesel	Wind	Manual	Open	Bore	Dug / Bore	Tube	Total Dry Wells

Percentage of Irrigation wells	Period of Construction - Irrigation							
	2000-04	1990-99	1980-89	1970-79	1960-69	1950-59	1900-49	1700-1899

Annexure-4.1.9 B: Existing Network of Monitoring wells (GWMW)

District/ Basin	Number of (GWMS)	Total number of Dug wells as GWMS	Agency/ Department	Geology/ Principle Aquifer system	Total number of Piezometers/ as GWMS	Geology/ Principle Aquifer system	Average DTWL *(m bgl) (pre-monsoon)	Average DTWL (m bgl) (post-monsoon)	Average Fluctuation (m)	Trend (Rise/fall)

*DTWL: Depth to Water Level: **GWMS: Ground water level Monitoring Stations**

Annexure-4.1.9 C: Ground water Levels (M bgl):

District/ Basin	May-17	Aug-17	Nov-17	Jan-17	Rise (+) / Fall (-) from Current water level				Rainfall (in mm) 01/06/2017 to till now		
					May-17	August-17	November-17	January-17	Actual	Normal	Deviation in %

(M bgl: Meters below ground level)

Annexure-4.1.9 D: District Wise Pre and Post monsoon average groundwater levels for the years

District/ Basin	2013		2014		2015		2016		2017	
	Pre (May)	Post (Nov)	Pre (May)	Post (Nov)	Pre (May)	Post (Nov)	Pre (May)	Post (Nov)	Pre (May)	Post (Nov)

(M bgl: Meters below ground level)

Annexure-4.1.9 E: Ground Water Level ranges:

District/ Basin	**Percentage of Areas with Different Water Level Ranges**			
	<3 m	3-6 m	6-9 m	>9 m

Annexure-4.1.9 F: Long Term Water Level trend (Decadal) (m)

Basin	District	Long Term Water Level trend (Decadal) (m)	Rise/fall

Annexure-4.1.9 G Data Adequacy/Constraints

Basin	District	Total Existing Number of Piezometers	No. of Piezometers under Telemetry system of Monitoring	Required Number of Piezometers	Number of additional Piezometers required

(***Note: Each Micro watershed/Basin at least have 3 piezometers one at recharge area, one at discharge area and in the intermediate zone of the basin)***

Annexure – 4.1.9 H Ground Water Resources - 2013

Basin/ District	Annual Replenishable Ground Water (MCM)	Natural discharge/base flows (MCM)	Net annual availability (MCM)	Existing draft for irrigation (MCM)	Existing draft for domestic and industrial use (MCM)	Total draft (MCM)	Stage of ground water development (%)	No of Over-exploited blocks

Annexure-4.1.9 I Ground Water Resources (Block/ Mandal wise)

Basin	Name of Block	Annual Replenishable Ground Water (MCM)	Natural discharge/ base flows (MCM)	Net annual GW availability	Existing Net GW draft for irrigation	Existing net GW draft for domestic and industrial use	Total draft	Stage of ground water development	Categorization of block (Over-exploited/ Critical/ Semi-critical/ Safe/ Saline)
i	**ii**	**iii**	**iv**	**v**	**vi**	**vii**	**viii**	**ix**	**x**

The column (iii) of Ann 4.1.9 I to be used for filling up A13 of Chapter 9

The column (iv) of Ann 4.1.9 I to be used for filling up row 2 of table B11 of Chapter 9

The column (v) of Ann 4.1.9 I to be used for filling up of row 4 of table B11 of Chapter 9

Annexure- 4.1.9 J: Stage of Ground water development over years

Basin	District	Stage of Ground Water development (%)					
		2003	2005	2009	2011	2013	2015

Annexure-4.1.9 K Sector wise high and low development/consumption of ground water

Basin/ District	Heavy ground water consumption Sector	Low ground water consumption Sector	Increase or decrease in consumption of ground water in heavy ground water consumption sector from the previous GW resources (2011/2013)

Annexure-4.1.9 L: Measures taken for arresting over exploitation of ground water

Basin/ District	Number of Over exploited mandals Notified for GW regulation	Total area under over exploitation of GW (Sq.kms)	Number of artificial recharge structures constructed in Over Exploited mandals	Volume harvested/ Recharged (MCM)	Area under drip and Sprinkler Irrigation in Over exploited Block/ Mandal Ha	Percentage/ Volume of water saved from the drip /sprinkler irrigation	Area under Participatory ground water management Ha

Ground Water Quality:

Annexure-4.1.9 M: Average/Range of Basic Constituents in the Ground water

Basin	District	*pH*	*EC*	*TH*	*Ca*	*Na*	*K*	*Mg*	*HCO3*	*Cl*	*SO4*	*NO3*	*F*

Annexure-4.1.9 N: Parameters analyzed (Heavy Metals) (mg/l)

Basin	District	Ni	Zn	Mn	Cu	Co	Cd	Pb	Fe	Cr	As(arsenic)

Annexure-4.1.9 O: Areas of high Arsenic

Basin	District	Mandal	No. of Villages affected	Total area contaminated by arsenic

(Include a map showing area and villages affected by high concentration of Arsenic)

Annexure-4.1.9 P: Areas of high fluoride

Basin	District	Mandal	No. of Villages affected	Total area contaminated by fluoride

(Include a map showing area and villages affected by high concentration of fluoride)

Annexure-4.1.9 Q: Areas of high Nitrate

Basin	District	Mandal	No. of Villages affected	Total area contaminated by Nitrate

(Include a map showing area and villages affected by high concentration of Nitrate)

Annexure-4.1.9 R: Alternate sources of supply areas affected by ground water quality

Basin	District	Mandal	No. of Villages covered under alternate sources of supply	Source of Supply	Quantum of Supply MCM

Annexure-4.1.9 S Data on Rain Water Harvesting/Artificial Recharge structures

District/ Basin	No. of Check dams constructed	Volume of water Harvested (MCM)	Volume of Ground Water Recharged (MCM)	No. of Percolation Tanks Constructed	Volume of water Harvested (MCM)	Volume of Ground Water Recharged (MCM)	No. of farm ponds constructed	Volume of Water Harvested (MCM)

Others	Volume of Water Harvested (MCM)	Volume of Ground Water Recharged (MCM)	No. of Piezometer constructed to assess the impact	If constructed, GW Level (m bgl)			Rise/fall in water level (m)
				Pre Monsoon	Post monsoon	Fluctuation (m)	

Annexure 4.1.9 T: Impact assessment of Rain water harvesting/Artificial recharge structures

Basin	District	Annual Quantum of ground water Recharge due to ARS (m^3/day)	Rise in GW water level (m)	% improvement in the Stage of ground water development	Additional area irrigated with recharge water (ha)

Annexure-4.1.9 U: Artificial Recharge Structure and its impact assessment (ARS)-Urban

Municipality	**No. of Govt. establishment having Roof top rain water harvesting structures**	**Quantum of ground water recharged (MCM)**

Annexure-4.1.9 V: Detailed Information on Existing Minor Irrigation Tanks and its impact

District/Basin	Total Number of Minor Irrigation Tanks	Total area irrigated under MI Tanks (Ha)	Total No. of Tanks De-silted	Volume of de-silting (MCM)	Volume of Water harvested due to de silting	Expected GW Recharge due to de-silting (MCM)	Expected increased irrigated area due to de-silting (ha)

Annexure -4.1.9 W (i) Data on Minor Irrigation Tanks

Basin	District	Total Number of tanks	Catchment area (Sq kms)	Tank Spread Area (Sq kms)	Storage (m^3/day) MCM	Registered Ayacut (Ha)

Ground Water Resources Informatics

Annexure-4.1.9 X (i) Surface Water Informatics

District/ Basin	Name of the Reservoir/	Reservoir Type	Full Reservoir Level (m)	Storage @FRL (MCM)	Dead Storage level (m)	Dead Storage Capacity (MCM)	Present Reservoir Level (m)	Present Reservoir Storage Capacity (MCM)

Annexure-4.1.9 X (ii) No. of Monitoring Stations installed with AWLR/Telemetry

No. of Ground Water Monitoring Stations	No. of Stations having Automatic water level recorders (AWLR)	Agency/ Department	Number of stations under telemetry of Monitoring	Agency/ Department

Annexure – 4.1.9 X (iii): Annual existing ground water demand and supply for Irrigation (MCM)

Basin	District	Demand for Irrigated Crops			**Supply for Irrigated crops**			**TOTAL**
		1.Water Intensive Crops	2. Less Water Intensive Crops	3. Horticulture Crops	1.Water Intensive Crops	2. Less Water Intensive Crops	3. Horticulture Crops	

Note: Ground Water Draft for irrigation can be calculated either from the number of ground water abstraction structures and corresponding draft or crop water requirements of each crop and extension/area of crop. (GEC Methodology)

Annexure – 4.1.9 X (iv): Annual existing ground water demand and supply for Drinking (MCM) -Urban

		Demand			Supply			
Basin	District	City A	City B	Towns	City A	City B	Towns	**TOTAL**

Note: Ground Water Draft can be calculated either from the number of ground water abstraction structures and corresponding draft or Per capita consumption/per capita allocation

Annexure – 4.1.9 X (v): Annual existing ground water demand and supply for Drinking (MCM)-Rural

	Demand			Supply			
Basin	District A	District B	Towns	District A	District B	Towns	**TOTAL**

Annexure-4.1.9 X (vi): No. of Ground water abstraction structures geo tagged in irrigation sector

Basin	District	No. of bore wells (irrigation)	No. of bore wells geo tagged	Existing actual drafts from the bore wells geo tagged

[Include a Map showing locations of Ground water abstraction structures (for irrigation) geo-tagged]

Annexure-4.1.9 X (vii): No. of Artificial Recharge structures

District/ Basin	Number of artificial Recharge structures	Number of artificial recharge structures geo tagged

(Include a Map showing locations of Artificial Recharge structures geo tagged)

Annexure-4.1.9 X (viii): No. of Minor irrigation tanks geo tagged

District/ Basin	Number of Minor Irrigation Tanks	Number Minor Irrigation Tanks geo tagged

(Include a Map showing locations of Minor Irrigation Tanks geo tagged)

<u>Ground water Irrigation</u>

Annexure-4.1.9 X (ix): Area and type of crops under Ground water Irrigation

District/Basin	Area under Command Irrigation (ha)	Types of Crops (Water intensive/Less Water Intensive) or both*	Area under Non Command/GW Irrigation (ha)	Types of Crops (Water intensive/Less Water Intensive) or both*

****Mention only whether Water Intensive crop/less water Intensive crop. No details of crop types required***

Annexure-4.1.9 X (x): Areas under Micro Irrigation

District/Basin	Area under Non Command/GW Irrigation (ha)	Types of Crops (Water intensive/Less Water Intensive) or both*	Area covered with drip and Sprinklers (ha)	Percentage of GW Saved

****Mention only whether Water Intensive crop/less water Intensive crop. No details of crop types required***

Annexure-4.1.9 X (xi): Waste water-Urban

Municipality/ Basin	Quantum of Water supply to the Municipality (MLD)/Day	Source of Supply and quantum (MLD/Day)	Waste Water generated (MLD/DAY)	Quantum of Waste Water Treated (MLD/Day)

Annexure 4.1.9 X (xii): Capacity Building

Basin	District/Basin	No. of NGOs working in water/ground water sector trained last five years	No. of water User associations trained last five years	No. of Minor irrigation tanks being managed by WUA trained last five years

4.1.10. WASTE WATER

A. DOMESTIC WASTE WATER

1.0 Subject Matter

Waste water generation, waste water treatment infrastructure and performance of the water treatment (sector-wise and source wise):

- Domestic wastewater management

i. Status of Sewage generation
ii. Status of sewage collection Table 4.1.10.1 A
iii. Status of sewage treatment Table 4.1.10.1 B
iv. Status of treatment capacity utilization Table 4.1.10.1 C
v. Status of sewage recycle, reuse and disposal Table 4.1.10.1 D
vi. STP- Performance and Compliance to Sewage Quality norms Table 4.1.10.1 E

2.0 Availability & Utilizable Water

Treated/ Recycled Waste Water for Reuse is that water generated as waste within the System, round the Water Year, after some end-use which has been already accounted for in some form in the above sources of water, and is not an inflow into the system. So, considering that in Total Water Availability will lead to double-counting or Duplication. Table A13 is just for monitoring purpose.

A13. Treated/recycled Waste Water for Reuse (MCM)		REMARKS (For Monitoring Purpose)
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

Treated water will enhance the availability of water internally (i.e. internal redistribution only) but not the total water availability of the system as it is not created or supplied into the system from outside. However, if utilizable water has been calculated by considering/setting aside bad quality water and if subsequently the quality of that untreated/used water (i.e. return flow) is improved by treatment then quantity of Utilizable Water will enhance.

B11. Water available from Treated/Recycled Waste Water minus any losses (Considering Table A13) (MCM)		REMARKS
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

3.0 Issues and Challenges

4.0 Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0 Governance / Management:

a. Institutions governing / managing / monitoring the resources and Institutional structure.
b. Areas of Peoples/Private Participation if any
c. Schemes & Financing [Also, relevant tables on Water Financing and Economics may be looked into Chapter 7 and filled up with appropriate data/information]

6.0 Measurement, Monitoring and Data Constraints/ Management

7.0 Performance Indicators: for comparison across Districts/ Plants/ Units/ Products etc.

a) Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently.
   a. Norms for STPs (Sector Wise) **(**Table 4.1.10.1.7 A**)**
   i. Treatment efficiencies of the treatment plants and their mode of disposal.

ii. Performance of ETPs/ CETPS.

b) Status of various Performance Indicators – for comparison across Districts/ Plants/ Units/ Products etc.

	Indicator	Bench Mark/Unit	District.1/	District.2/
Sewage Measurement	**Sewerage network area**			
	% collection stations provided with flow meters (for whole district) for the area under sewerage network **4.1.10.1 F**			
	% of properties connected to the Sewer Network Table G			
	% total area provided with flow meters for the area under sewerage network (for whole district) **4.1.10.1 F**			
	% collection stations provided with flow meters (for whole district) for the urban area under sewerage network **4.1.10.1 F**			
	% total area provided with flow meters for the urban area under sewerage network (for whole district) **4.1.10.1 F**			
	% collection stations provided with flow meters (for whole district) for the rural area under sewerage network **4.1.10.1 F**			
	% total area provided with flow meters for the rural area under sewerage network (for whole district) **4.1.10.1 F**			
	% of properties connected onsite or local level collection system. **Table G**			
	% Non Sewered area in the district Table 4.1.10.1 A5			
	% of drains for which GPS coordinates is mapped on GIS platform.			
Sewerage Management	**Urban Areas**			
	Total sewerage generated (Total water supplied+ Estimated water use from other sources)*100 **Table 4.1.10.1 A**	100%		
	Total sewerage Collected(waste water collected through the systems **4.1.10.1 A**			
	Total Sewerage Treated **4.1.10.1 B**			
	Sewer network coverage **4.1.10.1 A** [Area covered with Sewer network/total urban area] x 100	100%		
	Sewage Collection Efficiency [Sewage Collected / Sewage Generated] x 100 **4.1.10.1 A**			
	Sewage Treatment Efficiency [Sewage treated / Sewage Generated] x 100 **4.1.10.1 B**			
	Sewage Treatment capacity utilization (capacity) [Number of STPs complying / Total Number of STPs] x 100 **4.1.10.1 C**			
	STP – BOD Performance BOD load reduction/ Total BOD reduction as per design **Table 4.1.10.1 E 1 and 4.1.10.1 E2**			
	Number of STPs conforming to the discharge standards / Total number of STPs **Table 4.1.10.1 E 1 and 4.1.10.1 E 2**	100%		
	Re-cycle Efficiency [Sewage recycled / Sewage treated] x 100 Table-Sewage Recycle, Reuse and Disposal **Table 4.10.1.1 C5**			
	Reuse Efficiency [Sewage reused / Sewage treated] x 100 **Table 4.10.1.1 C5**			
	Energy Efficiency [Total electrical Energy consumed in operating STPs/Total Quantity of Sewage treated]			

Septic tanks and soak pits in rural area	% of rural areas covered with septic tanks and soak pits **4.1.10.1 G**			
	% of rural population covered with septic tanks + soak pits **4.1.10.1 G**			
Financing	Per capita capital investment for waste water for collection			
	Per capita capital investment for waste water treatment and disposal			
Economics	O&M cost of sewage collection, treatment and disposal, Rs. Crore per MLD per year			
	Revenue Generation, Rs. Crore per MLD per year			
	% cost recovery			
Peoples participation	Number of Campaigns for waste Water management			
	Grievances received and redressed			
PPP	Private partnerships in sewerage treatment and maintenance			

8.0 Reforms undertaken / being undertaken / proposed if any

9.0 Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity.

Table 4.10.1.1 Sewage Generated (Collection, and Coverage):

Table 4.1.10.1 A: Sewerage Network coverage area and collection: Rural and Urban areas

District/ Basin	Area (Km2)	Urban Area including Metro cities	Rural Area	Sewer network coverage (in Km) of Urban and Rural	Uncovered Sewerage Area of Urban and Rural	Operational Sewerage / Conveyance System of Urban and Rural	Sewage generation, MLD	Sewage collection through sewerage, MLD	Sewage collection through I&D (MLD)

Table 4.1.10.1 A1 Sewerage Network coverage area and collection

Metro cities/ District/ Basin	Area (Km^2)	Sewer network coverage (in Km^2)	Uncovered Sewerage Area (in Km^2)	Operational Sewerage / Conveyance System	Sewage generation, MLD	Sewage collection through sewerage, MLD	Sewage collection through I&D (MLD)

Note: Collection efficiency of sewage networks: Reference service level Benchmark by MoUD Wastewater collected (the last column in this table)/ (Total water supplied+ Estimated water use from other sources)*100

Table 4.1.10.1 A2 Sewerage Network coverage area and collection: Urban Area of Class I & II cities / Towns

District/ Basin	Area (Km2)	Total Urban Area of Class I & II cities / Towns	Sewer network coverage (in Km)	Uncovered Sewerage Area	Operational Sewerage / Conveyance System	Sewage generation, MLD	Sewage collection through sewerage, MLD	Sewage collection through I&D (MLD)

Table 4.1.10.1 A3 Sewerage Network coverage area and collection: Urban Area other than Class I & II cities / Towns and Metros

District/ Basin	Area (Km2)	Total Urban Areas (other than class I & II)	Sewer network coverage (in Km)	Uncovered Sewerage Area	Operational Sewerage / Conveyance System	Sewage generation, MLD	Sewage collection through sewerage, MLD	Sewage collection through I&D (MLD)

Table 4.1.10.1 A4 Sewerage Network coverage area and collection: Rural Area

District/ Basin	Area (Km2)	Total Rural Area	Sewer network coverage (in Km)	Uncovered Sewerage Area	Operational Sewerage / Conveyance System	Sewage generation, MLD	Sewage collection through sewerage, MLD	Sewage collection through I&D (MLD)

Table 4.1.10.1 B: Sewage Treatment:

Table 4.1.10.1 B1 Sewage Treatment Capacity Metros

Metro cities/ District/ Basin	Total sewage generation MLD	Sewage collected MLD	Sewage treatment capacity	Treatment capacity gap	
				Quantity	%

Table 4.1.10.1 B2 Sewage Treatment Capacity in Urban areas Class I & II Cities and Towns

District/ Basin	Total sewage generation MLD from Class I & II cities / Towns	Sewage treatment capacity	Treatment capacity gap	
			Quantity	%
	100	80	20	

Table 4.1.10.1 B3 Sewage Treatment Capacity in Urban areas other than Class I & II Cities and Towns

District/ Basin	Total sewage generation MLD from other than class I & II cities	Sewage treatment capacity	Treatment capacity gap	
			Quantity	%

Table 4.1.10.1 B4 Sewage Treatment Capacity in Rural areas

District/ Basin	Total sewage generation MLD from Rural Areas	Sewage treatment capacity	Treatment capacity gap	
			Quantity	%

Table 4.1.10.1 B4.1 Septic tanks/Soak pits in rural areas

District/ Basin	Total no of House Holds	No of House Holds having Septic Tank/ Soak pits	Septic Tank/Soak pit facility	
			Quantity	%

Table 4.1.10.1B5 Sewage Treatment Capacity in Rural and Urban Areas

District/ Basin	Total sewage generation MLD Urban + Rural	Sewage treatment capacity	Treatment capacity gap	
			Quantity	%

Table 4.10.1.1 C: Sewage Treatment Capacity Utilization and performance (Design Norms compliant/ CPCB norms compliant/ MoEF notified Norms compliant)

Table 4.10.1.1C1 Sewage Treatment Capacity Utilization Metro city – Urban body wise

Metro- urban body wise	Sewage Generation (in MLD)	Number of STPs	STP Installed Capacity (in MLD)	Actual capacity utilization (in MLD)	
				Quantity	%

Table 4.10.1.1C2 Sewage Treatment Capacity Utilization Class I & II Cities and Towns – Urban body wise

District/ Basin	Sewage Generation (in MLD) from Class I & II	Number of STPs	STP Installed Capacity (in MLD)	Actual capacity utilization (in MLD)	
				Quantity	%

Table 4.10.1.1C3 Sewage Treatment Capacity Utilization Urban Areas other than Class I&II Cites and Towns

District/ Basin	Sewage Generation (in MLD) from other than Class I & II	Number of STPs	STP Installed Capacity (in MLD)	Actual capacity utilization (in MLD)	
				Quantity	%

Table 4.10.1.1C4 Sewage Treatment Capacity Utilization Rural Areas

District/ Basin	Sewage Generation (in MLD) from Rural	Number of STPs	STP Installed Capacity (in MLD)	Actual capacity utilization (in MLD)	
				Quantity	%

Table 4.10.1.1C5 Sewage Treatment Capacity Utilization Urban and Rural Areas

District/ Basin	Sewage Generation (in MLD) from Urban + Rural	Number of STPs	STP Installed Capacity (in MLD)	Actual capacity utilization (in MLD)	
				Quantity	%

New tables or additional column in the above tables may be added for Compliant or Non Compliant STPs.

Some information regarding finances (operating cost and who bears the O&M cost) may also be added.

Table 4.1.10.1 D: Sewage Re-cycle, Re-use and Disposal

Table 4.1.10.1 D1: Sewage Re-cycle, Re-use and Disposal Metros

Metro cities/ District/ Basin	Total sewage generation MLD	Sewage Treated MLD	Sewage untreated MLD	Treated MLD					Untreated MLD			
				Re-cycle	Re-use		Discharge		Un-organized re-use	Discharge		
				Industrial activity	Gardening	Irrigation	River / Lake discharge	Sea discharge	Irrigation	Land Application	River / Lake discharge	Sea discharge

Table 4.1.10.1 D2: Sewage Re-cycle, Re-use and Disposal Urban Areas Class I&II Cities and Towns

District/ Basin	Total sewage generation MLD from Class I & II	Sewage Treated MLD	Sewage untreated MLD	Treated MLD					Untreated MLD			
				Recycled			Discharge		Un-organized	Discharge		
				In	G	Ir	R/ L D	SD	Irrigation	LA	R/LD	SD

Table 4.1.10.1 D3: Sewage Re-cycle, Re-use and Disposal Urban areas Other Than Class I&II Cities and Towns

District/ Basin	Total sewage generation MLD from other than Class I & II	Sewage Treated MLD	Sewage untreated MLD	Treated MLD					Untreated MLD			
				Recycled			Discharge		Un-organized reuse	Discharge		
				Industrial	G	Irri	R/ LD	SD	Irrigation	LA	R/LD	SD

Table 4.1.10.1 D4: Sewage Re-cycle, Re-use and Disposal Rural areas

District/ Basin	Total sewage generation MLD from Rural	Sewage Treated MLD	Sewage untreated MLD	Treated MLD					Untreated MLD			
				Recycled			Discharge		Un-organized reuse	Discharge		
				Ir	G	Ir	RD	SD	Irrigation	LA	RD	SD

Table 4.1.10.1 D5: Sewage Re-cycle, Re-use and Disposal Urban + Rural areas

District/ Basin	Total sewage generation MLD from Urban + Rural	Sewage Treated MLD	Sewage untreated MLD	Treated MLD					Untreated MLD			
				Recycled			Discharge		Un-organized reuse	Discharge		
				In	G	Ir	RD	SD	Irrigation	LA	RD	SD

Table 4.1.10.1 D6: Sewage Management

Metro cities/ District/ Basin	Total sewage generation MLD Urban	Sewage Treated MLD	Sewage untreated MLD	Treated MLD					Untreated MLD			
				Re-cycle	Re-use		Discharge		Un-organized re-use	Discharge		
				Industrial activity	Garden ing	Irrigation	River discharge	Sea discharge	Irrigation	LA	RD	Sea discharge

Metro cities/ District/ Basin	Total sewage generation MLD of Rural Areas	Sewage Treated MLD	Sewage untreated MLD	Treated MLD					Untreated MLD			
				Re-cycle	Re-use		Discharge		Un-organized re-use	Discharge		
				Industrial activity	Garden ing	Irrigation	River discharge	Sea discharge	Irrigation	LA	RD	Sea discharge

Metro cities/ District/ Basin	Sewage generated	Sewage Collected	Sewage Treated	% of Sewage untreated	% of untreated sewage recycled	% of untreated sewage discharged in Rivers and Seas	% of sewage discharged in Rivers and Seas

Table 4.1.10.1 E: STP- Performance and Compliance to Sewage Quality norms

District/ Basin	**City**	**Norms for various Parameters**								
		pH	**SS**	**COD**	**BOD**	**TDS**	**Heavy metals (Specify heavy metals of industrial origin only like Cr, Pb, Ni, Hg, Cd)**	**Bacteriological Parameters (MPN/100 ml)**	**TN**	**TP**

Table 4.1.10.1 E2 STP- Performance and Compliance to Sewage Quality norms

District/ Basin	Urban body	Name of the STP/location/city/state	Capacity MLD	Utilization MLD	Raw Sewage Quality		Expected Treated Effluent Quality as per Design		Actual Treated affluent quality		Discharge Norms		Expected BOD load reeducation as per design Kg/Day	Actual BOD load reduction Kg/Day
					BOD	**COD**	**BOD**	**COD**	**BOD**	**COD**	**BOD**	**COD**		

Table 4.1.10.1 F: Area under Sewered network and Collection Centers with Flow Meters

District/ Basin	Total area under sewer network		Number of glow meters in the sewer network area		Collection Centers		Number of Collection centers with flow meters	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural

Table 4.1.10.1 G: Collection Centers with Flow Meters

District/ Basin	Total Properties in the district		Total Properties connected to the sewer network		Total Properties in the district		Total Properties with septic tanks not connected to the sewer network	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural

Table 4.10.1.7 A

[1][SCHEDULE – VI]

(See rule 3A)

GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS PART-A : EFFLUENTS

S. No.	Parameter	Standards			
		Inland surface water	Public Sewers	Land for irrigation	Marine coastal areas
1	2	3			
		(a)	(b)	(c)	(d)
1.	Colour and odour	See 6 of Annexure-I	--	See 6 of Annexure -I	See 6 of Annexure-I
2.	Suspended solids mg/l, Max.	100	600	200	(a) For process waste water-100 (b) For cooling water effluent 10 percent above total suspended matter of influent.
3.	Particulate size of suspended solids	Shall pass 850 micron IS Sieve	--	--	(a) Floatable solids, max. 3 mm. (b) Settleable solids, max. 850 microns.
[2]4.	***	*	--	***	--
5.	pH Value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
6.	Temperature	shall not exceed 5°C above the receiving water temperature	--	--	shall not exceed 5°C above the receiving water temperature

B. INDUSTRIAL WASTE WATER

1.0 Subject Matter should include:

- Effluent from organized sector
- Effluent from unorganized sector

2.0 Waste water generation, waste water treatment infrastructure and performance of the water treatment (sector-wise and source wise): (Table A –D)

a) Industrial wastewater management
   i. Fresh water consumption, wastewater generation and their treatment system. (Sector wise)
   ii. Inventory of Effluent Treatment Plants (ETPs) and Common ETPs

Treated/ Recycled Waste Water for Reuse is that water generated as waste within the System, round the Water Year, after some end-use which has been already accounted for in some form in the above sources of water, and is not an inflow into the system. So, considering that in Total Water Availability will lead to double-counting or Duplication. Table A13 is just for monitoring purpose.

A13. Treated/recycled Waste Water for Reuse (MCM)		**REMARKS (For Monitoring Purpose)**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

Treated water will enhance the availability of water internally (i.e. internal redistribution only) but not the total water availability of the system as it is not created or supplied into the system from outside. However, if utilizable water has been calculated by considering/setting aside bad quality water and if subsequently the quality of that untreated/used water (i.e. return flow) is improved by treatment then quantity of Utilizable Water will enhance.

B11. Water available from Treated/Recycled Waste Water minus any losses (Considering Table A13) (MCM)		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

3.0 Issues and Challenges

4.0 Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0 Governance / Management:

a) Institutions governing / managing / monitoring the resources and Institutional structure.
b) Areas of Peoples/Private Participation if any
c) Schemes & Financing [Also, relevant tables on Water Financing and Economics may be looked into Chapter 7 and filled up with appropriate data/information]

6.0 Measurement, Monitoring and Data Constraints/ Management

7.0 Performance Indicators: for comparison across Districts/ Plants/ Units/ Products etc: Table E and Table F

a) Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently.
   i. Treatment efficiencies of the treatment plants and their mode of disposal.
   ii. Performance of ETPs/ CETPS (Table E)

b) Status of various Performance Indicators – for comparison across Districts/ Plants/ Units/ Products etc.

Table E: Indicators – District Wise

Category of Indicators (Illustrative)	Indicator	Bench Mark	District.1/	District.2/
Industrial Waste water management				
Measurement of intake of water by organized sector industry Measurement of Waste water from Sewerage Treatment plants if any	Number of Industries having water meters with computer recording / Total number of industries x 100 Quantity of waste water received	100%		
Return	Total wastewater generation / Total water use x 100			
Treatment	Number of Industries having full capacity ETPs or CETPs / Total number of industries x 100	100%		
Norms compliance	[Number of ETPs/CETPs complying norms / Total Number of ETPs/CETPs] x 100	100&		
Reuse	[Waste water reused / Waste water treated] x 100	100%		
Energy	[Total electrical Energy consumed in operating ETPs/CETPs/Total Quantity of Waste water treated]	…. MWH/MLD		

Table F: Indicators – Sector wise

Category of Indicators (Illustrative)	Indicator	Bench Mark	Sector.1	Sector.2
Industrial Waste water management				
Measurement	Number of Industries having water meters with computer recording / Total number of industries x 100	100%		
Return	Total wastewater generation / Total water use x 100			
Water cost burden Vs OPEX	Total annual cost of water / Total annual OPEX			
Water cost burden Vs CAPEX	Total annual cost of water / Total annual CAPEX			
Specific water use	Specific water use			
Specific consumptive water use	Specific consumptive water use			
Treatment	Number of Industries having full capacity ETPs or CETPs / Total number of industries x 100	100%		
Norms compliance	[Number of ETPs/CETPs complying / Total Number of ETPs/CETPs] x 100	100%		
Reuse	[Waste water reused / Waste water treated] x 100	100%		
Energy	[Total electrical Energy consumed in operating ETPs/CETPs/Total Quantity of Waste water treated]	…. MWH/MLD		

8.0 Reforms undertaken/ being undertaken/ proposed if any

9.0 Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity.

Table A: Total wastewater generation & discharge by industries in the state (district wise & overall).

Sr. No.	District/ Basin	Type of Sector	Name of the Industry	Product(s) & Installed Capacity (Tonnes/annum) or (m3/annum)	Fresh Water Requirement (MLD)	Qty. of Effluent generated (MLD)	Qty. of water lost in process (consumptive use) (MLD)	ETP capacity (MLD)	Where discharged (Land/River/Sea)
1		E.g. Textile	ABC						
			XYZ						
Total Quantity of Effluent Generated									

Table B: Industrial wastewater treatment

District/ Basin	Industrial Sector	**Total Fresh Water Requirement (MLD)**	Total wastewater generation, MLD	**Total water lost in process (consumptive use) (MLD)**	Treatment capacity	Treatment capacity gap	
						Qty	%
	TPP						

Table C: Treatment capacity utilization

District/ Basin	Industrial Sector	Number of ETPs	Number of CETPs	Total installed Capacity (in MLD)	Actual capacity utilization (in MLD)	
					Qty	%
	TPP					

Table D: Industrial wastewater Re-cycle, Re-use and Disposal

District/ Basin	Sector	Total wastewater generation, MLD	Wastewater Treated MLD	Waste water untreated MLD	Treated MLD					Untreated MLD			
					Re-cycle	Re-use		Discharge		Un-organized re-use	Discharge		
					Industrial activity	Gardening	Irrigation	River discharge	Sea discharge	Irrigation	Land Application	River discharge	Sea discharge

District/ Basin	Sector	Waste water generated	Waste water Treated	% of Waste water untreated	% of untreated waste water recycled	% of untreated waste water discharged in Rivers and Seas	% of waste water discharged in Rivers and Seas

Table E: ETP/CETPs - Performance and Compliance to waste water Quality norms

Sector	**Norms for various Parameters**						
	pH	**SS**	**COD**	**BOD**	**TDS**	**Heavy metals**	**Others**

District/ Basin	Sector	ETP/ CETP	Capacity MLD	District	Raw waste water Quality			Expected Treated waste water Quality as per Design			Actual Treated wastewater quality			Discharge Norms			Expected BOD load reeducation as per design Kg/Day	Actual BOD load reduction Kg/Day
					BOD	COD	HM	BOD	COD	HM	BOD	COD	HM	BOD	COD	HM		
Unit																		

4.2 WATER: DEMAND / CONSUMPTION Side

4.2.1.1 FORESTRY

1.0 Subject Matter: Forestry and Water – Assessment of Current Demand, Efficiencies, Challenges etc.

This part shall comprehensively cover the basic information which directly or indirectly has linkage to the Supply of Water quality, Quantity from Forests area or its Consumption pertaining to Forests. The relevant annexure should be filled for the purpose. If possible the data in this section should be presented in the form of graphs, Bar Diagrams, Pie Charts etc. for easy comparison amongst the Forests Divisions on the following parameters.

i. Whether STATE WATER POLICY is in place or not: Yes/ No
   - Notified forest area (Annexure – 4.2.1.1 A)
   - Area under forest covers (Annexure – 4.2.1.1 B)
   - Change in Forest cover (Annexure – 4.2.1.1 C)

ii. Area under different forest types and Available Tree Species (Annexure – 4.2.1.1 D)
iii. Forest Land Diverted for Non Forest Purpose (Last 5 Years) (Annexure – 4.2.1.1 E)
iv. Status of Waste Land (Annexure – 4.2.1.1 F)
v. Fire incidences noticed, annually (for Last 5 years) (Annexure – 4.2.1.1 G)
vi. Problem of salinity & water logging in Forest Areas (Annexure – 4.2.1.1 H)

4.2.1.2 Nurseries in the Forest Department

i. Permanent & Temporary (Annexure – 4.2.1.2 A)
ii. Modern Nurseries (Annexure – 4.2.1.2 B)

4.2.1.3 Major source of water for nurseries/plantations (Annexure – 4.2.1.3 A)

4.2.1.4 Types/methods of irrigation used in nurseries (Annexure – 4.2.1.4 A)

4.2.1.5 Requirement of water (Litres)

i. Water Storage in nurseries (Annexure – 4.2.1.5 A)
ii. Demand & supply of water in nurseries (Annexure – 4.2.1.5 B)
iii. Season wise water requirements (Annexure – 4.2.1.5 C)

4.2.1.6 Plantations raised (ha)

i. Division wise Plantation raised (Annexure – 4.2.1.6 A)
ii. Species wise Plantation raised (Annexure – 4.2.1.6 B)
iii. Status of Watering in Plantations (Annexure – – 4.2.1.6 C)
iv. Status of Watering in Plantations – stress period (Annexure – – 4.2.1.6 D)
v. Survival percentage in Plantations (Annexure – 4.2.1.6 E)

4.2.1.7 Status of water in Forests

i. Water springs in forest area (Annexure – 4.2.1.7 A)
ii. Status of water table (Annexure – 4.2.1.7 A)

4.2.1.8 Water Facilities in Forests

i. . Rain water harvesting/Pondage (Annexure – 4.2.1.8A)
ii. Soil & water conservation majors (Annexure – 4.2.1.8 B)
iii. Water harvesting structures (Annexure – 4.2.1.8 C)

4.2.1.9 Health of Watersheds/Wetlands (Annexure- 4.2.1.9 A)

4.2.1.10 Silt load in rivers (Annexure – 4.2.1.10)

4.2.1.11 Status of Soil Erosion (Annexure -4.2.1.11)

4.2.1.12 Status of Forest Soils (Annexure – 4.2.1.12)

2.0 Availability, Utilizable, Supply (Sector wise and Source wise), Demand (Sector wise and Source wise), Consumption (Sector wise and Source wise). Temporal & Spatial basis is to be considered.

State Wise - Water Budget (June 1 – May 31) (As on 1st June)

Water used coming from:	Availability	Demand	Supply	Consumption	Gaps/ Remarks
Forest Area					
River, Streams					
Rain Water Harvesting					
Ponds, Tanks, Lakes					
Watersheds/wetlands					
Ground Water					
Inter Basin Transfer					
Minor, Medium, Major Projects					
Precipitation including Snow					
Glacial Melts					
Total (MCM)					

Forest Division Wise -Water Budget (June 1 – May 31) (As on 1st June)

Water used coming from:	Availability	Demand	Supply	Consumption	Gaps/ Remarks
Forest Area					
River, Streams					
Rain Water Harvesting					
Ponds, Tanks, Lakes					
Watersheds/wetlands					
Ground Water					
Inter Basin Transfer					
Minor, Medium, Major Projects					
Precipitation including Snow					
Glacial Melts					
Total (MCM)					

Sector Wise Demand, Supply (Withdrawals) & Consumptive Use of Water:

C6. Forestry Sector (MCM) Present Water Year from 1st June to 31st May next year (Chapter 4.2.1)									
Sub Sectors	Demand for Present Water Year *	Previous Year/ Average Annual Demand	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Return Flows **	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water/ Snow	Surface Water	Ground Water ***	**TOTAL SUPPLY**			
1. Rain-fed Forestry									
2. Irrigated Forestry									
3. Wildlife									
TOTAL									
GRAND TOTAL									

* Demand can be calculated either from Direct Measurement or Species Water Requirement

** Calculations as per established methodology/assumptions

*** GW Draft can be calculated either from the number of GW abstraction structures & corresponding draft or Species Water Requirements and extension/area of Forestry (GEC Methodology)

(The data obtained from District/Blocks etc should be aggregated to corresponding Basin/Sub Basin Level for Comparability with Water Availability or Utilizable Water)

Source Wise Previous Year/ Average Annual Water Supply:

C6. Forestry Sector (MCM) Within the Basin/ Sub-basin A (Chapter 4.2.1)					
Source	Sub Source	Rain-fed Forestry	Irrigated Forestry	Wildlife	**TOTAL**
Rain Water/ Snow	Direct Soil Moisture (useful)				
	Directly Harvested Rain Water				
Total					
Surface Water	Glaciers				
	Springs, Nallahs				
	Major Projects				
	Medium Projects				
	Minor Projects				
	Ponds/Tanks				
	Wetlands				
	Desalinated Water/ Sea water				
	Inter Basin Transfer				
Total					
Ground Water * (Dynamic/ Static)	Dug wells (Total No. x Draft)				
	Dug cum Bore well (Total No. x Draft)				
	Bore/Tube wells (Total No. x Draft)				
	Others				
Total					
Treated Waste Water					
GRAND TOTAL					

* GW Draft can be calculated either from the number of GW abstraction structures & corresponding draft or Species Water Requirements and extension/area of Forestry (GEC Methodology)

The Evapo-transpiration from the natural vegetation, forests etc form another large chunk of Outflow from the System. The forests and vegetation consumes water from the soil moisture and ground water storage to finally transpire them out of the system.

D3. Evapo-Transpiration * from natural dense forests, natural vegetation other than in Table C6 (MCM)		REMARKS
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

(When it cannot be measured, it has to be calculated basically as a difference in Mass balance to close the Water Budget)

*** If Evapo-Transpiration from forests and other natural vegetation need to be calculated, it can be carried out on the basis of NDVI (Normalized Difference Vegetation Index) at the Basin or Sub-basin scale.**

3.0 Issues and Challenges: For Example…

- Sustainable supply of water for nurseries and plantations.
- Water Harvesting and Conservation.
- Community Participation in Water Harvesting and Conservation.
- Watershed/Wetland Management Issues
- Pollution control issues
- Waste disposal issues in rivers, water bodies

4.0 Problem Tree/ Root Cause Analysis: Causes, Effect and Conservations: For Example..

- Depletion in Forest Cover.
- Drying of water streams and springs.

- Siltation in rivers, lakes, ponds
- Reduction in Water Quality and quantity.
- Water Allocation Issues.
- Changes in Life Patterns.

5.0 Governance/ Management:

4.2.1.5.1 Statute/ Law/Policy/ Regulations, if any… like provisions in

- Water Policy
- Indian Forest Act
- National Forest Policy
- Biodiversity Act

4.2.1.5.2 Institutions governing/managing/monitoring the resources and Institutional structures, like..

- State Forest Department
- Agriculture Department
- Gram Panchayats
- Local level Institutions
- MGNREGA

4.2.1.5.3 Areas of People/ Private Participation, if any, like…

- Participatory Management of water resources.
- Local level Institutions
- Inter Departmental Co-ordination.

4.2.1.5.4 Schemes & Financing in the Area, if any, like…

- Water Projects
- Central Government Schemes
- World Bank Schemes
- State Government Schemes
- UNDP Projects
- Asian Development Bank Projects

[Also, relevant tables on Water Financing and Economics may be looked into Chapter 7 and filled up with appropriate data/information]

6.0 Measurement, Monitoring and Data Constraints Management:

- Monitoring Projects
- Assessment Methods
- Water Data Management
- Transparency in data collection
- Circulation of water data

7.0 Performance Indicators:

Bench Marks / Norms/ Standards and deviation from the norms/benchmarks/standards currently in operation.

If possible the data in this section should be presented in the form of graphs, Bar Diagrams, Pie Charts etc. for easy comparison amongst the Forests Divisions on the following parameters.

4.2.1.7.1 (Indicators at a Glance)

i. Survival Percentage of Plantations
ii. Extent of Forest Cover
iii. Forest Cover (Density-wise)
iv. Number of springs dried and revived
v. Extent of Natural Regeneration
vi. Forest Land diverted for Non Forestry purpose
vii. Losses due to floods in Forest Area
viii. Silt load in Rivers
ix. Ground Water Table
x. Agriculture land in Forest Fringe area
xi. Organic C content in the Forest Soils
xii. Extent of Damage reported e.g. Encroachment, Illicit felling and Fire

4.2.1.7.2 Status of various Performance Indicators – For comparison Districts/Forest Division/Units/ Products etc.

Parameters	Performance Indicators	Bench Mark	Units	Div.1	Div.2
Conservation Measures	% of Water Resources geo-tagged				
	Number of rain gauges per forest division				
	Whether rain gauge functional				
	Whether regular rain gauge readings recorded				
	% of Water Resources having working water meters-at Source level and outlet level				
	Undertaken internal Water Audit in the last Year				
	Undertaken Third party Water Audit in the last two years				
	Operationalization of water management plans				
	Forest land diverted for non-forest use				
	Area planted last two years				
	Area planted under Compensatory Afforestation – last two years				
	Survival % of Plantations				
	Functional Rain Water Harvesting				
	Water storage capacity meeting total water requirements in Nursery				
	Additional Water Storage capacity created during last 2 years				
	% of Nurseries with micro-irrigation				
	Reported decline in ground water level				
	No. of Springs dried in the last 2 Years				
	% Area unfit because of salinity				
	% Area unfit because of Water logging				
	Soil moisture <75% in plantation areas				
	Number of fire incidents recorded in last 2 years				
	Number of Plants produced per litre of water in nurseries				

Demand Management	Watering in Plantations				
Water productivity	Water consumed per 1000 plants raised in nursery				
	Water consumed per 1000 plants raised in plantation				
	Expenditure done towards irrigating the plantations during stress period (during last year)				
Environmental Sustainability	Fuel wood extraction				
	Timber extraction				
	Fodder extraction				
	Non-Timber Forest Produce extraction				
	Average Ground Water Level				
	Losses reported due to floods in Forest Area				
Water Quality	Undertaking Water Quality tests as prescribed				
	Any Alarming Water Quality Report as per tests				
	Reported degradation of water Quality from potable to non-potable.				
	Whether regular monitoring of silt load done in rivers				
Participatory management	Existence of active community participation				
	Existence of Water Panchayats in the area				
	Any other local body regulating the use of water flowing through the forest				
Economics	Investment per ha for soil and Water Conservation in the previous Years				

8.0 Reforms undertaken/ being undertaken/ proposed if any

9.0 Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity.

***Annexure* – 4.2.1.1 A**

Forest Coverage State- Time Trend*

	1950	1985	1995	2005	2015
Very Dense Forest (VDF)					
Moderately Dense Medium					
Open Forest					
Scrub Forest					
Total					

Note: Also give in graphics

***Annexure* – 4.2.1.1 B**

% Forest Coverage for the Current Year*

	1950	1985	1995	2005	2015
Dense					
Medium					
Open					
Total					

Note: Also give in graphics

***Annexure* – 4.2.1.1 C**

Change in Forest Cover*

	Forest Area	% of Forest Division	% change in Area compared previous Assessment
Division 1			
Division 2			

Note: Also give in graphics

Annexure – 4.2.1.1 D

Forest Types in the Area

	Forest Area	Major Tree Species	
		Conifers	Broad Leaved
Division 1			
Division 2			

***Annexure* – 4.2.1.1 E**

Status of Forest Land Diversion*

	Status of Forest Land Diverted to Non Forestry purpose
Current Year	
Previous Year (I)	
(II)	
(III)	
(IV)	

Note: Also give in graphics

***Annexure* – 4.2.1.1 F**

Status of Waste Lands (ha)

	Culturable Waste Lands	% of total forest	Non-Culturable Waste Lands	% of total forest
Division 1				
Division 2				

Annexure – 4.2.1.1 G

Forest Fire Incidences

	Forest Fire Incidence		
	Number	Area effected	Estimated Loss (Rs)
Current year			

Previous year (I) (I)			
(II)			
(III)			
(IV)			

Annexure – 4.2.1.1 H

Problem of Salinity &Water Logging in Forest Area

	Salinity	% of total forest	Water logging	% of total forest
Division 1				
Division 2				

Annexure – 4.2.1.2 A

Nurseries- Number and Area of Permanent Nurseries (Current Year)

	No.	Area (ha)	Number of Plants		Total No.
			Coniferous Spp.	Broad Leaved Spp.	
Division 1					
Division 2					

Annexure – 4.2.1.2 B

Nurseries- Number and Area of Temporary Nurseries (Current Year)

	No.	Area (ha)	Number of Plants		Total No.
			Coniferous Spp.	Broad Leaved Spp.	
Division 1					
Division 2					

***Annexure* – 4.2.1.2 C**

Modern Nurseries

	Mist Chamber	Shade House	Poly House	Others
Division 1				
Division 2				

Annexure – 4.2.1.3 A

Sources of Water used in Nurseries/Plantations

	Forest area	Rain Water Harvestin g (RWH)	River/ Stream	Spring/ Nala	Watershed/W etlands	G. Water	Precipitati on/ Snow	Glacial Melts
Division 1								
Division 2								

Annexure – 4.2.1.4 A

Methods of Irrigation in Nurseries

	Flood	Rose can	Sprinkler	Others
Division 1				
Division 2				

Annexure – 4.2.1.5 A

Water Storage capacity for Nursery Irrigation

	RCC	Earthen	Plastic/ Steel	Others
Division 1				
Division 2				

Annexure- 4.2.1.5 B

Demand and Supply
In the Current Year: Total of Spring, Summer, Rainy and Winter Seasons

	Actual requirement/ Demand /ha	Supply	Consumption	
Division 1				
Division 2				

Annexure- 4.2.1.5 C

Demand and Supply Season wise: Spring, Summer, Rainy and Winter

	Actual requirements/ Demand/ha	Supply	Consumption
Spring Season			
Summer Season			
Rainy Season			
Winter Season			

Annexure- 4.2.1.6 A

Division wise Plantation raised in Area (ha)

	Current Year	Last year	Last 2 year	Last 3 year	Last 4 year
Division 1					
Division 2					

Annexure- 4.2.1.6 B

Species wise Plantation raised in Area (ha)

	Conifers Spp.	Broad Leaved Spp.	Others	Total
Division 1				
Division 2				

Annexure- 4.2.1.6 C

Status of Watering in Plantations (Current Year)

	Area	Number of Plants/ha	Number of Watering/Year	% under total area	Investment/ ha
Division 1					
Division 2					

Annexure- 4.2.1.6 D

Status of Water in Plantations - Stress Period (Current Year)

	Area	Number of Plants/ha	Number of Watering/Year	% under total area	Investment/ ha
Division 1					
Division 2					

Annexure- 4.2.1.6 E

Survival % in Plantations

	Survival%	Current year	Last year	Last to last year	Average %
Division 1					
Division 2					

Annexure- 4.2.1.7 A

Water Springs in the Forest Area

	Number	Location	Types	No. of Water Springs dried (year)
Division 1				
Division 2				

Annexure- 4.2.1.7A

Water Table in Forests (m)

	Water Table (m)	Location	Season	
Division 1				
Division 2				

Annexure- 4.2.1.8 A

Rain Water Harvesting/ Pondage

	Number	Type of RWH	Capacity	Irrigation potential Area	Actual Area Irrigated
Division 1					
Division 2					

Annexure- 4.2.1.8 B

Expenditure on Soil Water Conservation Measures in Previous Year

	Scheme.1	Scheme.2	Scheme.3	**Total**
Division 1				
Division 2				

Annexure- 4.2.1.8 B

Water Harvesting Structures (WHS) - Number and Amount

	Trenches		Check dams		WHS		Total
	No.	Amount	No.	Amount	No.	Amount	
Division 1							
Division 2							

Annexure- 4.2.1.9 A

Watersheds/Wetlands in Area

	Watersheds			Total
	Number	Location	Health	
Division 1				
Division 2				

Annexure- 4.2.1.10

Silt Load in Rivers

	Rivers			Total
	Silt load	Location	Type	
Division 1				
Division 2				

Annexure- 4.2.1.11

Soil Erosion in Area

	Soil Erosion			
	Magnitude	Location	Type	
Division 1				
Division 2				

Annexure- 4.2.1.12

Soil Status in Area

	Soil Nutrients				Others
	Organic Carbon	Nitrogen	Phosphorous	Potassium	
Division 1					
Division 2					

4.2.1.2 WILDLIFE

1.0 Subject Matter: Objective: To derive the State wise water allocation for wildlife conservation

Background: Water as a resource for wildlife conservation (Table 4.2.1.2.1)

i. Number and location (on district map with drainage network) of aquatic habitat in the State/District (Lentic & Lotic)
ii. Number, location (on district map with drainage network) and extent of protected and non-protected areas (both terrestrial and aquatic) in the State/District
iii. Number, location (on district map with drainage network) and extent of wetlands /aquatic habitats in the State/District
iv. Level, type and extent of threat to the protected areas/ wetlands /aquatic habitats

Status of aquatic species (Table 4.2.1.2.2)

i. Population and diversity trend of species of conservation concern
ii. Dispersal range across the river systems
iii. Level and extent of threat to the species of conservation concern

Existing State wise water allocation for wildlife conservation (Table 4.2.1.2.3)

2.0 Available & Utilizable Water, Demand, Supply and Consumption

4.2.1.2.4 Total water volume or flow available for wildlife conservation (Table 4.2.1.2.4)

Availability: Total water volume or flow available for wildlife conservation

4.2.1.2.5 Total utilizable water (volume or flow) for wildlife including migratory water birds and fish (Table 4.2.1.2.5)

4.2.1.2.6 Demand (Sector wise and Source wise) (Table 4.2.1.2.6)

Water availability as per the natural hydro period of a given water body or for lotic systems: 50% of the Mean monthly Runoff (Flow) for sustaining wildlife populations and ecosystem services, 60-75% of the natural mean monthly water volume at human used wetlands, 90-100% of the natural mean monthly water volume in notified wetlands or wetlands in protected areas for sustaining wildlife populations and ecosystem services

4.2.1.2.7 Supply (Sector wise and Source wise) (Table 4.2.1.2.7)

The amount of water available in lentic and lotic ecosystems after consumptive use by humans

4.2.1.2.7 Consumption (Sector wise and Source wise) (Table 4.2.1.2. 8)

The amount of water required from wetlands, rivers or streams for maintenance of ecosystem level processes

3.0 Issues and Challenges

i. Following defined categories and/or any other State-specific parameter(s) shall be explained and measures taken to address those issues may be provided.

ii. Issues/ challenges in deriving water requirement for wildlife conservation and maintenance of ecosystem services
iii. Issues/ challenges in ensuring water availability for conservation: Continuity, Quality and Quantity
iv. Issues/ challenges in involving communities for water conservation
v. Any other

4.0 Root cause Analysis: Cause, Effect and Interventions

Following defined categories and/or any other State-specific parameter(s) shall be explained and the root-cause, their effects and interventions adopted to address those issues may be provided.

i. Reduction in water availability
ii. Deterioration in water quality
iii. Water allocation issues
iv. Development – Conservation conflicts
v. Sand mining
vi. State of floodplain
vii. Depletion of prey base
viii. Any other

5.0 Governance / Management

i. Statute / Law / Policy/ Regulations if any

- . Provision under National Environmental Policy, 2006
- Provision under Wildlife (Protection) Act, 1972
- . Provision under Environmental (Protection) Act, 1986
- Wetland Conservation and Management rules, 2010
- With specific reference districts in Ganga system, District Ganga Committee and its state
- Any other

ii. Institutions governing / managing / monitoring the resources and Institutional structure

- **.** Forest Department/Wildlife Department
- Irrigation and water resources, Agriculture, revenue Department
- Local level institutions (Role of Panchayati Raj System, if any)
- Central Pollution Control Board (CPCB)/ State Pollution Control Board (SPCB)
- Pollution control committees (where applicable)
- State and District level departments
- Any other

iii. Areas of Peoples/Private Participation if any

- Participatory management of water resources, if any
- Local level institutions (Panchayati Raj Institution) in water resource management
- Interdepartmental collaboration in wetland and river management, if any
- Any other

iv. Schemes & Financing in the area

- Central Government schemes
- State Government aid projects
- UNDP funded projects
- World Bank aided projects
- Other international aided projects (JICA, GIZ, AUSAID and so on)
- . Local level site-specific projects such as MGNREGA
- Any other

[Also, relevant tables on Water Financing and Economics may be looked into Chapter 7 and filled up with appropriate data/information]

6.0 Measurement, Monitoring and Data Constraints/ Management

Following defined categories and/or any other State-specific parameter(s) shall be explained and interventions adopted to address those issues may be provided.

i. Monitoring protocol in place
ii. Description of the area
iii. Assessment methods
iv. Periodicity of assessment
v. Frequency of reporting
vi. Document control and data management: Availability, Transparency and Circulation
vii. Monitoring agency
viii. Availability of human resources (trained manpower)
ix. Evaluation mechanism
x. Any other

7.0 Performance Indicators: comparison across Districts/ Units/ Products etc.

The performance Indicators shall be evaluated in terms of deviation from norms/benchmarks for spatial and temporal comparisons.

Categories of indicators	Indicators	Bench Mark	Districts		
			1	2	3
Status					
	% of lentic and lotic ecosystems geo-tagged				
	% lentic ecosystems where water storage is assessed				
	Number of Flow Gauging Stations in lotic ecosystems				
	% of lentic ecosystems in Protected Areas surveyed for population estimation of indicator aquatic species				

Categories of indicators	Indicators	Bench Mark	Districts		
			1	2	3
	% of lentic ecosystems outside Protected Areas surveyed for population estimation of indicator aquatic species				
	% of lotic ecosystems under Protected Areas surveyed for population estimation of indicator aquatic species				
	% of lotic ecosystems outside Protected Areas surveyed for population estimation of indicator aquatic species				
Water conservation efforts	Existence of watershed management plans/wetland management plan for lentic ecosystems				
	Existence of watershed management plans for lotic ecosystems				
	% of lentic ecosystems protected under Wild Life (Protection) Act, 1972				
	% of lentic ecosystems notified as Ramsar Site				
	% of Protected areas with functional waterhole in lean seasons				
	% of lotic ecosystems protected under Wild Life (Protection) Act, 1972				
	% lotic ecosystems notified as Ramsar Site				
	% lotic ecosystems newly notified as Ramsar Site				
	Ecological restoration undertaken in number of lentic and lotic ecosystems in near past				
	% Population increase (index) and/or recurrence of indicator species of aquatic ecosystems				
	River dolphins				
	Otters				
	Crocodilians				
	Amphibians				
	Fish				
	Congregation of winter migratory water birds (Total nos.)				
	Congregation of island/shoreline nesting birds (Total nos.)				
	% Population decline (index) and/or local extinction of indicator species of aquatic ecosystems				
	River dolphin				
	Otters				
	Crocodilians				
	Amphibians				
	Fish				
	Congregation of winter migratory water birds (Total nos.)				
	Congregation of island/shoreline nesting birds (Total nos.)				
	% lotic ecosystems where flow has reduced from 40% of Mean Annual Runoff (Flow, cubic meter per second)				
Water demand management	Extraction of water from lentic ecosystems (cubic meter per annum)				
	Systems facing recurring water scarcity during lean seasons may be a better indicator				
	% lotic ecosystems suitable for sustenance of wildlife				
	% new waterhole created in Protected Areas				
Sustainability of aquatic ecosystems	Average increase in ground water table				

Categories of indicators	Indicators	Bench Mark	Districts		
			1	2	3
	% increase in total stored volume (cubic meter) of water in lentic ecosystems				
	% increase in mean annual runoff (cubic meter per annum) in lotic systems				
Assessment of water quality and quantity	% of lentic ecosystems where water quality assessment regularly carried out by State Pollution Control Board or other MoEF&CC recognized agency				
	% of lotic ecosystems where water quality assessment regularly carried out by State Pollution Control Board and other MoEF&CC recognized agency				
	% lentic ecosystems in terms of Biochemical Oxygen Demand (BOD) of 3 mg/L or less				
	% lentic ecosystems in terms of Dissolved Oxygen concentration 6 mg/L or more				
	% lotic ecosystems in terms of Biochemical Oxygen Demand 3 mg/L or less				
	% lotic ecosystems in terms of Dissolved Oxygen concentration 6 mg/L or more				
	Nos. of species locally extinct due to change in water quality and quantity				
	Nos. of species re-appeared due to rejuvenation of water quality and availability				
	% decline reported in migratory water bird congregation				
Participatory management in aquatic ecosystem conservation	Whether there is a participatory wetland and river management framework				
	% lentic ecosystem reclaimed/rejuvenated through participatory management				
	% lotic ecosystem reclaimed/rejuvenated through participatory management				
Water economics of aquatic ecosystems	Investment per hectare in the current year for lentic ecosystem restoration (in INR)				
	Investment per km in the current year for lotic ecosystem restoration (in INR)				
	Revenue generated through river and wetland tourism (in INR)				
	Revenue generated out of ecosystem goods and services (in INR)				

8.0 Reforms undertaken/ being undertaken/ proposed if any

4.2.1.2.12 Reforms undertaken/ being undertaken/ proposed, if any (Table 4.2.1.2.12)

Reforms may be evaluated in terms of the categories included in Table **4.2.1.2.12** and other category if any may also be incorporated.

9.0 Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity.

4.2.1.2.13 Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity

Sl. No.	Proposed tasks	Methodology	Probable outcome	Agency responsible	Proposed timeline

4.2.1.2.14 Information Sources

i. Forest Department/Wildlife Department
ii. Irrigation Department
iii. State Wetland Conservation and Management Authority
iv. State Pollution Control Board
v. Central Water Commission
vi. Department of Science and Technology
vii. Groundwater Board
viii. State Statistical Department
ix. Biodiversity Board
x. Biodiversity Management Committee (BMCs)
xi. People's Biodiversity Register (PBRs)
xii. Village Panchayats, blocks and Tehsil Office

Table 4.2.1.2.1 Water as resource for wildlife and aquatic ecosystem conservation (Overall or State)

No.	Status of aquatic habitats		2000	2010	2017
1.	Number of aquatic habitat in the area (Lentic & Lotic)				
2.	Number and extent of protected areas				
a)	Total number of lentic habitats (Wetlands, lakes, ponds, marshes and any other wetland type) inside Protected Areas	Natural			
		Manmade (Dam, barrage, check dam, water holes etc.)			
b)	Total number of lentic habitats outside Protected Areas	Natural			
		Manmade (Dam, barrage, check dam etc.)			
c)	Total number of freshwater protected area (Lotic- Rivers and Streams)				
d)	Total number of lotic habitats (Rivers and Streams) outside Protected Area				
e)	Total stretch of lotic habitats (Rivers and streams) (km) inside Protected Area				
f)	Total stretch of lotic habitats (Rivers and streams) (km) outside Protected Area				
g)	Numbers of wetland covered under National Wetland Conservation Plan (NWCP)				
h)	Numbers of wetlands not covered under National Wetland Conservation Plan (NWCP)				
i)	Number of Ramsar sites				
j)	Maps depicting lentic and lotic ecosystems and Protected Areas				
3.	**Level and extent of threat**				
a)	Total number of lentic habitats lost (due to reduced water availability, pollution, drought, reclamation and other causes like climate change)				
b)	Total number of lentic habitats need restoration (due to reduced water availability, pollution, draught, anthropogenic factors and other causes like climate shifts)				
c)	Total number of lentic habitats under **Designated-Best-Use Water Quality Criteria (http://www.cpcb.nic.in/ Water_Quality_Criteria.php)**	Class A			
		Class B			
		Class C			
		Class D			
		Class E			
		Un-assessed			
d)	Total number of lotic habitats lost (due to reduced water availability, pollution, draught and other causes like climate shifts)				
e)	Total number of lotic habitats need restoration (due to reduced water availability, pollution, draught, reclamation and other causes like climate shifts)				
f)	Total number of lotic habitats under **Designated-Best-Use Water Quality Criteria (http://www.cpcb.nic.in/ Water_Quality_Criteria.php)**	Class A			
		Class B			
		Class C			
		Class D			
		Class E			
		Un-assessed			

Table 4.2.1.2.2 Status of aquatic species – State wise population trend of important species

Fauna		**Name of important species**	**Location (insert multiple rows)**	**Global status***	**Local status****	**2000**	**2010**	**2017**
Aquatic and semi-aquatic mammals	River dolphin							

<table>
<tr><th colspan="3">Fauna</th><th>Name of important species</th><th>Location (insert multiple rows)</th><th>Global status*</th><th>Local status**</th><th>2000</th><th>2010</th><th>2017</th></tr>
<tr><td colspan="2" rowspan="3"></td><td rowspan="3">Otters</td><td>1.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="22">Birds</td><td rowspan="8">Resident</td><td rowspan="2">Herons</td><td>1.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Cranes</td><td>1.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Waders</td><td>1.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Ducks and geese</td><td>1.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="3">Total congregation (Number)</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="8">Migratory</td><td rowspan="2">Herons</td><td>1.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Cranes</td><td>1.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Waders</td><td>1.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Ducks and geese</td><td>1.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="3">Total congregation (Number of birds)</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Nos. of island and shore-nesting bird colonies</td><td colspan="2">Congregation (Total nos.)</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Nos. of Heronry around wetlands/rivers</td><td colspan="2">Congregation (Total nos.)</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2" rowspan="7">Reptiles</td><td rowspan="4">Freshwater turtles</td><td>1.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>2.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>4.</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td rowspan="3">Crocodilians</td><td>Gharial</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Mugger</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Saltwater crocodile</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2"></td><td>Aquatic snakes</td><td>Overall population</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Amphibians</td><td colspan="2">Overall population</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Fish Species 1</td><td>Catch per unit effort</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Fish Species 2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Fish Species 3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Invertebrates</td><td>Catch per unit effort of species like shrimps and prawns</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

Global status: According to International Union for Conservation of Nature (IUCN) Red List
*****Local status: According to Indian Wild Life (Protection) Act, 1972***

Table 4.2.1.2.3. Existing State wise water allocation for wildlife and aquatic ecosystems and other common users

Sl. No.	**Type of aquatic habitat**	**Total number of dams/barrages/other impoundments/Irrigation schemes/canals**	**Total amount of water allocated annually (if done)**	
			Sectors	**Amount of water (cubic meter per annum)**
1.	Lentic ecosystems This needs to be wetland wise		Wildlife and Environment	
			Agricultural sector	
			Drinking water	
			Industrial use	
			Domestic consumption	
			Hydro-projects	
			Wetland reclamation	
			Any other	
2.	Lotic ecosystems Need to be river wise info		Wildlife and Environment	
			Drinking water	
			Industrial use	
			Domestic consumption	
			Hydro-projects	
			Any other	

Table 4.2.1.2.4 Total water volume or flow available for wildlife and aquatic ecosystem conservation (not sure if this info is available)

Year	Lentic ecosystems (cubic meter)	Lotic ecosystems (cubic meter per annum)
2000		
2010		
2017		

Table 4.2.1.2.5. Total utilizable water or flow for wildlife including migratory water birds

Year	Total mean annual volume (cubic meter) of stored water in lentic ecosystems inside Protected Areas	Total mean annual discharge (cubic meter per annum) of lotic ecosystems inside Protected Areas	Total nos. of lentic and lotic ecosystems fulfilling Designated-Best-Use Water Quality Criteria Class D: Propagation of Wildlife and Fisheries (http://www.cpcb.nic.in/Water_Quality_Criteria.php)			
			• pH between 6.5 to 8.5 • Dissolved Oxygen 4 mg/L or more • Free Ammonia (as N) 1.2 mg/L or less			
			Lentic ecosystems		Lotic ecosystems	
			Total nos.	Un-assessed	Total No.	Un-assessed
2000						
2010						
2017						

Table 4.2.1.2.6 Demand (Sector wise and Source wise)

Year	Water availability as per the natural hydro period of a given water body or for lotic systems 50% of the Mean Annual Runoff (Flow) for sustaining wildlife populations and ecosystem services, 60-75% of the natural mean monthly water volume at human used wetlands, 90-100% of the natural mean monthly water volume in notified wetlands or wetlands in protected areas for sustaining wildlife populations and ecosystem services.		
	Nos. of lentic ecosystems retaining 75% (Optimum level) of the total natural storage at human used wetlands	Nos. of lentic ecosystems retaining 100% (Optimum level) of the total natural storage in notified wetlands or wetlands in protected areas	Nos. of lotic systems retaining more than 50% of the Mean Annual Runoff (flow)
2000			
2010			
2017			

Table 4.2.1.2.7 Supply (Sector wise and Source wise)

Year	The amount of water available in lentic and lotic ecosystems after consumptive use by humans		
	Total annual mean storage (cubic meter) or total mean annual runoff (cubic meter per annum)	Total mean annual volume of water withdrawn from all sectors apart from environment and wildlife (cubic meter per annum)	Remaining annual mean storage (cubic meter) or total mean annual runoff (cubic meter per annum)
	Lentic ecosystems		
2000			
2010			
2017			
	Lotic ecosystems		
2000			
2010			
2017			

Table 8. Consumption (Sector wise and Source wise)

Sl. No.	**The amount of water required from lentic and lotic ecosystems for maintenance of ecosystem level processes**	**(%) of water bodies fulfilling the criteria**		
		2000	**2010**	**2017**
3.	Lentic ecosystems retaining 75% (Optimum level) of the total natural storage at human used wetlands Criteria: *60-75% of the natural mean monthly water volume at human used wetlands for sustaining wildlife populations and ecosystem services.*			
4.	Lentic ecosystems retaining 100% (Optimum level) of the total natural storage in notified wetlands or wetlands in protected areas Criteria: *90-100% of the natural mean monthly water volume at notified wetlands and wetlands in Protected Areas for sustaining wildlife populations and ecosystem services.*			
5.	Lotic systems retaining more than 40% of the Mean Annual Runoff (flow) Criteria: *More than 40% of Mean Annual Runoff (Flow, cubic meter per second) for sustaining wildlife populations and ecosystem services.*			

Table 4.2.1.2.9 Reforms undertaken/ being undertaken/ proposed for management of lentic and lotic ecosystems for wildlife and ecosystem conservation

Sl. No.	Categories	Districts		
		1	2	3
15.	Total number of sensitization workshops/seminars on aquatic ecosystem and biodiversity conservation targeting various stakeholders			
16.	Total number of capacity building workshops on aquatic ecosystem and biodiversity conservation for institutions governing/managing/monitoring the aquatic resources			
17.	% systems having species specific or multi species conservation plans			
18.	% reduction in conversion/land use change for lentic ecosystems			
19.	% lentic habitats revived after deterioration (if any)			
20.	% lentic ecosystems newly designated for regular water quality assessment by State Pollution Control Board or other MoEF&CC recognized agency			
21.	% lentic ecosystems restored in terms of Biochemical Oxygen Demand (BOD) of 3 mg/L or less			
22.	% lentic ecosystems restored in terms of Dissolved Oxygen concentration of 6 mg/L or more			
23.	% lotic ecosystems newly designated for regular water quality assessment by State Pollution Control Board or other MoEF&CC recognized agency			
24.	% lotic ecosystems restored in terms of Biochemical Oxygen Demand (BOD) of 3 mg/L or less			
25.	% lotic ecosystems restored in terms of Dissolved Oxygen concentration of 6 mg/L or more			
26.	Water flow enhanced in % of lotic ecosystems			
27.	New riparian area developed/restored under watershed management			
28.	Man-made interventions: Example/Case studies (Criteria: Restored/rejuvenated biodiversity and ecological service value)			
29.	Any other			

4.2.2 FARM SECTOR

4.2.2.1. RAINFED AND IRRIGATED AGRICULTURE/ HORTICULTURE

1. **A. Agriculture and Irrigation-- Assessment of current demand, efficiencies, challenges**
   A.1 Basic State agriculture statistics (Annexure – 4.2.1)
   A.2 Land use pattern (Annexure- 4.2.2)
   A.3 Major soil type(s)and area under each(Annexure – 4.2.3)

B. Crop and season wise area, production and productivity under rain-fed and irrigated agriculture

B.1. Field Crops

B.1a Rice (Annexure – 4.2.4)
B.1b Wheat (Annexure – 4.2.5)
B.1c Maize (Annexure – 4.2.6)
B.1d Sugarcane (Annexure – 4.2.7)
B.1e Other Cereal crops (Annexure – 4.2.8)
B.1f Pulses (Annexure – 4.2.9)
B.1g Food grains (Annexure-4.2.10)
B.1g Oilseeds (Annexure – 4.2.11)
B.1h Fibre crops (Other than cotton) (Annexure – 4.2.12)
B.1i Commercial crops (excluding sugarcane)
B.1i (i) Cotton (Annexure – 4.2.13)
B.1i (ii) Tobacco (Annexure – 4.2.14)
B.1i(iii) Chilli (Annexure – 4.2.15)
B.1j. Forage crops (Annexure-4.2.16)

B.2 Horticultural Crops

B.2a Fruits (Annexure – 4.2.17)
B.2b Vegetables (Annexure – 4.2.18)
B.2c Floriculture (Annexure – 4.2.19)
B.2d Plantation crops (Annexure – 4.2.20)
B.2e Spices /Condiments (Annexure – 4.2.21)
B.2f Medicinal and Aromatic plants (Annexure-4.2.22)

B.3 Protected Cultivation (Greenhouse/ Net house/Shade house) related Crops and Nursery (Annexure-4.2.23)

B. 4. Other uses, *viz*. Barren land/ Water bogs, Avenues, Play field And Parks, Common land, Waste Lands etc. (Annexure-4.2.24)

C. Crop water requirement/productivity data

C.1. Field Crops

C.1a Rice (Annexure – 4.2.25)
C.1b Wheat (Annexure – 4.2.26)
C.1c Sugarcane (Annexure – 4.2.27)
C.1d Forage crops (Annexure-4.2.28)
C.1e Other field crops (Annexure – 4.2.29)
C.1f Total field crops (Annexure – 4.2.30)

C.2 Horticultural Crops

C.2a.Fruits (Annexure – 4.2.31)
C.2b. Vegetables (Annexure – 4.2.32)
C.2c. Floriculture (Annexure – 4.2.33)
C.2d Plantation crops (Annexure – 4.2.34)
C.2e Spices /Condiments (Annexure – 4.2.35)
C.2f Medicinal and Aromatic plants (Annexure-4.2.36)
C.3 Protected Cultivation (Greenhouse/ Net house/Shade house) related Crops (Annexure-4.2.37)
C.4. Any other lands (Annexure-4.2.38)

D. Past trend of crop area and water demand

D.1. Past trend of crop area (Annexure-4.2.39)
D.2. Past trend of crop water demand (Annexure-4.2.40)

E. Present and projected agricultural water demand

E.1: Based on the annual growth rate of past 10 years in crop water demand (Annexure-4.2.41)

F. Subject of Irrigation

F.1. Irrigation water demand and availability at critical crop growth stages for different crops (Annexure-4.2.42)
F.2.Status of season wise water availability from different sources of irrigation (Annexure-4.2.43)
F.3.Status of crop wise water availability from different sources (Annexure-4.2.44)
F.3. Status of groundwater availability (Annexure-4.2.45)
F.4. Methods of irrigation (Annexure-4.2.46)
F.5. Area under micro-irrigation and protected cultivation (Annexure-4.2.47)
F.6. Irrigation efficiencies with different methods (Annexure-4.2.48)

G. On-farm channel maintenance and regulation policies & issues
(Annexure-4.2.49)

H. Status of conjunctive use of water (Annexure-4.2.50)

I. History of floods/ droughts and other water related natural disasters(Annexure-4.2.51)

2. Statute / Law / Policy/ Regulations if any

- Regulation for groundwater use / recharge/ sustainable use
- Regulation for canal water distribution
- Energy subsidy for groundwater use
- Renewable energy policy for irrigation / agriculture
- Policies for promoting micro irrigation/ Enhancing water use efficiency
- National / State water policies
- Conjunctive storage in aquifers and rain water harvesting system
- Integrated river basin management (IRBM)
- Policy for de-pollution/ discharge of waste water to different water bodies
- Policies for resolving inter regional water conflicts within and neighboring states

3. Institutions Governing / Managing / Monitoring the natural resources and Institutional structure

- Command Area Development Authority (CADA)
- Water and Land Management Institute (WALMI)
- State level Nodal Agencies (SLNAs) for watersheds like Odisha Watershed Development Mission
- Agricultural Technology Management Agency (ATMA)
- CII-Triveni Water Institute
- River Basin Organization for keeping river basins and ground water aquifers in good ecological status and productivity

4. Areas of Peoples/ Private/PPP Participation if any

- Integrated Watershed Management Programme (IWMP)
- Participatory Irrigation Management (PIM)
- Water Users Associations (WUAs)
- Co-operative Groundwater Management (like Vaishali Area Small Farmers Association (VASFA) in Bihar)

5. Measurement, Monitoring and Data Constraints/ Management by State/ Regional Agencies

6. Performance Indicators

6.A. Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently in operation.

6. A.1. Crop productivity: (Rainfed ecosystem) (Annexure-4.2.52)
6.A.2. Crop productivity: (Irrigated ecosystem) (Annexure-4.2.53)
6.A.3. Water productivity: (Rainfed ecosystem) (Annexure-4.2.54I)
6.A.4 Water productivity : (Irrigated ecosystem) (Annexure-4.2.55)

6.B. Status of various performance indicators (Please refer to Annexure-4.2.56 for estimation procedure etc.)

Category of Indicators	**Indicator**	**Unit**	**Bench Mark**	**District.1**	**District.2**	**District.3**
Measurement	**Geo-tagging**					
	• % of canal outlets	%				
	• % of tank /pond	%				
	• % of dug well /bore well	%				
	• % of Govt. tube well	%				
	• % of Private tube well	%				

	• % of lift irrigation	%				
	Measuring devices (weir, flumes, V-notch, current meters etc.)					
	• % of canal outlet equipped with water measuring devices	%				
	• % of tank /pond equipped with water measuring devices	%				
	• % of dug well /bore well equipped with water measuring devices	%				
	• % of Govt. tubewell equipped with water measuring devices	%				
	• % of Private tubewell equipped with water measuring devices	%				
	• % change in net irrigated area (**Annexure 4.2.56-A**)	%				
	Permission / Sanction from Water Regulatory Authority					
	• % of authorized (designed) canal outlets	%				
	• % of Govt. tube well	%				
	• % of Private tube well	%				
Water Conservation	**Irrigation Command**					
	Dependability of water supply (in terms of duration) (**Annexure 4.2.56-B**)	Ratio				
	Dependability of water supply (in terms of irrigation interval) (**Annexure 4.2.56-C**)	Ratio				
	Irrigation ratio (**Annexure 4.2.56-D**)	Ratio				
	Irrigability index (**Annexure 4.2.56-E**)	Ratio				
	Rainfed Area /Watershed Management					
	Number of water harvesting structures constructed or rejuvenated as compared to the target (**Annexure 4.2.56-F**)	No				
	% of volume of rain water harvested *vis-a-vis* total volume of water harvested in all RWHs of the State (**Annexure 4.2.56-G**)	%				
	% of net cultivated area irrigated using harvested rainwater (**Annexure 4.2.56-H**)	%				
	% change in groundwater recharge (change in water table depth) during last 5 years (**Annexure 4.2.56-I**)	%				
	% of total blocks under safe limit in groundwater withdrawal (**Annexure 4.2.56-J**)	%				
Water Demand Management	**Both for irrigation commands and rainfed areas**					
	Cropping intensity (**Annexure 4.2.56-K**)	%				
	Cultivated land utilization index (CLUI) (**Annexure 4.2.56-L**)	Ratio				
	Annual relative water supply (ARWS) (**Annexure 4.2.56-M**)	Ratio				
	Irrigation commands					
	Annual relative irrigation supply (ARIS)	Ratio				

	(**Annexure 4.2.56-N**)					
	% of Irrigation Potential Utilized (IPU) as compared to Irrigation Potential Created (IPC) (**Annexure 4.2.56-O**)	%				
	% of area irrigated using canal water based pressurized irrigation systems [Diggie (secondary storage) with MI] (**Annexure 4.2.56-P**)	%				
	Percentage increased area under micro- irrigation (drip, sprinkler, micro-sprinkler) in different crops(**Annexure 4.2.56-Q**)					
	• Vegetable crops	%				
	• Fruit crops	%				
	• Sugarcane	%				
	• Cotton	%				
	• Wheat	%				
	• Maize	%				
	• Chilli	%				
	• Groundnut	%				
	• Pulses	%				
	• All crops	%				
Water economics	• Profitability of applied water (**Annexure 4.2.56-R**)	Ratio				
Water Productivity (**Annexure 4.2.56-S**)	WP of irrigated rice	kg/ha-mm				
	WP of rainfed Rice	kg/ha-mm				
	WP of irrigated Wheat	kg/ha-mm				
	WP of irrigated Maize	kg/ha-mm				
	WP of rainfed Maize	kg/ha-mm				
	WP of Sugarcane	kg/ha-mm				
	WP of irrigated Cotton	kg/ha-mm				
	WP of rainfed Cotton	kg/ha-mm				
	WP of Chilli	kg/ha-mm				
	WP of Pulses	kg/ha-mm				
	WP of Oilseeds	kg/ha-mm				
	WP of Vegetable crops	kg/ha-mm				
	WP of irrigated Potato	kg/ha-mm				
	WP of Fruit crops	kg/ha-mm				
	WP of Banana	kg/ha-mm				
	Conserved water productivity index (CWPI) (**Annexure 4.2.56-T**)	Ratio				
Environmental sustainability	Relative water table depth (**Annexure 4.2.56-U**)	Ratio				
	% of area under irrigation induced salinity/ water logging as compared to total cultivated area (**Annexure 4.2.56-V**)	%				
Water Quality	Relative EC ratio (**Annexure 4.2.56-W**)	Ratio				

	% of cropped area having higher threshold limit of arsenic (arsenic contaminated ground water) compared to total cultivated area (**Annexure 4.2.56-X**)	%				
Waste water management	% of total volume of waste water being used in irrigation (**Annexure 4.2.56-Y**)	%				
	% of area irrigated using waste water *vis a vis* potential area that can be irrigated using waste water (**Annexure 4.2.56-Z**)	%				
Participatory Water Management	No of Registered Water User Associations (WUAs) per unit of canal command area	No				
	No of Registered Ground Water management Committee (GWMC) per unit of tube well command	No				
	% of irrigated command areas having WUAs involved in the O&M of irrigation facilities (minors, distributaries and CAD&WM) (**Annexure 4.2.56-AA**)	%				
	% of irrigated command areas having GWMC involved in the O&M of irrigation facilities (**Annexure 4.2.56-BB**)	%				
	% of elected WUAs (**Annexure 4.2.56-CC**)	%				
	% of elected GWMCs (**Annexure 4.2.56-DD**)	%				
	% of total fees collected by WUAs/GWMCs used in O&M (**Annexure 4.2.56-EE**)	%				
	Capacity building of WUAs, GWMC (no of personnel trained)	No				
Participatory Watershed Management	% farmers involved in agro-forestry activities (**Annexure 4.2.56-FF**)					
	% of Fallow & Wasteland brought under Agriculture and horticulture (**Annexure 4.2.56-GG**)	%				
	No. of Watershed management Committee created	No				
	Watershed Development Fund created	Rs				
Others	% of area increased under commercial horticultural development in open field conditions and in protected cover *vis a vis* total area in the district (**Annexure 4.2.56-HH**)	%				
	% increase in export growth rate of fruit crops, vegetables and floriculture during last five years (**Annexure 4.2.56-II**)	**%**				

Annexures

Annexure – 4.2.1: Basic State agriculture statistics

Name of the state	
Location (latitude and longitude)	
Agro-climatic zone (s) (As per Planning Commission of India)	
Total Geographical area (reported area) (ha)	
Gross cultivable area (ha)	
Net cultivable area (ha)	
Cropping intensity (%)	
Mean annual rainfall (mm)	
Gross irrigated area (ha)	
Net irrigated area (ha)	
Irrigation Intensity* (%)	
Source wise irrigated area (ha)	
Reservoirs/ Canal	
Tanks/Ponds/Lakes	
Government tube wells/groundwater	
Lift irrigation	
Private Tube wells/groundwater	
Treated waste water	
Other sources	
Rainfed area (Directly harvested)	
Rainfed area (Useful Soil Moisture)	

*Intensity of irrigation is the percentage of net irrigated area to the net sown area.

Annexure- 4.2.2: Land use pattern (Basin/Sub-basin wise)

Net sown area (ha)	
Forest land (ha)	
Land put to non-agriculture use (ha)	
Land under waterlogged/marshy etc. (ha)	
Cultivable waste (ha)	
Current fallow (ha)	
Fallow other than current fallow (ha)	
Land under miscellaneous trees (ha)	
Permanent pastures and other grazing land (ha)	
Barren uncultivable land (ha)	
Others (ha)	
Total (ha)	

Annexure – 4.2.3: Major soil type (Basin/Sub-basin wise)

S. No.	**Major soil type**	**Area (ha)**	**Depth of Soil (m)**	**Depth to groundwater table (m)**

Annexure – 4.2.4: Area, production and productivity of RICE under rainfed and irrigated ecosystems

Name of ecosystem/planting method	**Irrigated area**			**Rainfed area**		
	Area (ha)	Production (t)	Productivity (t/ha)	Area (ha)	Production (t)	Productivity (t/ha)
1	2	3	4	5	6	7
Kharif Season						
Lowland						
Medium land						
Upland						

Waterlogged ecosystem						
Transplanted						
Direct sown						
Total rice (Low land+Medium land + Upland)						
Rabi season						
Lowland						
Medium land						
Upland						
Total rice (Lowland+Medium land +Upland)						
Summer season						
Lowland						
Medium land						
Upland						
Total rice (Lowland+Medium land +Upland)						
Boro season/any other season, if applicable						
Lowland						
Medium land						
Upland						
Total rice (Lowland+Medium land +Upland)						

Annexure – 4.2.5: Area, production and productivity of WHEAT under rainfed and irrigated ecosystems

Name of ecosystem/planting method	Irrigated area			Rainfed area		
	Area (ha)	Production (t)	Productivity (t/ha)	Area (ha)	Production (t)	Productivity (t/ha)
1	2	3	4	5	6	7
Rabi Season						
Lowland						
Medium land						
Upland						
Total wheat						

Annexure – 4.2.6: Area, production and productivity of MAIZE under rainfed and irrigated ecosystems.

Name of ecosystem/planting method	Irrigated area			Rainfed area		
	Area (ha)	Production (t)	Productivity (t/ha)	Area (ha)	Production (t)	Productivity (t/ha)
1	2	3	4	5	6	7
Kharif Season						
Lowland						
Medium land						
Upland						
Total maize						
Rabi season						
Lowland						
Medium land						
Upland						
Total maize						
Summer season						
Lowland						
Medium land						
Upland						
Total maize						

Annexure – 4.2.7: Area, production and productivity of SUGARCANE under rainfed and irrigated ecosystems

Name of ecosystem	**Irrigated area**		
	Area (ha)	Production (t)	Productivity (t/ha)
1	2	3	4
Subtropical areas			
Autumn			
Spring			
Summer			
Sugarcane Intercropping system			
Ratoon			
Sub Total			
Tropical areas			
Plant cane (seasonal)			
Plant cane (pre-seasonal)			
Plant cane (*Adsali*)			
Ratoon			
Sub Total			
Total			

Annexure – 4.2.8: Area, production and productivity of other cereals under rainfed and irrigated ecosystems

Name of field crop	**Irrigated area**			**Rainfed area**		
	Area (ha)	Production (t)	Productivity (t/ha)	Area (ha)	Production (t)	Productivity (t/ha)
1	2	3	4	5	6	7
Kharif Season (List the major crops of the state)						
Rabi season (List the major crops of the state)						
Summer season (List the major crops of the state)						
Total Other Cereal crops						

Annexure – 4.2.9: Area, production and productivity of PULSES under rainfed and irrigated ecosystems

Name of pulse crop	**Irrigated area**			**Rainfed area**		
	Area (ha)	Production (t)	Productivity (t/ha)	Area (ha)	Production (t)	Productivity (t/ha)
1	2	3	4	5	6	7
Kharif Season						
Rabi season						

Summer season						
Total pulses						

Annexure – 4.2.10: Area, production and productivity of FOOD GRAINS under rainfed and irrigated ecosystems.

Total food grain	**Irrigated area**			**Rainfed area**		
	Area (ha)	Production (t)	Productivity (t/ha)	Area (ha)	Production (t)	Productivity (t/ha)
1	2	3	4	5	6	7
Kharif season						
Rabi season						
Summer season						
Total food grain						

Annexure – 4.2.11: Area, production and productivity of OILSEEDS under rainfed and irrigated ecosystems

Name of oilseed crop	**Irrigated area**			**Rainfed area**		
	Area (ha)	**Production (t)**	**Productivity (t/ha)**	**Area (ha)**	**Production (t)**	**Productivity (t/ha)**
1	**2**	**3**	**4**	**5**	**6**	**7**
Kharif Season						
Rabi season						
Summer season						
Total oilseeds						

Annexure – 4.2.12: Area, production and productivity of FIBRE CROPS (other than cotton) under rainfed and irrigated ecosystems

Name of Fibre crop	**Irrigated area**			**Rainfed area**		
	Area (ha)	**Production (t)**	**Productivity (t/ha)**	**Area (ha)**	**Production (t)**	**Productivity (t/ha)**
1	**2**	**3**	**4**	**5**	**6**	**7**
Kharif Season						
Rabi season						

Summer season						
Total fibre crops						

Annexure – 4.2.13: Area, production and productivity of COTTON under rainfed and irrigated ecosystems

Season	**Irrigated area**			**Rainfed area**		
	Area (ha)	**Production (t)**	**Productivity (t/ha)**	**Area (ha)**	**Production (t)**	**Productivity (t/ha)**
1	**2**	**3**	**4**	**5**	**6**	**7**
Kharif Season						
Rabi season						
Summer season						
Total cotton						

Annexure – 4.2.14: Area, production and productivity of TOBACCO under rainfed and irrigated ecosystems.

Season	**Irrigated area**			**Rainfed area**		
	Area (ha)	**Production (t)**	**Productivity (t/ha)**	**Area (ha)**	**Production (t)**	**Productivity (t/ha)**
1	**2**	**3**	**4**	**5**	**6**	**7**
Kharif Season						
Rabi season						
Summer season						
Total tobacco						

Annexure – 4.2.15: Area, production and productivity of CHILLI under rainfed and irrigated ecosystems

Season	**Irrigated area**			**Rainfed area**		
	Area (ha)	**Production (t)**	**Productivity (t/ha)**	**Area (ha)**	**Production (t)**	**Productivity (t/ha)**
1	**2**	**3**	**4**	**5**	**6**	**7**
Kharif Season						
Rabi season						
Summer season						
Total chilli						

Annexure-4.2.16: Area, production and productivity of FORAGE CROPS under rainfed and irrigated ecosystems

Name of forage crop	**Irrigated area**			**Rainfed area**		
	Area (ha)	Production (t)	Productivity (t/ha)	Area (ha)	Production (t)	Productivity (t/ha)
1	2	3	4	5	6	7
(List major forage crops of the state)						
Berseem						
Lucerne						
Oat						
Sorghum single cut						
Sorghum multi-cut						
Cowpea						
Maize						
Bajra single cut						
Bajra multi-cut						
Hybrid Napier						
Guinea grass						

Pasture land						
Fodder Trees						
Other						
Total forage crops						

Annexure – 4.2.17: Area, production and productivity of FRUIT CROPS under rainfed and irrigated ecosystems.

Name of fruit crop	**Irrigated area**			**Rainfed area**		
	Area (ha)	**Production (t)**	**Productivity (t/ha)**	**Area (ha)**	**Production (t)**	**Productivity (t/ha)**
1	**2**	**3**	**4**	**5**	**6**	**7**
(List major fruit crops of the state)						
Other						
Total Fruit crops						

Annexure – 4.2.18: Area, production and productivity of VEGETABLE CROPS (including potato) under rainfed and irrigated ecosystems.

Name of vegetable crop	**Irrigated area**			**Rainfed area**		
	Area (ha)	Production (t)	Productivity (t/ha)	Area (ha)	Production (t)	Productivity (t/ha)
1	2	3	4	5	6	7
Kharif						
(List major vegetable crops of the state)						
Rabi						
(List major vegetable crops of the state)						
Zaid (summer)						
(List major vegetable crops of the state)						
Other crops						
Total Vegetables						

Annexure – 4.2.19: Area, production and productivity of FLOWER CROPS under rainfed and irrigated ecosystems

Name of flower crop	**Irrigated area**			**Rainfed area**		
	Area (ha)	**Production (t)**	**Productivity (t/ha)**	**Area (ha)**	**Production (t)**	**Productivity (t/ha)**
1	**2**	**3**	**4**	**5**	**6**	**7**
(List major flower crops of the state)						
Other crop						
Total Flower crops						

Annexure – 4.2.20: Area, production and productivity of PLANTATION CROPS under rainfed and irrigated ecosystems

Name of plantation crop	**Irrigated area**			**Rainfed area**		
	Area (ha)	**Production (t)**	**Productivity (t/ha)**	**Area (ha)**	**Production (t)**	**Productivity (t/ha)**
1	**2**	**3**	**4**	**5**	**6**	**7**
(List major plantation crops of the state)						
Other crops						
Total plantation crops						

Annexure – 4.2.21: Area, production and productivity of SPICES and CONDIMENTS under rainfed and irrigated ecosystems

Name of spices / condiments crop	**Irrigated area**			**Rainfed area**		
	Area (ha)	Production (t)	Productivity (t/ha)	Area (ha)	Production (t)	Productivity (t/ha)
1	2	3	4	5	6	7
(List the major spices and condiments of the state)						
Total spices and condiments						

Annexure-4.2.22: Area, production and productivity of MEDICINAL and AROMATIC PLANTS under rainfed and irrigated ecosystems

Name of medicinal and aromatic plants	**Irrigated area**			**Rainfed area**		
	Area (ha)	Production (t)	Productivity (t/ha)	Area (ha)	Production (t)	Productivity (t/ha)
1	2	3	4	5	6	7
(List the major medicinal and aromatic plants of the state)						
Total medicinal and aromatic plants						

Annexure-4.2.23: Area under OTHER USES- Barren land/ Water bogs, Avenues, Play field and Parks, Common land, Wastelands etc.

Name of crop habitat	Area (ha)
Barren land	
Water bogs/wet lands	
Avenue plantation	
Play fields and parks	
Common land	
Any other habitat	
Total area	

Annexure-4.2.24:Area, production and productivity of crops under PROTECTED CULTIVATION (Greenhouse/ Net house/Shade house) and NURSERY

Name of crop	**Area (ha)**	**Production (t)**	**Productivity (t/ha)**
1	2	3	4

Nursery			
• Govt.			
• Private			
Total			

Annexure – 4.2.25: Water requirement and water productivity of RICE

Name of ecosystem/ planting method	**Crop water requirement (mm)/Actual ET (mm)***	**Cultivated area (ha)**	**Total crop water requirement (ha-mm)**	**Effective Rainfall (mm)**	**Irrigation water Requirement (ha mm)**	**Yield (kg/ha)**	**Water Productivity (kg/ha-mm)**
1	2	3	4 (2*3)	5	6 (4-5)	7	8 (7/4)
Kharif							
Lowland							
Medium land							
Upland							
Waterlogged ecosystem							
Transplanted							
Direct sown							
Total rice							
Rabi							
Lowland							
Medium land							
Upland							
Total rice							
Summer season							
Lowland							
Medium land							
Upland							
Total rice							
Total annual water requirement of rice (ha-mm)							

*FAO-56

Annexure – 4.2.26: Water requirement and water productivity of WHEAT

Name of ecosystem	Crop water requirement (mm)/ Actual ET (mm)*	Cultivated area (ha)	Total crop water requirement (ha-mm)	Effective Rainfall (mm)	Irrigation water Requirement (ha-mm)	Yield (kg/ha)	Water Productivity (kg/ha-mm)
1	2	3	4 (2*3)	5	6 (4-5)	7	8 (7/4)
Irrigated							
Rainfed							
Total Annual water requirement of wheat (ha-mm)							

Annexure – 4.2.27: Water requirement and water productivity of SUGARCANE

Season	Crop water requirement (mm)/Actual ET (mm)*	Cultivated area (ha)	Total crop water requirement (ha-mm)	Effective Rainfall (mm)	Irrigation water Requirement (ha-mm)	Yield (kg/ha)	Water Productivity (kg/ha-mm)
1	**2**	**3**	**4 (2*3)**	**5**	**6 (4-5)**	**7**	**8 (7/4)**
Subtropical India							
Autumn							
Spring							
Summer							
Sugarcane Intercropping system							
Ratoon							
Sub Total							
Tropical India							
Plant cane (seasonal)							
Plant cane (pre-seasonal)							
Plant cane (Adsali)							
Ratoon							
Sub Total							
Total Annual water requirement of sugarcane							

Annexure-4.2.28: Water requirement and water productivity of FORAGE CROPS

Crop	Crop water requirement (mm)/Actual ET (mm)*	Cultivated area (ha)	Total crop water requirement (ha-mm)	Effective Rainfall (mm)	Irrigation water Requirement (ha-mm)	Yield (kg/ha)	Water Productivity (kg/ha-mm)
1	2	3	4 (2*3)	5	6 (4-5)	7	8 (7/4)
(List the major forage crops of the state)							
Berseem							
Lucerne							
Oat							
Sorghum single cut							
Sorghum multi-cut							
Cowpea							
Maize							
Bajra single cut							
Bajra multi-cut							
Hybrid Napier							
Guinea grass							
Pasture land							
Fodder Trees							
Others							
Annual water requirement (ha-mm)							

Annexure – 4.2.29: Water requirement and water productivity of OTHER FIELD CROPS

Crop	Crop water requirement (mm)/Actual ET (mm)*	Cultivated area (ha)	Total crop water requirement (ha-mm)	Effective Rainfall (mm)	Irrigation water Requirement (ha-mm)	Yield (kg/ha)	Water Productivity (kg/ha-mm)
1	2	3	4 (2*3)	5	6 (4-5)	7	8 (7/4)
Kharif Season (List the major crops of the state)							

Rabi season (List the major crops of the state)							
Summer season (List the major crops of the state)							
Annual water requirement of other cereals (ha-mm)							

*FAO-56

Annexure – 4.2.30: Water requirement and water productivity of ALL FIELD CROPS

Crop	Crop water requirement (mm)/Actual ET (mm)*	Cultivated area (ha)	Total crop water requirement (ha-mm)	Effective Rainfall (mm)	Irrigation water Requirement (ha-mm)	Yield (kg/ha)	Water Productivity (kg/ha-mm)
1	2	3	4 (2*3)	5	6 (4-5)	7	8 (7/4)
Kharif Season							
Irrigated							
Rainfed							
Total kharif water requirement of cereals (ha-mm)							
Rabi season							
Irrigated							
Rainfed							
Total Rabi water requirement of cereals (ha-mm)							
Summer season							
Irrigated							
Rainfed							

Total summer water requirement of cereals(ha-mm)							
Total annual water requirement of total field crops (ha-mm)							

*FAO-56

Annexure – 4.2.31: Water requirement and water productivity of FRUIT CROPS

Crop	**Crop water requirement (mm)/Actual ET (mm)***	**Cultivated area (ha)**	**Total crop water requirement (ha-mm)**	**Effective Rainfall (mm)**	**Irrigation water Requirement (ha-mm)**	**Yield (kg/ha)**	**Water Productivity (kg/ha-mm)**
1	2	3	4 (2*3)	5	6 (4-5)	7	8 (7/4)
(List the major fruit crops of the state)							
Annual water requirement (ha-mm)							

Annexure – 4.2.32: Water requirement and water productivity of VEGETABLE CROPS

Crop	**Crop water requirement (mm)/Actual ET (mm)***	**Cultivated area (ha)**	**Total crop water requirement (ha-mm)**	**Effective Rainfall (mm)**	**Irrigation water Requirement (ha-mm)**	**Yield (kg/ha)**	**Water Productivity (kg/ha-mm)**
1	2	3	4 (2*3)	5	6 (4-5)	7	8 (7/4)
Kharif Season (List the major vegetable crops of the state)							
Rabi season (List the major vegetable crops of the state)							

Summer season (List the major vegetable crops of the state)							
Annual water requirement (ha-mm)							

Annexure – 4.2.33: Water requirement and water productivity of FLOWER CROPS

Crop	**Crop water requirement (mm)/Actual ET (mm)***	**Cultivated area (ha)**	**Total crop water requirement (ha-mm)**	**Effective Rainfall (mm)**	**Irrigation water Requirement (ha-mm)**	**Yield (kg/ha)**	**Water Productivity (kg/ha-mm)**
1	2	3	4 (2*3)	5	6 (4-5)	7	8 (7/4)
(List the major flower crops of the state)							
Annual water requirement (ha-mm)							

Annexure – 4.2.34: Water requirement and water productivity of PLANTATION CROPS

Crop	**Crop water requirement (mm)/Actual ET (mm)***	**Cultivated area (ha)**	**Total crop water requirement (ha-mm)**	**Effective Rainfall (mm)**	**Irrigation water Requirement (ha-mm)**	**Yield (kg/ha)**	**Water Productivity (kg/ha-mm)**
1	2	3	4(2*3)	5	6(4-5)	7	8(7/4)
(List the major plantation crops of the state)							

Annual water requirement (ha-mm)							

4.2.35: Water requirement and water productivity of SPICES and CONDIMENTS

Crop	**Crop water requirement (mm)/Actual ET (mm)***	**Cultivated area (ha)**	**Total crop water requirement (ha-mm)**	**Effective Rainfall (mm)**	**Irrigation water Requirement (ha-mm)**	**Yield (kg/ha)**	**Water Productivity (kg/ha-mm)**
1	2	3	4 (2*3)	5	6 (4-5)	7	8 (7/4)
(List the major spices and condiments of the state)							
Annual water requirement (ha-mm)							

Annexure-4.2.36: Water requirement and water productivity of MEDICINAL and AROMATIC PLANTS

Crop	**Crop water requirement (mm)/Actual ET (mm)***	**Cultivated area (ha)**	**Total crop water requirement (ha-mm)**	**Effective Rainfall (mm)**	**Irrigation water Requirement (ha-mm)**	**Yield (kg/ha)**	**Water Productivity (kg/ ha-mm)**
1	2	3	4 (2*3)	5	6 (4-5)	7	8 (7/4)
(List the major medicinal and aromatic plants of the state)							
Annual water requirement (ha-mm)							

Annexure-4.2.37: Water requirement and water productivity of crops grown under PROTECTED CULTIVATION (Greenhouse/ Net house/Shade house) and NURSERY

Crop	Crop water requirement (mm)/ Actual ET (mm)*	Cultivated area (ha)	Total crop water requirement (ha-mm)	Irrigation water Requirement (ha-mm)	Yield (kg/ha)	Water Productivity (kg/ ha-mm)
1	2	3	4 (2*3)	5	6	7 (6/4)
Nursery						
Annual water requirement (ha-mm)						

Annexure-4.2.38: water requirement of crops under other uses- barren land/ water bogs, avenues, play field and parks, common land etc.)

Crop	Water requirement (mm)	Area (ha)	Total crop water requirement (ha-mm)
1	2	3	4(2*3)
Barren land			
Water bogs/wetlands			
Avenue plantation			
Play fields and parks			
Common land			
Any other habitat			
Annual water requirement (ha-mm)			

Annexure-4.2.39: Analysis of past trend of crop area

Crop	Cultivated Area (ha)				Decadal Growth rate in cultivated area (%)		
	1985-86	1995-96	2005-06	Existing (2015-16)	1986-1995	1996-2005	2006-2015
1	2	3	4	5	6 ((3-2)/2)*100	7 ((4-3)/3)*100	8 ((5-4)/4)*100

Annexure-4.2.40: Analysis of past trend of crop water demand

Crop	Crop water demand# (Million cubic meters)$				Decadal Growth rate in crop water demand (%)		
	1985-86	1995-96	2005-06	Existing (2015-16)	1986-1995	1996-2005	2006-2015
1	2	3	4	5	6	7	8

					((3-2)/2)*100	((4-3)/3)*100	((5-4)/4)*100

#The crop water demand will be estimated for each crop / crop group by multiplying the cultivated area and crop water requirement (to be computed from the sum of the total crop requirement values (column 4) from Annexure-4.2-XXIII to Annexure-4.2-XXXVIII).
$ 1 Million Cubic Meter = 100 ha-meter = 100000 ha-mm

Annexure-4.2.41: Analysis of present and projected agricultural water demand based on annual growth rate of past 10 years

Season	Existing crop water demand (MCM)	Projected crop water demand (MCM)			
		2020	2030	2040	2050
1	2	3 (Col.2*1.098)	4 (Col.2*1.294)	5 (Col.2*1.49)	6 (Col.2*1.686)

Reference year for existing crop water demand is 2015-16 (The cumulative growth rate of crop water demand is taken as 9.8%, 29.4%, 49% and 68.6% for 2015-2020, 2015-2030, 2015-2040 and 2015-2050 respectively; Source : Central Water Commission (BP Directorate) - Report of the Standing Sub-Committee for Assessment of availability and requirement of water for Diverse Uses in the Country August, 2000).

Annexure-4.2.42: Irrigation water demand and availability at critical crop growth stages for different crops

Crop	Critical stages*	Crop water requirement at critical stage (mm)	Area (ha)	Total water requirement (MCM#)	Total irrigation water requirement (MCM)	Total irrigation water availability (MCM)
1	2	3	4	5	6	7
Rice	Tillering					
	Panicle initiation					
	Heading					
	Flowering					
Wheat	Crown root initiation					
	Late tillering					
	Jointing					
	Booting					
	Flowering					
Maize	Knee high stage					
	Silking					
	Tasseling to dough stage					
Gram	Pre-flowering					
	Pod filling					
Arhar	Flower initiation					
	Pod filling					
Groundnut	Flowering					
	Peg formation					
	Pod development					
Sugarcane	Formative stage					
	Grand growth period					
	Maturity stage					
	Sprout initiation (ratoon crop)					
Cotton	Square formation					
	Flowering					
	Boll formation					
Potato	Stolon formation					
	Tuber initiation to maturity					
Tomato	Flowering					
	Fruit setting					
Citrus	Flowering					

	Fruit setting					
	Fruit enlargement					

*FAO-24; #Million Cubic Meter [1 Million Cubic Meter = 100 ha-meter = 100000 ha-mm]

Annexure-4.2.43: Status of season wise water availability from different sources (BCM)

Source	Kharif	Rabi	Summer	Total
1	2	3	4	1+2+3
1. Rainwater				
i) Harvested rainwater (inbunded paddy fields etc)				
ii) Available soil moisture				
2. Surface Water				
i) Canal(Major & Medium Irrigation projects)				
ii) Minor Irrigation projects				
iii) Lift Irrigation/Diversion				
iv) Pond/tanks				
v) Lakes				
vi) Glaciers				
vii) Springs				
viii) Wetlands and other water bodies				
3. Wastewater				
i) Treated Effluent Received from STP				
ii) Untreated Effluent				
4. Water from Desalination				
5. **Inter-basin transfer of water**				
6. Ground Water				
i) Dug well				
ii) Shallow tubewell				
iii) Deep tubewell				

Source: CWC & Minor irrigation.

Annexure-4.2.44: Status of crop wise water Availability from different sources (BCM)

Source	**Agricultural crops**					**Horticultural crops**		Forage Crops	Total
	Rice	Wheat	Sugarcane	Cotton	All other crops	Banana	All Other Horti Crops		
	1	2	3	4	5	6	7	8	1+2+3+..+8
1. Rainwater									
i) Harvested rainwater (in paddy fields etc)									
ii) Soil moisture									
2. Surface Water									
i) Canal(Major & Medium Irrigation projects)									
ii) Minor Irrigation projects									
iii) Lift Irrigation/Diversion									
iv) Pond/tanks									
v) Lakes									
vi) Glaciers									
vii) Springs									
viii) Wetlands and other water bodies									
3. Wastewater									

i) Treated effluent from STP									
ii) Untreated effluent									
4. Water from Desalination									
5. Inter-basin transfer of water									
6. Groundwater									
i) Dug well									
ii) Shallow tubewell									
iii) Deep tubewell									

Annexure-4.2.45: Status of groundwater availability

Name of the State:							
Name of the District:							
Name of the Block/ Unit	Critical (Yes/No)	Semi critical (Yes/No)	Safe (Yes/No)	Depth to Water Table (m)	Draft	Recharge	Gap
1	2	3	4	5	6	7	8

Source: CGWB

Annexure-4.2.46: Season wise methods of irrigation

Method	**Area (ha)**			
	Kharif	**Rabi**	**Summer/ Zaid**	**Total**
1	2	3	4	5
Surface/ Flooding : • Border/ check basin • Furrow				
Piped irrigation				
Drip including Irrigation under protected cultivation				
Sprinkler/ Micro-sprinkler including Irrigation under protected cultivation				

Annexure-4.2.47: Area under micro-irrigation, protected cultivation, nursery etc.

Crop	**Area (ha)**				
	Drip	**Sprinkler**	**Protected cultivation**	**Protected + Drip**	**Nursery**
1	2	3	4	5	6

Annexure-4.2.48: Irrigation efficiencies with different methods

Conveyance efficiency (%)		**Application efficiency (%)**	
Field channel (Unlined)		Surface / flooding	
Field channel (Lined)		Drip	
Piped network		Sprinkler	

Annexure-4.2.49: On-farm Channel Maintenance and Regulation Policies & Issues

Particulars	**Values**	**Issues**
1	2	3
Total length of field channel network (m)		
Length of lined channel (m)		
Length of unlined channel (m)		
Status of channel lining(Very poor; Poor, Medium; Good, Very Good)		
Existing policies of water distribution (Warabandhi etc.)		
Involvement of WUA / PIM		

Annexure-4.2.50: Status of conjunctive use of water (Area in ha)

Districts	Season	Existing status of conjunctive use of water (Area in ha)#							
		Surface water + groundwater		Surface water + harvested rain water		Surface water + poor quality water		Others	
		Potential	Actual	Potential	Actual	Potential	Actual	Potential	Actual
1	2	3	4	5	6	7	8	9	10
District 1	Kharif								
	Rabi								
District 2	Kharif								
	Rabi								
District 3	Kharif								
	Rabi								
District 4	Kharif								
	Rabi								
District 5	Kharif								
	Rabi								

#Source of information: Ministry of Water Resources, Government of India, Dept. of water Resources of each State Government, Central Ground Water Board and State Ground Water Boards etc.

Annexure-4.2.51: History of floods/ droughts and other water related natural disasters in the past one decade

Year	History of natural disasters experienced during past one decade					
	Flood		Drought		Other natural disasters	
	Number of events	Affected area (ha)	Number of events	Affected area (ha)	Number of events	Affected area (ha)
2016						
2015						
2014						
2013						
2012						
2011						
2010						
2009						
2008						
2007						

Annexure-4.2.52: Analysis of Crop Productivity (Rainfed ecosystem)

Season / crops	Average yield of state (t/ha)	National average (t/ha)	Attainable yield (t/ha)	% deviation from national yield	% deviation from attainable yield
1	2	3	4	5	6
Kharif crops	(List major grown field crops including forage crops)				

Rabi crops	(List major grown field crops including forage crops)				
Zaid/Summer crops	(List major grown field crops including forage crops)				
Perennial forage crops	(List major grown forage crops)				
Horticultural Crops					
(List 5 major Fruit and Plantation crops)					
(List 5 major Vegetable & Tuber crops)					
(List 5 major Miscellaneous Horticultural crops)					

Annexure-4.2.53: Analysis of Crop Productivity (Irrigated ecosystem)

Season / crops	Average yield of state (t/ha)	National average (t/ha)	Attainable yield (t/ha)	% deviation from national yield	% deviation from attainable yield
1	2	3	4	5	6
Kharif crops	(List major grown field crops including forage crops)				
Rabi crops	(List major grown field crops including forage crops)				
Zaid/Summer crops	(List major grown field crops) including forage crops				
Perennial forage crops	(List major grown forage crops)				
Horticultural Crops					
(List 5 major Fruit and Plantation crops)					

(List 5 major Vegetable & Tuber crops)					
(List 5 major Miscellaneous Horticultural crops)					

Annexure-4.2.54: Analysis of Water Productivity (Rainfed ecosystem)

Season / crops	Existing water productivity kg/ha-mm)	National average water productivity (kg/ha-mm)	% deviation from national water productivity (kg/ha-mm)
1	2	3	4 (Col.3-Col.2)
Kharif crops (List major grown field crops including forage crops)			
Rabi crops (List major grown field crops including forage crops)			
Summer crops (List major grown field crops including forage crops)			
Perennial forage crops (List major grown forage crops)			
Horticultural crops (List major grown crops)			

Annexure-4.2.5: Analysis of Water Productivity (Irrigated ecosystem)

Season / crops	Existing water productivity kg/ha-mm)	National average water productivity (kg/ha-mm)	% deviation from national water productivity (kg/ha-mm)
1	2	3	4 (Col.3-Col.2)
Kharif crops (List major grown field crops including forage crops)			
Rabi crops (List major grown field crops including forage crops)			
Summer crops (List major grown field crops including forage crops)			
Perennial forage crops (List major grown field crops including forage crops)			
Horticultural crops (List major grown crops)			

Source: AWP from FAO

Annexure-4.2.56: Procedure for estimation of various performance indicators

A. Change in net irrigated area (District wise)

$$\mathit{Change\ in\ net\ irrigated\ area}\ (\%) = \frac{(\mathit{Net\ irrigated\ area\ as\ on}\ 31.3.2017 - \mathit{Net\ Irrigated\ area\ as\ on}\ 31.3.2016) * 100}{\mathit{Net\ Irrigated\ area\ as\ on}\ 31.3.2016}$$

B. Dependability of Duration (irrigation command)

$$\text{Dependability of duration} = \frac{\mathit{Actual\ duration\ of\ water\ delivery}}{\mathit{Intended\ duration\ of\ water\ delivery}}$$

C. Dependability of irrigation interval (irrigation command wise)

$$\text{Dependability of irrigation interval} = \frac{\mathit{Actual\ irrigation\ interval}}{\mathit{Intended\ irrigation\ interval}}$$

D. Irrigation ratio (District wise)

$$\text{Irrigation ratio} = \frac{\mathit{Irrigated\ land}}{\mathit{Irrigable\ land}}$$

E. Irrigability index (District wise)

Irrigability index is a ratio of additional gross irrigated area and net incremental irrigated area. Gross irrigated area can be estimated by adding the net incremental irrigated area as many times as it was irrigated.

$$\text{Irrigability Index} = \frac{\mathit{Additional\ gross\ irrigated\ area}}{\mathit{Net\ incremental\ irrigated\ area}}$$

F. Percentage of number of water harvesting structures constructed or rejuvenated as compared to the target (sanctioned projects under IWMP, RKVY, MGNREGS and other schemes)(District wise)

Name of district	Water harvesting structures constructed or rejuvenated during last one year (nos)	Water harvesting structures targeted during corresponding year (nos)	% of number of water harvesting structures constructed or rejuvenated as compared to the target
1	2	3	4 (Col.2/Col.3)*100
Dist.1			
Dist.2			
Dist.3			
Dist n			

G. Percentage of volume of rain water harvested vis a vis total volume of water harvested in all RWHs of the district(District wise)

Name of district	Volume of rain water harvested during last one year	Total volume of water harvested in all RWHs of the district	Percentage of volume of rain water harvested vis a vis total volume of water harvested in all RWHs of the district
1	2	3	4 (Col.2/Col.3)*100
Dist.1			
Dist.2			
Dist.3			
Dist n			

H. Percentage of net cultivated area irrigated using harvested rainwater (District wise)

Name of district	Net cultivated area (ha)	Area irrigated using harvested rain water	Volume of harvested rain water utilized for irrigation	Volume of rain water harvested during last one year	% of net cultivated area irrigated using harvested rain water	% volume of harvested rain water used for irrigation
1	2	3	4	5	6 (Col.3/ Col.2)*100	7 (Col.4/ Col.5)*100
Dist.1						
Dist.2						
Dist.3						
Dist n						

I. Percentage change in groundwater recharge in water table (change in water table depth) during last 5 years(District wise)

Name of district	Water table depth as on March 2012 (m)	Water table depth as on March 2017 (m)	Change in water depth during last five years (m)	Percentage change in groundwater recharge in water table (change in water table depth) during last 5 years
1	2	3	4 (Col.2-Col.3)	5 (Col.4/Col.2)*100
Dist.1				
Dist.2				
Dist.3				
Dist n				

J. Percentage of total blocks under safe limit in groundwater exploitation status(District wise)

Name of district	Total number of blocks under safe limit	Total number of blocks in the district	Percentage of total blocks under safe limit in groundwater exploitation status
1	2	3	4 (Col.2/Col.3)*100
Dist.1			
Dist.2			
Dist.3			
Dist n			

K. Cropping intensity (District wise)

Name of the district	Gross cropped area (ha)	Net cropped area (ha)	Cropping intensity (%)
1	2	3	4 ((2/3)*100)
Dist.1			
Dist.2			
Dist.3			
Dist n			

L. Cultivated land utilization index (CLUI)(District wise)

S.No.	Name of crop	Duration of crop (di) (365 days for perennials)	Area occupied by each crop (ai)	ai*di
1	2	3	4	5
List all the crops including plantation and fruit crops				
1				

2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
13				
14				
15(if n=15)				
$\sum_{i=1}^{n} a_i\, d_i$				
$CLUI = \frac{\sum_{i=1}^{n} a_i\, d_i}{A*365}$ Where, i = 1,2,3…..n; n = total number of crops; ai = area occupied by the ith crop; di = days that the ith crop occupies; A = total cultivated land area available for 365 days.				

M. Relative water supply (irrigation command)

The relative water supply relates the water made available for crops, including surface irrigation, groundwater pumped and rainfall, to the amount crops need. This indicator provides information about the relative abundance or scarcity of water. It is estimated as follows:

$$Realtive\ water\ supply = \frac{Total\ \ water\ supply}{Crop\ demand}$$

N. Relative irrigation supply (irrigation command)

The relative irrigation supply indicates how well irrigation supply and demand are matched. A value of >1 would suggest too much water is being supplied, possibly causing waterlogging and negatively impacting yields; a value less than one indicates that crops aren't getting enough water

$$Realtive\ irrigation\ supply = \frac{Irrigation\ supply}{Irrigation\ \ demand}$$

Where, irrigation supply includes only surface diversions and pumped groundwater. Irrigation supply includes only surface diversions and pumped groundwater.

O. Percentage of Irrigation Potential Utilized (IPU) to Irrigation Potential Created (IPC)(District wise)

Name of district	Irrigation Potential Utilized (IPU)	Irrigation Potential Created (IPC)	Percentage of Irrigation Potential Utilized (IPU) to Irrigation Potential Created (IPC)
1	2	3	4 (Col.2/Col.3)*100
Dist.1			
Dist.2			
Dist.3			
Dist n			

P. Percentage of area irrigated using canal water based pressurized irrigation systems [Diggie (secondary storage) with MI]

Name of district	Irrigated area using canal water based pressurized irrigation system (ha)	Gross irrigated area (ha)	Percentage of GIA irrigated using canal water based pressurized irrigation systems
1	2	3	4 (Col.2/Col.3)*100
Dist.1			
Dist.2			
Dist.3			
Dist n			

Q. Percentage increase in micro irrigation in different crops during last five years (District wise)

Dist	Area under micro irrigation in different crops (ha)		Increased area under micro irrigation in horticultural crops in last five years	
	2011	2016	Area (ha)	(%)
	1	2	3 (Col.2-Col.1)	4 (Col.3/Col.1)*100
To be computed separately for each crop (Sugarcane, wheat, maize, Cotton, Chilli, Groundnut, Pulses, Fruit crops, Vegetable crops and total crops)				
Dist.1				
Dist.2				
Dist.3				
Dist n				

R. Profitability of applied water(District wise)

$$Profitability\ of\ applied\ water = \frac{Value\ of\ crop\ produce\ with\ irrigation - Value\ of\ crop\ produce\ without\ irrigation}{Cost\ of\ applied\ water}$$

S. Water productivity of crops (Irrigated rice, rainfed rice, irrigated wheat, maize, sugarcane, irrigated and rainfed cotton, chilli, pulses, oil seeds, vegetables, potato, fruits, banana etc.) (to be computed for each crop) (District wise)

Name of district	Productivity of crop (kg/ha)	Water used (crop) (mm)	Water Productivity (kg/ha-mm)
1	2	3	4 (Col.2/Col.3)
Dist.1			
Dist.2			
Dist.3			
Dist n			

T. Conserved water productivity index (CWPI) (District wise)

CWPI is the ratio of sum of average equivalent yields per unit of conserved water utilized by crops that were irrigated in terms of targeted production. The value of the index can vary from 0 to 1, and a higher value will indicate achievement closer to the targeted production.

$$CWPI = \frac{Average\ prodction\ achieved\ (eq.yield\ per\ unit\ of\ water)}{Production\ targeted\ (equivalent\ yield\ per\ unit\ of\ water)}$$

U. Relative water table depth (District wise)

$$Realtive\ watertable\ depth = \frac{Actual\ watertable\ depth\ (m)}{Critical\ watertable\ depth\ (m)}$$

For waterlogging and salinity, critical water table depth depends on effective rooting depth of the crop, irrigation efficiency and soil characteristics. In case of groundwater mining, critical depth depends on cost of pumping, value of irrigated crop and depth of the aquifer.

V. Percentage of area under irrigation induced salinity/waterlogging as compared to total cultivated area (District wise)

Name of district	Area under irrigation induced salinity/ waterlogging (ha)	Total cultivated area (ha)	Percentage of area under irrigation induced salinity/ water logging as compared to total cultivated area
1	2	3	4 (Col.2/Col.3)*100
Dist.1			
Dist.2			
Dist.3			
Dist n			

W. Relative EC ratio (district sub basin wise)

$$\text{Relative EC ratio} = \frac{Actual\ EC\ value}{Critical\ EC\ value}$$

The critical EC value depends on the salt tolerance of crops.

X. Percentage of cropped area having higher threshold limit of arsenic (arsenic contaminated ground water) compared to total cultivated area (District wise)

Name of district	Cropped area irrigated using irrigation water having higher threshold limit of arsenic (arsenic contaminated groundwater) (ha)	Total cultivated area (ha)	Percentage of cropped area having higher threshold limit of arsenic (arsenic contaminated ground water) compared to total cultivated area
1	2	3	4 (Col.2/Col.3)*100
Dist.1			
Dist.2			
Dist.3			
Dist n			

Y. Percentage of total volume of waste water being used in irrigation (District wise)

Name of district	Volume of waste water harvested during last one year	Volume of waste water utilized for irrigation	Net cultivated area (ha) irrigated using harvested waste water	% of net cultivated area (ha) irrigated using harvested waste water	% of volume of waste water being used in irrigation
1	2	3	4	5 (4/NCA)*100	6 (Col.3/ Col.2) *100
Dist.1					
Dist.2					
Dist.3					
Dist n					

Z. Percentage of area irrigated using waste water *vis a vis* potential area that can be irrigated using waste water

Name of district	Net cultivated area (ha) using waste water during last one year	Potential area (ha) that can be irrigated using waste water	% of area irrigated using waste water *vis a vis* potential area that can be irrigated using waste water
1	2	3	5 (Col.2/Col.3)*100
Dist.1			
Dist.2			
Dist.3			
Dist n			

AA. Percentage of irrigated command areas having Water User Associations (WUAs) involved in the O&M of irrigation facilities (minor distributaries and CAD&WM) (District wise)

Name of district	Irrigated command areas having WUAs involved in the O&M of irrigation facilities (ha)	Total irrigated command areas (ha)	Percentage of irrigated command areas having Water User Associations (WUAs) involved in the O&M of irrigation facilities
1	2	3	4 (Col.2/Col.3)*100
Dist.1			
Dist.2			
Dist.3			
Dist n			

BB. Percentage of irrigated command areas having GWMC involved in the O&M of irrigation facilities(District wise)

Name of district	Irrigated command areas having GWMC involved in the O&M of irrigation facilities (ha)	Total irrigated command areas (ha)	Percentage of irrigated command areas having GWMC involved in the O&M of irrigation facilities
1	2	3	4 (Col.2/Col.3)*100
Dist.1			
Dist.2			
Dist.3			
Dist n			

CC. Percentage of elected WUAs (District wise)

Name of district	Total number of existing WUAs	Total number of elected WUAs	Percentage of elected WUAs
1	2	3	4 (Col.3/Col.2)*100
Dist.1			
Dist.2			
Dist.3			
Dist n			

DD. Percentage of elected GWMCs (District wise)

Name of district	Total number of existing GWMCs	Total number of elected GWMCs	Percentage of elected GWMCs
1	2	3	4 (Col.3/Col.2)*100
Dist.1			
Dist.2			
Dist.3			
Dist n			

EE. Percentage of total fees collected by WUAs/GWMCs used in O&M (District wise)

Name of district	Total fees collected by WUAs/GWMCs	Total fees collected by WUAs/GWMCs used in O&M	Percentage of elected GWMCs
1	2	3	4 (Col.3/Col.2)*100
Dist.1			
Dist.2			
Dist.3			
Dist n			

FF. Percentage of farmers involved in agro-forestry activities (District wise)

Name of district	Total number of farmers involved in all types of agricultural activities	Total number of farmers involved in agro-forestry activities	Percentage of elected GWMCs
1	2	3	4 (Col.3/Col.2)*100
Dist.1			
Dist.2			
Dist.3			
Dist n			

GG. Percentage of Fallow & Wasteland brought under Agriculture and horticulture (last 5 years)(District wise)

Dist	Area under fallow land and wasteland* (ha)		Percentage of fallow land and wasteland brought under agriculture and horticulture	
	2011	2016	Area (ha)	(%)
	1	2	3 (Col.2-Col.1)	4 (Col.3/Col.1)*100
Dist.1				
Dist.2				
Dist.3				
Dist n				

*This data will be taken from land utilization statistics website of Government of India

HH. Percentage of area increased under commercial horticultural development in open field conditions and in protected cover vis a vis total area in the district in last five years (District wise)

Name of district	Increased area under commercial horticultural development in open area (ha) in last five years	Increased area under commercial horticultural development in protected cover (ha) in last five years	Total increased area under commercial horticultural development (ha) in last five years	Total cultivated area (ha)	Percentage of area increased under commercial horticultural development in open field conditions and in protected cover vis a vis total area in the district in last five years

1	2	3	4 (Col.3 +Col. 4)	5	6 (Col.4/Col.5)*100
Dist.1					
Dist.2					
Dist.3					
Dist n					

II. Percentage increase in export growth rate of fruit crops, vegetables and floriculture during last five years (District wise)

District	Value of exports under fruit crops, vegetables and floriculture (Rs. in lakhs)		Growth in exports under fruit crops, vegetables and floriculture (Rs. in lakhs) in last five years	
	2011	2016	Growth (Rs. in lakhs)	Growth rate (%)
	1	2	3 (Col.2-Col.1)	4 (Col.3/Col.1)*100
Dist.1				
Dist.2				
Dist.3				
Dist n				

FINAL TABLE FOR CHAPTER 9 (within a Basin/Sub-basin)

<u>**Sector Wise Demand, Supply (Withdrawals) & Consumptive Use of Water:**</u>

C1. Farm Sector (MCM) Present Water Year from 1st June to 31st May next year (Chapter 4.2.2)									
Sub Sectors	Demand for Present Water Year *	Previous Year/ Average Annual Demand	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Return Flows **	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water/ Snow	Surface Water	Ground Water ***	**TOTAL SUPPLY**			
1. Agriculture Rain-fed Crops									
2. Agriculture Irrigated Crops									
a) Rice									
b) Wheat									
c) Sugarcane									
d) Cotton									
e) All other Crops									
TOTAL									
3. Horticulture									
a) Banana									
b) All other crops/plantations									
TOTAL									
4. Livestock, Birds & Others									
5. Fisheries & Others									
GRAND TOTAL									

* Demand can be calculated either from Direct Measurement or Crop Water Requirement and livestock population with individual demand.

** Calculations as per established methodology/assumptions

*** GW Draft can be calculated either from the number of GW abstraction structures & corresponding draft or Crop Water Requirements of each crop and extension/area of Crop (GEC Methodology)

ET/Consumptive Use from all the crops in agriculture can also be estimated and accounted for using the standard NDVI Algorithm.

(The data obtained from Village/Blocks etc should be aggregated to corresponding Basin/Sub Basin Level for Comparability with Water Availability or Utilizable Water)

Source Wise Previous Year/ Average Annual Water Supply:

C1. Farm Sector (MCM) Within the Basin/ Sub-basin A (Chapter 4.2.2)												
Source	Sub Source	Rain-fed Crops	Agriculture Irrigated Crops					Horticulture		Animal Husbandry (Livestock, Birds and Others)	Fishery & Others	**TOTAL**
			Rice	Wheat	Sugarcane	Cotton	All other crops	Banana	All other crops/ plantation			
Rain Water/ Snow	Direct Soil Moisture (useful)											
	Harvested Rain Water											
Total												
Surface Water	Glaciers											
	Springs, Nallahs											
	Major Projects											
	Medium Projects											
	Minor Projects											
	Wetlands											
	Ponds/Tanks											
	Desalinated Water/ Sea											
	Inter Basin Transfer											
Total												
Ground Water * (Dynamic/ Static)	Dug wells (Total No. x Draft)											
	Dug cum Bore well (Total No. x Draft)											
	Bore/Tube wells (Total No. x Draft)											
	Others											
Total												
Treated Waste Water												
GRAND TOTAL												

* GW Draft can be calculated either from the number of GW abstraction structures & corresponding draft or Crop Water Requirements of each crop and extension/area of Crop (GEC Methodology)

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4.2.2.2 LIVESTOCK, BIRDS AND OTHERS (Animal Husbandry)

1. **Subject matter**
   (Present a brief background on the Animal Husbandry – a bird's eye view picture and analysis using the following information/ tables). The details can be provided as per the format in the respective annexure mentioned. Appropriate graphs / maps can be represented.

A. Livestock Population

a. State livestock population statistics (Annexure-**4.2.2.1**)
b. District wise livestock population statistics (Annexure 4..2.2.2)

B. Number of dairies and dairy animals

a. State dairy farm statistics (Annexure 4.2.2.3)
b. District dairy farm statistics (Annexure 4.2.2.4)

C. Poultry Farms

a. State poultry statistics (Annexure 4.2.2.5)
b. District wise infrastructure and Birds Population (Annexure 4.2.2.6.
c. State poultry farm statistics (Annexure 4..2.2.7)
d. District poultry farm statistics (Annexure 4.2.2.8)

D. Milk Processing plants

a. State milk plant statistics (Annexure 4.2.2.9)
b. District milk plant statistics (Annexure 4.2.2.10)

E. Abattoirs/ Meat processing plants or both units

a. State Abattoirs and meat plants with / without Abattoirs (Annexure 4.2.2.11)
b. District meat plants/Abattoirs statistics (Annexure 4.2.2.12)
c. State Meat processing units/plants number statistics Annexure 4.2.2.13.
d. District wise Meat processing units/plants number statistics Annexure 4.2.2.14.
e. State Abattoirs with meat processing units/plants number Annexure 4.2.2.15statistics
f. District Abattoirs with meat processing units/plants number statistics Annexure 4.2.2.16.

2. **Water Demand-Supply and Consumption**

a. Livestock water demand for drinking, washing and shed cleaning (Annexure 4.2.2.17)
b. Dairy Water demand for drinking, washing and cleaning (Annexure 4.2.2.18)
c. Poultry Water demand for drinking (Annexure 4.2.2.19)
d. Milk Plants Water demand (Annexure 4.2.2.20)
e. Water demand at different stages of animal slaughter in abattoir (Annexure 4.2.2.21)
f. Water demand at different stages in meat product processing plant (Annexure 4.2.2.22)
g. Water demand of Abattoirs with meat processing unit(Annexure 4.2.2.23)

A. Water Productivity

a. Milk production (cattle and buffalo) (Annexure 4.2.2.24)
b. Poultry Egg production (Layers) (Annexure 4.2.2.25)
c. Poultry Meat production (Broiler) (Annexure 4.2.2.26)
d. Meat production (Sheep/goat) (Annexure 4.2.2.27)
e. Meat production (buffalo/cattle) (Annexure 4.2.2.28)
f. Milk processing (pasteurized milk) (Annexure 4.2.2.29)
g. **Processed Milk Water Productivity- State level (Annexure 4.2.2.30)**
h. Meat processing (Annexure 4.2.2.31)

B. Past trend livestock/Animal husbandry

a. Past trend of livestock population (Annexure 4.2.2.32)
b. Past trend of livestock Dairy farms (Annexure 4.2.2.33)
c. Past trend of livestock Poultry farms (Annexure 4.2.2.34)
d. Past trend of Milk processing (Annexure 4.2.2.35)
e. Past trend
   a. Abattoir only (Annexure 4.2.2.36a)
   b. Meat processing plant only (Annexure 4.2.2.36b)
   c. Abattoir with Meat processing plant (Annexure 4.2.2.36c)

c. Present and Projected water demand for animal husbandry/livestock sector

a. Projected water demand for livestock (Annexure 4.2.2.37)

b. Projected water demand for dairy farms
c. Projected water demand for poultry farms
d. Projected water demand for milk processing plants
e. Projected water demand for abattoirs
f. Projected water demand for meat processing plants/units
g. Projected water demand for abattoirs having meat processing unit.

3. Issues and challenges

- Water scarcity or water availability in drought and summer.
- Poor water use efficiency in livestock production.
- Chronic water shortage in arid and semi-arid areas limiting expansion of livestock rearing.
- Water pollution (animal excreta, urine, feed/fodder refusals, milk shed waste, silage effluent etc).
- Water use efficiency (cleaning, milk cooling systems, irrigation).
- Water quality Vs livestock health and production
- Largely unorganized livestock sector.
- Issues related to waste water treatment/recycle/reuse in livestock sector.

4. Problem Tree/Root Cause Analysis

5. Governance/management

Statute / Law / Policy/ Regulations if any which may besides other things may include

- National / State/Local water policy/ regulations
- Regulation for local water bodies (especially village ponds, lakes and other water sources).
- Renewable energy for commercial dairies.
- Renewable energy policy for dairy/milk plants and abattoirs.
- Regulation for water recycling in livestock/poultry based industries
- Regulation for animal grazing (Anna Pratha in Bundelkhand region).
- Policy to integrate livestock production with watershed/water resource development programmes.
- Policy to rear water efficient animal breeds in water deficit regions.
- Policy for peri-urban and urban dairies for environment safety.
- State level laws, policy and governance for the livestock sector in the state on water access, consumption and waste water discharge.

Institutions governing / managing / monitoring the resources and Institutional structure- sub sector wise (May include)

- State Government Department/ Agencies/ Bodies/ Corporations/Universities/ Local bodies (Gram Panchayats)
- State government agencies/NGO dealing with water shed

Areas of Peoples/Private Participation if any (may include)

- Watershed development
- Milk dairies/Unions
- Poultry Farm Union
- Meat Industry Associations
- Consumer Association- Milk/Poultry/Meat/Public Health
- Command Area Development Agency (CADA)

Water Financing and Economics: [Relevant tables on Water Financing and Economics may be looked into Chapter 7 and filled up with appropriate data/information]

6. Measuring, Monitoring and data constraints/management

a. Water measuring systems for dairy/poultry farm and milk/ meat processing plants (Annexure 4.2.2.39)
b. Water monitoring systems for dairy/poultry farm and milk/ meat processing plants Annexure 4.2.2.40
c. Data constraint/ management for dairy/poultry farm and milk/ meat processing plants Annexure 4.2.2.41

Constraints

- No Designated/ responsible Official / team for Water management
- Lack of measurement equipment & standard infrastructure
- Unskilled manpower for Measurement & Monitoring
- No centralized data base and analytical support etc.
- Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for Animal Husbandry/Livestock Sector.

7. Performance Indicators.

g. Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently.

i. Livestock drinking water requirement Annexure 4.2.2.42
ii. Livestock washing/cleaning water requirement Annexure 4.2.2.43
iii. Poultry drinking water requirement Annexure 4.2.2.44a,b,c
iv. Service water requirement for poultry Annexure 4.2.2.45.
v. Water requirement for kg/liter milk production Annexure 4.2.2.46a, b
vi. Water requirement for kg/liter milk processing in milk plant Annexure 4.2.2.47
vii. Water requirement kg meat in meat processing plant/abattoir Annexure 4.2.2.48a,b

h. Status of various Performance Indicators – **for comparison across Districts/ Plants/ Units/ Products etc. (**Annexure 4.2.2.49 to Annexure 4.2.2.53)

Performance indicators for Dairy Farms (Annexure 4.2.2.49)

Category	**Indicator**	**Unit**	**Bench mark**	**District-1**	**District-2**
Water quantity Measurement	% of dairy farms with water flow meters	%			
	% of water sources (ponds for animal drinking and wallowing) geotagged	%			
	% dairy farms undertaking internal water audit	%			
	% dairy farms undertaking external water audit	%			
	Submitting monthly water balance to state pollution control board (SPCB).	Number			
Water conservation	% of dairy farms with water harvesting structures.	%			
	% of dairy farms with pressurized pumps for cleaning sheds/Pressure foam systems for cleaning shed floors.	%			
	% of dairy farms with shower facilities for washing animals	%			
	% of dairy farms with fogging facilities	%			
Water demand management	No animal washing in event of water scarcity	Number			
	% of dairy farms following dry washing of animals	%			
	% of dairy farms with facilities for dry washing and cleaning of animal sheds	%			
	% of dairy farms with using green fodder in animal diet	%			
	% of dairy farms repairing leaks from connections, valves and seals	%			
Water productivity	Water consumption per liter of milk production	Litres			
Water quality	% dairy farms conducting the prescribed water quality tests	%			
	% of dairy farms with separate channels for disposal of animal waste (dung and urine)	%			
	% of dairy farms with waste storage pond.	%			
	% of dairy farms with dairy waste lagoon	%			
	% of dairy units installed online water quality monitoring systems.	%			
	% of dairy units complied with the wastewater quality discharged norms.	%			
	% of dairy units received notices for the violation of statute from SPCB	%			
Waste Water	Total waste water generated from dairy farm	litres			
	% waste water treated	%			
	% treated water used in industrial activity	%			
	% treated water used in green belt	%			
	% reduction in total quantum of wastewater disposed.	%			
	% of dairy plants with Zero liquid discharge (ZLD).	%			
	% of dairy farms with waste water recycling	%			
	% of dairy farms with waste water treatment plant/Water purification system	%			
Capacity building	% of dairy plant conducting training for employees for minimizing water use.	%			
Water Economics	Cost of 1 lt Water				
	% of dairy farms paying water bills	%			
Others					

Performance Indicators for Poultry (Annexure 4.2.2.50)

Category	Indicator	Unit	Bench mark	District-1	District-2
Water quantity Measurement	% of poultry farms with water meters	%			
	% poultry farms undertaking internal water audit	%			
	% poultry farms undertaking external water audit	%			
	Submitting monthly water balance to state pollution control board (SPCB).				
Water conservation	% of poultry farms with working water harvesting Structures.	%			
	% of poultry farms with water recycling system	%			
	% of poultry farms with nipple system	%			
	% of poultry farms with fogging facilities for cooling of sheds in summer	%			
Water demand management	% of breeders /Layer farms having 0-6 weeks birds	%			
	% of breeders /Layer farms having 0-6 weeks birds6-20 weeks	%			
	% of breeders /Layer farms having20-72 weeks	%			
	% of poultry farms following disinfection of the sheds to control external parasites of birds	%			
	% of poultry farms with Facilities for dry washing and cleaning of animal sheds	%			
	% of poultry farms having own feed units	%			
	% of poultry farms repairing leaks from connections, valves and seals	%			
Water productivity	Water consumption (in L) per 100 eggs production				
	Water consumption (in L) per 1 Kg live meat				
Water quality	% poultry farms conducting the prescribed water quality tests	%			
	% of poultry farms with separate channels for disposal of animal waste (birds excreta)	%			
	% of poultry farms with waste storage pit	%			
	% of poultry farms with Poultry waste lagoon	%			
	% of poultry units installed online water quality monitoring systems.	%			
	% of poultry units complied with the wastewater quality discharged norms.	%			
	% of poultry units received notices for the violation of statute from SPCB	%			
Waste Water	Total Waste Water Generated				
	% of Poultry farms with waste water recycling	%			
	% Waste Water Treated	%			
	% Treated water used in farm activity (gardening, cooling of sheds etc)	%			
	% reduction in total quantum of wastewater disposed.	%			
	% of poultry farms with zero liquid discharge (ZLD).	%			
	% of poultry farms with waste water treatment plant/Water purification system	%			
Capacity building	% of plant conducting training for employees for minimizing water use.	%			
Water Economics	Cost of 1 lt Water				
	% of Poultry farms paying water bills	%			
Others	% of poultry farms having carcass disposable system	%			

Performance indicators for Milk Processing Plants- Separately for each category of Plant- (i) Less than 1 Lakh/ Day (ii) 1-5 Lakh / Day (iii) > 5 lakh litres/ day (Annexure 4.2.2.51)

Category	Indicator	Unit	Bench mark	District-1	District-2
Water quantity Measurement	% of milk plant using water measuring device at source.	%			
	% of plant using automatic water measuring system.	%			
	Milk plant annual total water consumption				
	Average water treated in ETP annually.				
	% dairy plants undertaking internal water audit	%			
	% dairy plants undertaking external water audit	%			
	Submitting monthly water balance to state pollution control board (SPCB).				
Water conservation	% of Plants with working water harvesting structures.	%			
	% of dairy plants with condensate recovery system	%			
	% of dairy plants with automatic CIP cleaning system	%			
Water demand management	% of plant conducting water audit.	%			
	% of dairy plants conducting regular maintenance (repairing leaks from connections, valves and seals)	%			
Water productivity	Water consumption (in L) per 1 litre of processed milk				
Water quality	% dairy plants conducting the prescribed water quality tests	%			
	% of dairy plants installed online water quality monitoring systems.	%			
	% of dairy plants complied with the wastewater quality discharged norms.	%			
	% of dairy plants received notices for the violation of statute from SPCB	%			
Waste Water	Total waste water generated				
	% of dairy plants with 100% waste water recycling	%			
	% waste water treated	%			
	% treated water used in Industrial activity	%			
	% treated water used in Green belt	%			
	% reduction in total quantum of wastewater disposed.	%			
	% of plants with Zero liquid discharge (ZLD).	%			
Participatory water management					
Capacity building	% of plant conducting training for employees for minimizing water use.	%			
Water Economics	Cost of 1 lt Water				
Others					

Performance indicators – Abattoirs only (Annexure 4.2.2.52)

Category	Indicator	Type of abattoir					
		Cattle	**Buffalo**	**Sheep**	**Goat**	**Pig**	**Poultry**
Water quantity measurement	% of abattoirs using water measuring device at source	%					
	% of abattoir using automatic water measuring system	%					
	% of abattoirs undertaking internal water audit	%					
	% of abattoirs undertaking external water audit	%					
	% abattoirs sending monthly water balance to State Pollution Control Board (SPCB)	%					
Water conservation	% of abattoirs having rain water harvesting facility	%					
	% of abattoirs having shower facilities for animals	%					
Water demand management	% of abattoirs having repairing leaks from connections, valves and seals at regular intervals	%					
Water productivity	Average water consumption per kg of meat produced						
Water quality	% of abattoirs conducting the prescribed water quality tests	%					
	% of abattoirs with separate channels for disposal of animal waste (dung and urine)	%					
	% of abattoirs with waste storage pond	%					
	% of abattoirs with waste lagoon	%					
	% of abattoirs installed online water quality monitoring system	%					
	% of abattoirs complied with the waste water quality discharged norms	%					
	% of abattoirs received notices for the violation of statute from SPPCB	%					
	% abattoirs meeting Pollution Control Board guidelines on treated water quality	%					
Waste water	Total waste water generated						
	% of abattoirs with waste water treatment plant	%					
	% of abattoirs recycling treated water	%					
	% waste water treated	%					
	% treated water used in abattoir activities	%					
	% treated water used in green belt	%					
	% reduction in total quantum of waste water disposed	%					
	% of abattoirs with zero liquid water discharge	%					
Capacity building	% of abattoirs conducting training of employees for minimizing water usage	%					
Water economics	Cost of 1 litre water						
Other issues	% number of abattoirs having meat product facility along with abattoir						
	% of abattoirs undertaking by product processing in their plant						
	% of abattoirs using automated cleaning of animal by products						

Performance indicators - Meat product processing plants only (without attached abattoir**)** (Annexure 4.2.2.53)

Category	Indicator	Units	Bench Mark	Plant-1	Plant-2
Water quantity measurement	% of processing plants using water measuring device at source	%			
	% of processing plants using automatic water measuring system	%			
	Annual total water consumed				
	Average water treated annually in ETP annually				
	% of plants undertaking internal water audit	%			
	% of plants undertaking external water audit	%			
	% plants sending monthly water balance to State Pollution Control Board (SPCB)	%			
Water conservation	% of abattoirs having rain water harvesting facility	%			
Water demand management	% of processing plants having repairing facility for leaks from connections, valves and seals	%			
Water productivity	Average water consumption per kg of meat product produced				
Water quality	% of processing plants conducting the prescribed water quality tests	%			
	% of units installed online water quality monitoring system	%			
	% of units complied with the waste water quality discharge norms	%			
	% plants meeting Pollution Control Board guidelines on treated water quality	%			
Waste water	Total waste water generated				
	% of plants with waste water treatment plant	%			
	% of units recycling treated water	%			
	% waste water treated	%			
	% Treated water used in plant activities	%			
	% Treated water used in green belt	%			
	% of plants with zero liquid water discharge	%			
Capacity building	% of plants conducting training of employees for minimizing water usage	%			
Water economics	Cost of 1 litre water				

8. **Reforms undertaken/ being undertaken/ proposed if any**

9. **Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity.**

Annexure

Annexure 4.2.2.1 Basic State Livestock population statistics

Species	Number of Animals based on Census: Thousand heads						
	1982	1992	1997	2003	2007	2012	2017
Cattle							
Buffalo							
Sheep							
Goat							
Pigs							
Pigs							
Mithun							
Yak							
Camel							
Donkey/Horse/Mules							
Others							

Annexure 4.2.2.2. District wise livestock population statistics

	Number of Animals based on Census: thousand heads of latest census				
Species	District.1	District.2	District3		
Cattle					
Buffalo					
Sheep					
Goat					
Pigs					
Mithun					
Yak					
Camel					
Donkey/Horse/Mules					
Others					

Annexure 4.2.2.3 State dairy farm number statistics

Dairy type/Number of animals	Numbers						
	1982	1992	1997	2003	2007	2012	2017
Cattle dairy farm							
Buffalo dairy farm							
Milch animals farm							
Other animals farm							
Total animals farm							

Annexure 4.2.2.4. District wise dairy number statistics of Current Year

Dairy type/Number of animals	Numbers				
	District.1	District.2	District3		
Cattle dairy farm					
Buffalo dairy farm					
Milch animals farm					
Other animals farm					
Total animals farm					

Annexure 4.2.2.5. Basic Poultry number Statistics v (As per livestock census)

Species (No.)	Numbers in thousands					
		1997	2003	2007	2012	2017
Layers						
Broilers						
Backyard Poultry						

Ducks						
Turkey						
Emu						
Ginny Fowl						
Other Birds						

Annexure 4.2.2.6. District wise infrastructure and Birds Population

Parameters	Units	District.1	District.2	Dist.3		
Poultry Farms						
Capacity of farms						
Farms which are fully mechanized for watering and feeding						
Total number of hatchery						
Capacity of Hatchery						
Number of feed plants						
Number of poultry waste recycling units						
Birds (No.)						
Layers						
Broilers						
Backyard Poultry						
Ducks						
Turkey						
Other Birds						

Annexure 4.2.2.7 State poultry farm and birds number statistics

Poultry farm/Poultry bird	Numbers						
	1982	1992	1997	2003	2007	2012	2017
Number of Poultry Farmers							
Poultry farms							
Number of Poultry Birds							
Layers							
Broilers							

Annexure 4.2.2.8. District wise poultry farm and birds number statistics of Current Year

Poultry farm/Poultry bird	Numbers				
	District.1	District.2	District3		
Number of Poultry Farmers					
Number of Total Poultry Birds					
Number of Poultry Layers					
Number of Poultry Broilers					

Annexure 4.2.2.9. State milk plants number statistics

Milk plants	Numbers						
	1982	1992	1997	2003	2007	2012	2017
Less than 1 Lakh/ Day							
1-5 Lakh / Day							
> 5 lakh litres/ day							
Total milk pants							

Annexure 4.2.2.10. District wise milk plant number statistics

Milk plants	Numbers				
	District.1	District.2	District3		
Less than 1 Lakh/ Day					
1-5 Lakh / Day					

> 5 lakh litres/ day					
Total milk pants					

Annexure 4.2.2.11. State Abattoir number statistics

Number and type of abattoir	Numbers						
	1982	1992	1997	2003	2007	2012	2017
Total number							
Sheep/goat							
Buffalo/cattle							

Annexure 4.2.2.12. District wise Abattoir number statistics

Number and type of abattoir	Numbers				
	District.1	District.2	Dist.3		
Total number					
Sheep/goat					
Buffalo/cattle					

Annexure 4.2.2.13. State Meat processing units/plants number statistics

Number and type of meat processing units	Numbers						
	1982	1992	1997	2003	2007	2012	2017
Total number							
Sheep/goat							
Buffalo/cattle							

Annexure 4.2.2.14. District wise Meat processing units/plants number statistics

Number and type of Meat processing units	Numbers				
	District.1	District.2	Dist.3		
Total number of meat processing units					
Sheep/goat					
Buffalo/cattle					

Annexure 4.2.2.15. State Abattoirs with meat processing units/plants number statistics

Number and type of meat processing units	Numbers						
	1982	1992	1997	2003	2007	2012	2017
Total number							
Sheep/goat							
Buffalo/cattle							

Annexure 4.2.2.16. District Abattoirs with meat processing units/plants number statistics

Number and type of abattoir with meat processing units	Numbers				
	District.1	District.2	Dist.3		
Total number of Abattoirs with meat processing units					
Sheep/goat					
Buffalo/cattle					

Annexure 4.2.2.17. Livestock water demand for drinking, washing and shed cleaning of Current Year

Districts/Species	Livestock water requirements			
District-1	Drinking	Washing	Shed cleaning	Total
Cattle				
Buffalo				
Sheep				

Goat				
Pigs				
Mithun				
Yak				
Camel				
Donkey/Horse/Mules				
Others				
District-2				
Cattle				
Buffalo				
Sheep				
Goat				
Pigs				
Mithun				
Yak				
Camel				
Donkey/Horse/Mules				
Others				
District-3				
Cattle				
Buffalo				
Sheep				
Goat				
Pigs				
Mithun				
Yak				
Camel				
Donkey/Horse/Mules				
Others				

Annexure 4.2.2.18. Water demand for drinking, washing and cleaning in dairies of Current Year

Purpose/use	Thousand Litres				
	District 1	**District 2**	**District 3**		
Drinking					
Washing					
Cleaning shed					
Total demand					

Annexure 4.2.2.19. Water demand for drinking and cleaning of poultry farms of current Year

Purpose/use	Thousand Litres				
	District.1	**District.2**	**Dist.3**		
Drinking					
Cleaning					
Cooling/fogging in summer					
Feed manufacturing					
Carcass disposal					
Total demand					

Annexure 4.2.2.20. Water demand for milk plants (Mainly for cleaning)

Purpose/use	Thousand Litres				
	Plant 1	Plant 2	Plant 3	Plant-4	Total
District-1					
District-2					
District-3					
District-4					

Annexure 4.2.2.21 Water demand at different stages of animal slaughter in abattoir

Different stages	Cattle	Buffalo	Sheep	Goat	Pig	Poultry
Drinking of animals at animal holding area and lairage						
Washing of animals						
Scalding	---	---	---	---		
Carcass washing						
Washing of slaughterhouse premises, lairage etc						
At Effluent treatment plant						

Annexure 4.2.2.22 Water demand at different stages in meat product processing plant

Different stages	Cattle	Buffalo	Sheep	Goat	Pig	Poultry
Water used for product preparation						
Water used for cooking of meat products						
Water used for washing of processing plant premises						
At Effluent treatment plant						

Annexure 4.2.2.23 Water demand for Abattoirs with meat processing unit/plant (plants having both Abattoir and meat processing unit)

Purpose/use	Thousand Litres				
Slaughter operation	**Abattoir 1**	**Abattoir 2**	**Abattoir 3**		
Drinking of animals at animal holding area and lairage					
Washing of animals					
Scalding					
Carcass washing (except pig, poultry)					
Washing of slaughterhouse premises, lairage etc					
At Effluent treatment plant					
Meat product processing					
Water used for product preparation					
Water used for cooking of meat products					
Water used for washing of processing plant premises					
At Effluent treatment					
Total water demand					

Annexure 4.2.2.24. Water productivity for milk production (cattle and buffalo)

Species	Water for drinking & washing (a)	Water for shed cleaning (b)	Total water requirement/water consumed (c) (a+b)	Milk yield (d)	Water Productivity Litre water /Litre milk c/d	Economic water productivity (Rs./litre)
Milch cattle						
Milch buffalo						
Others						
Total						

Annexure 4.2.2.25. Water productivity for poultry egg production (Layers)

Poultry	Water for drinking & cooling (a)	Water for cleaning (b)	Total water requirement/water consumed (c) (a+b)	Egg numbers (d)	Water Productivity Litre water /100 eggs c/d	Economic water productivity (Rs./litre)
Layers						

Annexure 4.2.2.26. Water productivity for poultry meat production (Broiler)

Poultry	Water for drinking & cooling (a)	Water for cleaning (b)	Total water requirement/water consumed (c) (a+b)	Broiler weight (d)	Water Productivity Litre water /kg wt gain c/d	Economic water productivity (Rs./kg)
Broilers						

Annexure 4.2.2.27. Water productivity for meat production (Sheep/goat)

Species	Water for drinking & washing (a)	Water for cleaning (b)	Total water requirement/water consumed (c) (a+b)	Animal weight (d)	Water Productivity Litre water /kg wt gain c/d	Economic water productivity (Rs./kg meat)
Sheep						
Goat						

Annexure 4.2.2.28. Water productivity for meat production (buffalo/cattle)

Species	Water for drinking & cooling (a)	Water for cleaning (b)	Total water requirement/water consumed (c) (a+b)	Animal weight (d)	Water Productivity Litre water /kg wt gain c/d	Economic water productivity (Rs./kg meat)
Buffalo						
Cattle						

Annexure 4.2.2.29. Water productivity for milk processing (Litre water per litre milk processing)

Milk plants	Water for steam generation (a)	Water for cleaning (b)	Water for other use in plant (c)	Total water requirement d = (a+b+c)	Litre of milk processed (e)	Water Productivity Litre water /litre milk processed d/e	Economic water productivity (Rs./litre of pasteurized milk)
Plant1							
Plant2							
Plant 3							

Annexure 4.2.2.30. Processed Milk Water Productivity- State level

Year	Total No. of Milk Processing Plants	Total Annual Capacity	Annual Av. Capacity for the last 5 Years	Inputs Qty		Output	Processed Milk Productivity Litres of Water/ 1 Litre of Processed Milk
				Raw Milk	Water	Processed Milk Kg/Yr	
2016							
2017							

Annexure 4.2.2.31. Water productivity for meat processing

Abattoirs	Slaughter operation (a)	Meat product processing operation (b)	Total water requirement/water consumed (c) (a+b)	Broiler weight (d)	Water Productivity Litre water /kg processed meat c/d	Economic water productivity (Rs./kg meat product)
Abattoir1						
Abattoir 2						
Abattoir 3						

Annexure-4.2.2.32: Analysis of past trend of animal growth rate (numbers)

Livestock species	**Cultivated Area (ha)**				**Five yearly growth rate in livestock numbers**		
	2003	2007	2012	2017	2003-2007	2007-2012	2006-2015
1	2	3	4	5	6 ((3-2)/2)*100	7 ((4-3)/3)*100	8 ((5-4)/4)*100
Buffalo							
Cattle							
Sheep							
Goat							
Yak							
Mithun							
Camel							
Horse/mule							
Donkey							
Pig							
Poultry							
Others							

Annexure 4.2.2.33 Past trend of dairy farms

Livestock farm type	**Cultivated Area (ha)**				**Five yearly growth rate in livestock numbers**		
	2003	2007	2012	2017	2003-2007	2007-2012	2006-2015
1	2	3	4	5	6 ((3-2)/2)*100	7 ((4-3)/3)*100	8 ((5-4)/4)*100
Dairy farms							

Annexure 4.2.2.34 Past trend of poultry farms

Livestock farm type	**Cultivated Area (ha)**				**Five yearly growth rate in livestock numbers**		
	2003	2007	2012	2017	2003-2007	2007-2012	2006-2015
1	2	3	4	5	6 ((3-2)/2)*100	7 ((4-3)/3)*100	8 ((5-4)/4)*100
Poultry farms							

Annexure 4.2.2.35 Past trend of milk processing plants

Livestock farm type	**Cultivated Area (ha)**				**Five yearly growth rate in livestock numbers**		
	2003	2007	2012	2017	2003-2007	2007-2012	2006-2015
1	2	3	4	5	6 ((3-2)/2)*100	7 ((4-3)/3)*100	8 ((5-4)/4)*100
Milk processing plants							

Annexure 4.2.2.36a Past trend of abattoir plants

Livestock farm type	**Cultivated Area (ha)**				**Five yearly growth rate in livestock numbers**		
	2003	2007	2012	2017	2003-2007	2007-2012	2006-2015
1	2	3	4	5	6 ((3-2)/2)*100	7 ((4-3)/3)*100	8 ((5-4)/4)*100
Abattoir							

Annexure 4.2.2.36b Past trend of meat processing plants

Livestock farm type	**Cultivated Area (ha)**				**Five yearly growth rate in livestock numbers**		
	2003	2007	2012	2017	2003-2007	2007-2012	2006-2015
1	2	3	4	5	6 ((3-2)/2)*100	7 ((4-3)/3)*100	8 ((5-4)/4)*100
Meat processing plants							

Annexure 4.2.2.36c Past trend of abattoir with meat processing units/plants

Livestock farm type	**Cultivated Area (ha)**				**Five yearly growth rate in livestock numbers**		
	2003	2007	2012	2017	2003-2007	2007-2012	2006-2015
1	2	3	4	5	6 ((3-2)/2)*100	7 ((4-3)/3)*100	8 ((5-4)/4)*100
Abattoir with meat processing plants							

Annexure 4.2.2.39 Water measuring systems for dairy/poultry farm and milk/ meat processing plants

Water use	Water Measuring systems
Dairy farm	
Poultry farm	
Milk plant	
Abattoir	
Meat processing plant	
Abattoir with meat processing unit/plant	

Annexure 4.2.2.40 Water monitoring systems for dairy/poultry farm and milk/ meat processing plants

Water use	Water monitoring – Quantity and Quality systems
Dairy farm	
Poultry farm	
Milk plant	
Abattoir	
Meat processing plant	
Abattoir with meat processing unit/plant	

Annexure 4.2.2.41 Data constraint/ management for dairy/poultry farm and milk/ meat processing plants

Water use	Data Constraints/ Challenges
Dairy farm	
Poultry farm	
Milk plant	
Abattoir	
Meat processing plant	
Abattoir with meat processing unit/plant	

BENCH MARKING

Annexure 4.2.2.42. Livestock drinking water requirements (Cattle and buffalo)

Animal type	Season	Water intake in 24 h (l)
Calf	Winter Summer	11.8 28.4
Heifer	Winter Summer	27.5 55.3
Adult	Winter –dry -Lactating Summer-dry -Lactating	45.1 58.9 55.5 66.9

Source: Kidan, (1976), Pal et al (1973) and Radadia et al (1980)

Annexure 4.2.2.43. Water requirement for livestock washing/cleaning

Animal type	Season	Water for washing each buffalo (L)
Calf	Winter Summer	15.2 23.0
Heifer	Winter Summer	28.3 45.3
Adult	Winter –dry -Lactating Summer-dry -Lactating	23.3 36.4

Source: Kidan, (1976), Pal et al (1973) and Radadia et al (1980)

Annexure 4.2.2.44a. Poultry drinking water requirement

Average daily water requirement per day (consumptions/water use in ml per day)

Types of Birds	Total (No.)	ml per day (mpd)
Broiler		159.11
Pullets		181.84
Layers		250.03
Breeders		318.22
Turkey		590.99

(Source:http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex1349/$file/716c01.pdf?OpenElement)

Annexure 4.2.2.44b Drinking water requirements for poultry

SN	Type of birds	Water requirements in lit per 100 birds
1	Layer pullets (growing birds)	10-13
2	Layer hens (mature)	22
3	Breeder pullets (growing)	12-16
4	Breeder hens (mature)	30
5	Broiler chickens	16-25
6	Turkey broilers	29-54
7	Turkey breeders	38-64

(Source: Ravindran; 2007)

Annexure 4.2.2.44c Drinking water requirement for poultry

SN	Type of Birds	Service water requirement (lit) per 100 birds per day	No of birds
1	Broiler Chicks	2lit	
2	Broiler Adults	18lit	
3	Layer Chicks	2 lit	
4	Laying Birds	30 lit	

(Source: Chapagain and Hoekstra,2003)

Annexure 4.2.2.45. Service water requirement for poultry

SN	Type of Birds	Service water requirement (lit)/100 birds/ day	No of birds
1	Broiler Chicks	1lit	
2	Broiler Adults	9 lit	
3	Layer Chicks	1lit	
4	Laying Birds	15 lit	

(Source: Chapagain and Hoekstra, 2003)

Annexure 4.2.2.46a. Water requirement for kg milk production

Water (L/Kg product)	East Asia	Latin America & Caribbean	North America & West Asia	North America & Oceania	South & Central Asia	Sub-Saharan Africa	Europe	Average
Milk	1800	2200	4100	1000	3700	9500	1000	3300

Annexure 4.2.2.46b. Water requirement for kg milk production

Product	Water in Liter/Kg product		
Milk	1020		

Annexure 4.2.2.47. Water requirement for per litre milk processing

Product	Water in Liter/litre milk processed
Milk	1-1.5

Annexure 4.2.2.48a. Water requirement kg livestock products in meat processing plant/abattoir

Processing of livestock products

Product	Water in Liter/(Kg product		
Eggs	3265		
Chicken-meat	4325		
Pig meat	5988		
Sheep/Goat meat	8763		
Bovine meat (Cattle/Buffalo)	15415		

Source: Mekonnen and Hoekstra (2010)

Annexure 4.2.2.48b. Water requirement kg livestock products in meat processing plant/abattoir

Water (L/Kg product)	East Asia	Latin America & Caribbean	North America & West Asia	North America & Oceania	South & Central Asia	Sub-Saharan Africa	Europe	Average
Egg	3900	6300	6200	2300	7400	14700	2400	6200
Beef	83000	61900	11	27100	308900	186600	20100	114700
Sheep/Goat	87900	0	64300	36100	243500	0	14000	63700
Poultry	5800	7300	1900	3200	10200	16900	3400	7000
Pork	16300	12800	21000	4100	12100	40700	15900	17600

Source: lva Ran, 2010. Consumptive water use in livestock production – Assessment of green and blue virtual water contents of livestock products.

Animal Husbandry: Water use Source wise

a. Livestock water demand for drinking, washing and shed cleaning
b. Dairy farm water demand for drinking, washing and cleaning
c. Poultry farm water demand for drinking
d. Milk processing plants water demand
e. Abattoirs water demand
f. Meat processing plant
g. Abattoirs with meat processing unit

Basin/Sub-Basin A

	Demand	Supply	Consumption	Gap/Remarks
Rain Water Harvesting				
Major/ Medium Projects				
Minor Projects				
Ponds, Tanks				
Lakes				
Desalinated Water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Ground Water (Static)				
Treated Waste Water				
TOTAL (MCM)				

State (including all Basins/Sub-basins within State Boundary)

	Demand	Supply	Consumption	Gap/Remarks
Rain Water Harvesting				
Major/ Medium Projects				
Minor Projects				
Ponds, Tanks				
Lakes				
Desalinated Water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Ground Water (Static)				
Treated Waste Water				
TOTAL (MCM)				

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4.2.2.3: Fisheries and Aquaculture

1.0Subject Matter:

A. Fisheries and Aquaculture – Assessment of current demand, efficiencies, challenges

A.1 State Fisheries and Aquaculture Resources - Annexure-4.2.4.I

A.2 Water use pattern for Aquaculture system - Annexure-4.2.4.II

A.3 Water use pattern for Wetland Fisheries - Annexure-4.2.4.III

A.4 Water use pattern in fish markets, feed mill plants and processing plants - Annexure-4.2.4.IV

2.0Water Demand, Supply and Consumption:

A.2 Water area use pattern for Aquaculture Production

a. Estimation of water requirement for Carp production in ponds and tanks, Annexure-4.2.4.V

b. Estimation of water requirement for Magur (*Clarias batrachus*) production, Annexure-4.2.4.VI

c. Estimation of water requirement for Pangasius catfish (*Pangasionodon hypophthalmus*) production, Annexure-4.2.4.VII

d. Estimation of water requirement for Freshwater Prawn production, Annexure-4.2.4.VIII

e. Estimation of water requirement for Tiger shrimp (*Penaeus monodon*) production, Annexure-4.2.4. IX

f. Estimation of water requirement for Pacific white-leg shrimp (*Litopenaeus vannamei*) production, Annexure-4.2.4.X

g. Estimation of water requirement for Indian White Shrimp (*Penaeus indicus*) production, Annexure-4.2.4.XI

h. Estimation of water requirement for Brackishwater finfishes production, Annexure-4.2.4.XII

i. Estimation of water requirement for other Fish production (Write species, if possible), Annexure-4.2.4.XIII

j. Water requirement for Fish Hatcheries, Annexure-4.2.4.XIV

k. Consolidated water requirement for aquaculture, Annexure-4.2.4.XV

l. Consolidated water requirement for Fisheries and Aquaculture, Annexure-4.2.4.XVI

3.0Issues and Challenges, such as

- River flow
- Drying of wetlands
- Non-availability of water in ponds/tanks round the year

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations, such as

- State Fisheries Act
- Wildlife Acts
- Cooperative Policy
- Water Policy in the state
- Regulation for canal water distribution
- Regulation for groundwater exploitation
- Energy subsidy for groundwater exploitation
- Rain water harvesting system
- State Pollution Act
- Any other act, policy, guidelines, regulations, etc. relating to fisheries and aquaculture

Institutions governing / managing / monitoring the resources and Institutional structure, such as given below or any other.

- State Fisheries Department
- Fisheries Corporation
- Forest Department
- Irrigation Department
- Gram Sabha / Panchayat
- Any other

Areas of Peoples/Private Participation, such as given below or any other

- Pen culture
- Cage culture
- Canal fisheries
- Any other

Schemes & Financing, such as given below or any other [Relevant tables on Water Financing and Economics may be looked into Chapter 7 and filled up with appropriate data/information]

- National Fisheries Development Board
- National Agricultural Bank for Rural Development
- Fish Farmers Development Agency
- State Fisheries Department
- Any other

6.0Measurement, Monitoring and Data Constraints/ Management

7.0Performance Indicators:

Bench Marks/ Norms/ Standards and deviation from the norms/benchmarks/standards currently.

Performance indicator for Fish Farms/Hatcheries, Annexure-4.2.4.XVII

Annexure-4.2.4.XVIII: Performance indicator for Fish Processing Plants

Annexure-4.2.4.XIX: Performance indicator for Fish Processing Plants

Annexure-4.2.4.XX: Performance indicator for Fish Feed Plants

b. Status of various Performance Indicators – for comparison across Districts/ Plants/ Units/ Products etc.

b-1 Fish productivity of different commodities, Annexure-4.2.4.XXI
b-2 Analysis of water productivity for different fish commodities, Annexure-4.2.4.XXII
b-3 Aquaculture intensity in Freshwater ponds/tanks, Annexure-4.2.4.XXIII
b-4 Aquaculture intensity in Brackish water ponds/tanks, Annexure-4.2.4.XXIV
b-5 Aquaculture intensity in Freshwater wetlands, Annexure-4.2.4.XXV
b-6 Aquaculture intensity in Brackish water wetlands, Annexure-4.2.4.XXVI
b-6 Cage culture intensity in reservoirs, Annexure-4.2.4.XXVII
b-7 Pen culture intensity in wetlands, Annexure-4.2.4.XXVIII
b-8 Intensity of integrated farming, Annexure- 4.2.4.XXIX
b-9 Annual relative canal water supply, Annexure-4.2.4.XXX
b-10 Establishment of fish feed mills, Annexure-4.2.4.XXXI
b-11 Development of modern post-harvest management infrastructure system for fish, Annexure-4.2.4.XXXII
b-12 Development of cold-chain system for fish and fish products, Annexure-4.2.4.XXXIII
b-13 Land use change pattern including conversion of wasteland to productive land, Annexure-4.2.4.XXXIV

8.0Reforms undertaken/ being undertaken/ proposed, such as given below or any other

- Diversification of aquaculture
- Introduction of Pen farming
- Introduction of Cage farming
- Establishment of re-circulatory aquaculture system
- Establishment of flow-through aquaculture system
- Establishment of bio-floc system for intensive aquaculture
- Introduction of mechanical aerators for intensive farming
- HRD structure for farmers, in-service personnel, entrepreneurs, etc. for imparting training on various reforms made.

9.0Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity.

Annexure-4.2.4.I: Format for available water resources of the state

Name of the state		
Agro-climatic zone		
Total Geographical area (ha)		
Total length of rivers (Kms)		
Reservoirs area		
1	Large (>5000ha)	
2	Medium (500-5000ha)	
3	Small (<500ha)	
4	Total reservoir area (ha)	
Total Canal area (km)		
Total Wetlands area (beels / jheels / chaurs /floodplain wetlands) (ha)		
Total Lakes area (ha)		
Total potential tanks and ponds area (ha)		
Net tanks and ponds culture area (ha)		
Estuarine area (ha)		
Brackish water area (ha)		
Salt affected area under laden with ground water, Sodic/Saline		
Coastline (km)		

Annexure-4.2.4.II: Format for water area use pattern for Aquaculture Production

Type of fish culture system		Water required per ha per year (Assumptive)	Surface water used (ha-m/yr)	Ground water used (ha-m/yr)	Area under cultivation (ha)	Total Fish production (ton/yr)	Total water requirement (ha-m/yr)
		1	2	3	4	5	6
A. Freshwater aquaculture (warm water)							
Culture of IMC							
a)	Traditional						
b)	Semi-intensive						
c)	Intensive						
Total							
Culture of Magur							
Culture of *Pangasius catfish*							
a)	Semi-intensive						
b)	Intensive						
c)	Flow-through						
Total							
Monoculture of Freshwater prawn							
Freshwater ornamental fish							
Culture of other freshwater species							
Total warm water aquaculture							
B. Coldwater aquaculture							
a)	Rainbow trout						
b)	Mahseer						
c)	Other species						
Total coldwater aquaculture							
C. Brackish water Aquaculture							
a)	*Penaeus monodon*						
b)	*Litopenaeus vannamei*						
c)	*Penaeus indicus*						
d)	Brackish water fin fishes						
Total brackish water aquaculture							
D. Inland saline aquaculture							
E. Mariculture							
a)	Marine cage farming*						
b)	Marine ornamental						
Total marine							
Grand Total							

- **Fill only area and production data. No need to fill up columns of water requirement**

Annexure-4.2.4.III: Format for water area use pattern for Wetland Fisheries

Sl. No.	**Type of activities**	**Potential units**			**Operational units**					**Quantity of deficit water (ha-m)**
		Number	Area (ha)	Total water requirement (ha-m)	Number	Area (ha)	Available water (ha-m)	Fish production (ton/yr)	Average productivity (kg/ha/yr)	
		1	2	3	4	5	6	7	8	9
1	Culture based fisheries (Pen farming) in wetlands									
2	Culture based capture fisheries in reservoirs									
Total										

Annexure-4.2.4.IV: Format for Water requirement in fish markets/landing centres, fish processing plants and fish feed plants

Unit Name		No. of units	Water requirement		Source of Water		Total water requirement
			Average/ unit (m^3)	Total (m^3)	Ground water	Surface water	
		1	2	3	4	5	6
Fish markets/Landing centre							
1	Small						
2	Medium						
3	Large						
Total							
Fish feed mill plants							
1	Small						
2	Medium						
3	Large						
Fish processing Plants							
a)	**Pre-processing**						
b)	**Processing**						
1	Small						
2	Medium						
3	Large						
Total							
Grand Total							

Annexure-4.2.4.V: Format for Estimation of water requirement for Carp production in ponds and tanks

Production system		Total Potential area (ha)	Total water required for potential area (ha-m)	Area under culture (ha)	Total water required for area under culture (ha-m)	Surface water required (ha-m)	Ground water required (ha-m)	Total water required (ha-m)
		1	2	3	4	5	6	7
Table fish Production (Grow-out phase)								
a)	Traditional							
b)	Semi-intensive							
c)	Intensive							
Total								
Fingerling Production (Rearing phase)								
Fry (nursery phase)								
a)	Earthen ponds							
b)	Cement tanks							
c)	**Total**							
Brood stock Production (brood pond)								
Total								

Annexure 4.2.4.VI: Format for Estimation of water requirement for Magur (*Clarias batrachus*) production

Production system		Total Potential area (ha)	Total water required for potential area (ha-m)	Area under culture (ha)	Total water required for area under culture (ha-m)	Surface water required (ha-m)	Ground water required (ha-m)	Total water required (ha-m)
		1	2	3	4	5	6	7
Table fish Production (Grow-out phase)								
a)	Traditional							
b)	Semi-intensive							
c)	Intensive							
Total								
Fingerling Production								

(Rearing phase)								
Fry (nursery phase)								
a)	Earthen ponds							
b)	Cement tanks							
c)	**Total**							
Brood stock Production (brood pond)								
Total								

Annexure-4.2.4.VII: Format for Estimation of water requirement for Pangasius catfish (*Pangasionodon hypophthalmus*) production

Production system		Total Potential area (ha)	Total water required for potential area (ha-m)	Area under culture (ha)	Total water required for area under culture (ha-m)	Surface water required (ha-m)	Ground water required (ha-m)	Total water required (ha-m)
		1	2	3	4	5	6	7
Table fish Production (Grow-out phase)								
a)	Traditional							
b)	Semi-intensive							
c)	Intensive							
Total								
Fingerling Production (Rearing phase)								
Fry (nursery phase)								
a)	Earthen ponds							
b)	Cement tanks							
c)	**Total**							
Brood stock Production (brood pond)								
Total								

Annexure-4.2.4.VIII: Format for Estimation of water requirement for Freshwater Prawn production

Production system		Total Potential area (ha)	Total water required for potential area (ha-m)	Area under culture (ha)	Total water required for area under culture (ha-m)	Surface water required (ha-m)	Ground water required (ha-m)	Total water required (ha-m)
		1	2	3	4	5	6	7
Table fish Production (Grow-out phase)								
a)	Traditional							
b)	Semi-intensive							
c)	Intensive							
Total								
Fingerling Production (Rearing phase)								
Fry (nursery phase)								
a)	Earthen ponds							
b)	Cement tanks							
c)	**Total**							
Brood stock Production (brood pond)								
Total								

Annexure-4.2.4.IX: Format for Estimation of water requirement for Tiger shrimp (*Penaeus monodon*) production

Production system		Total Potential area (ha)	Total water required for potential area (ha-m)	Area under culture (ha)	Total water required for area under culture (ha-m)	Surface water required (ha-m)	Ground water required (ha-m)	Total water required (ha-m)
		1	2	3	4	5	6	7
Table fish Production (Grow-out phase)								
a)	Traditional							
b)	Semi-intensive							
c)	Intensive							
Total								
Fingerling Production (Rearing phase)								

Fry (nursery phase)								
a)	Earthen ponds							
b)	Cement tanks							
c)	**Total**							
Brood stock Production (brood pond)								
Total								

Annexure-4.2.4.X: Format for Estimation of water requirement for Pacific white-leg shrimp (*Litopenaeus vannamei*) production

Production system		Total Potential area (ha)	Total water required for potential area (ha-m)	Area under culture (ha)	Total water required for area under culture (ha-m)	Surface water required (ha-m)	Ground water required (ha-m)	Total water required (ha-m)
		1	2	3	4	5	6	7
Table fish Production (Grow-out phase)								
a)	Traditional							
b)	Semi-intensive							
c)	Intensive							
Total								
Fingerling Production (Rearing phase)								
Fry (nursery phase)								
a)	Earthen ponds							
b)	Cement tanks							
c)	**Total**							
Brood stock Production (brood pond)								
Total								

Annexure-4.2.4.XI: Format for Estimation of water requirement for Indian White Shrimp (*Penaeus indicus*) production

Production system		Total Potential area (ha)	Total water required for potential area (ha-m)	Area under culture (ha)	Total water required for area under culture (ha-m)	Surface water required (ha-m)	Ground water required (ha-m)	Total water required (ha-m)
		1	2	3	4	5	6	7
Table fish Production (Grow-out phase)								
a)	Traditional							
b)	Semi-intensive							
c)	Intensive							
Total								
Fingerling Production (Rearing phase)								
Fry (nursery phase)								
a)	Earthen ponds							
b)	Cement tanks							
c)	**Total**							
Brood stock Production (brood pond)								
Total								

Annexure-4.2.4.XII: Format for Estimation of water requirement for Brackish water fin fishes production

Production system		Total Potential area (ha)	Total water required for potential area (ha-m)	Area under culture (ha)	Total water required for area under culture (ha-m)	Surface water required (ha-m)	Ground water required (ha-m)	Total water required (ha-m)
		1	2	3	4	5	6	7
Table fish Production (Grow-out phase)								
a)	Traditional							
b)	Semi-intensive							
c)	Intensive							
Total								
Fingerling Production								

(Rearing phase)							
Fry (nursery phase)							
a) Earthen ponds							
b) Cement tanks							
c) **Total**							
Brood stock Production (brood pond)							
Total							

Annexure-4.2.4.XIII: Format for Estimation of water requirement for other Fish production (Write species, if possible)

Production system	**Total Potential area (ha)**	**Total water required for potential area (ha-m)**	**Area under culture (ha)**	**Total water required for area under culture (ha-m)**	**Surface water required (ha-m)**	**Ground water required (ha-m)**	**Total water required (ha-m)**
	1	2	3	4	5	6	7
Table fish Production (Grow-out phase)							
a) Traditional							
b) Semi-intensive							
c) Intensive							
Total							
Fingerling Production (Rearing phase)							
Fry (nursery phase)							
a) Earthen ponds							
b) Cement tanks							
c) **Total**							
Brood stock Production (brood pond)							
Total							

Annexure-4.2.4.XIV: Format for Water requirement for Finfish/Shellfish Hatcheries

Type of hatchery	Available Hatcheries					Additional Future Hatcheries		Total future water requirement (thousand m^3)/ yr
	No. of units	Av. water requirement/ unit (thousand m^3)/ yr	Source of water		Total water required (thousand m^3)/ yr	No. of units	Total water required (thousand m^3)/ yr	
			Ground water (thousand m^3)/ yr	Surface water (thousand m^3)/ yr				
Carp Hatchery	1	2	3	4	5	6	7	8
1. Small								
2. Medium								
3. Large								
4. Total								
Magur Hatchery								
Pangasius Hatchery								
1. Small								
2. Medium								
3. Large								
4. Total								
Freshwater prawn Hatchery								
1. Small								
2. Medium								
3. Large								
4. Total								
Other Species Hatchery								
Rainbow Trout Hatchery								
Mahseer Hatchery								
Shrimp Hatchery								
1. Small								
2. Medium								
3. Large								
4. Total								
Brackishwater Fish Hatchery								
Ornamental Fish Hatchery								
Marine Fish Hatchery								
Total								
Grand Total								

Annexure-4.2.4.XV: Format for Consolidated water requirement for aquaculture

Sector Name	Total area (ha)	Total production (Ton)	Total water requirement (ha-m)
Grow-out production	1	2	3
Freshwater aquaculture			
Coldwater aquaculture			
Wetlands (Pen culture)			
Inland saline			
Brackish water			
Marine (ornamental fish)			
	Total area (ha)	**Quantity of seed produced (in million)**	**Total water requirement (ha-m)**
Seed Production (Hatchery and nursery rearing)			
Freshwater Hatchery			
Brackish water Hatchery			
Marine Hatchery (food and ornamental fishes)			
Total			

Annexure-4.2.4.XVI: Format for Consolidated water requirement for Fisheries and Aquaculture

Sector Name	Total production (Ton)	Total available water for the sector (ha-m)	Additional water demand for available potential area (ha-m)	Total future water requirement (ha-m)
	1	2	3	4
Aquaculture				
1. Freshwater				
2. Brackish water				
3. Inland saline water				
4. Marine				
Total				
Open water Fisheries				
1. Freshwater				
2. Brackish water				
Total				
Grant Total				

Annexure-4.2.4.XVII: Performance indicator for Fish Farms/Hatcheries

Category	Indicator	Unit	Bench mark	District-1	District-2
Water quantity Measurement	Fish farms/hatcheries with water meters	%			
	Fish farms/hatcheries undertaking internal water audit	%			
	Fish farms/hatchries undertaking external water audit	%			
	Submitting monthly water balance to state pollution control board (SPCB).	%			
Water conservation	Fish farms/hatcheries recycling water in fish ponds	%			
	Fish farms/hatcheries recycling water in other units such as agriculture/floriculture/horticulture	%			
	Fish farms/hatcheries recycling pond water in dairy, duckery, poultry, piggery units, etc.	%			
	Fish farms where zero exchange system of farming is carried out on intensive scale	%			
Water demand management	Nursery rearing area of the total farm area	%			
	Fingerling rearing area of the total farm area	%			
	Table fish production area of the total farm area	%			
	Fish Broodstock area of the total farm area	%			
	Fish farms having own fish feed unit	%			
	Water demand in hatcheries	%			
	Water consumption (in L) per 1 kg fry fish production	L			

Water productivity	Water consumption (in L) per 1 Kg fingerlings fish production	L			
	Water consumption (in L) per 1 Kg table fish production	L			
	Water consumption (in L) per 1 Kg brood fish production	L			
	Water consumption (in L) per lakh spawn production	L			
Water quality	Farms used water without testing water quality	%			
	Farms test and correct water quality suitable for fish production (liming/bleaching/aerating/adding other chemicals)	%			
	Farms received notices from Coastal Aquaculture Authority/PCB or other agencies for the violation of statute.	%			
Waste Water	Total Waste Water Generated				
	Wastewater drained out from the nursery ponds	%			
	Waste water drained out from the fingerling ponds	%			
	Wastewater drained out from the production ponds	%			
	% Treated water used in farm activity (gardening, cooling of sheds etc)	%			
	% of fish farms with zero liquid discharge (ZLD).	%			
	Fish farms with waste water treatment plant/Water purification system	%			
Capacity building	Farms conducting training for farmers/entrepreneurs/employees for minimizing water use.	%			
Water Economics	Cost of 1 lt Water				
	% of Fish farms paying water bills	%			
Others	% of Fish farms having fish carcass disposable system	%			

Annexure-4.2.4.XVIII: Performance indicator for Fish Processing Plants

Category	Indicator	Unit	Bench mark	District-1	District-2
Water quantity Measurement	Fish Processing units with water meters	%			
	Fish Processing units undertaking internal water audit	%			
	Fish Processing units undertaking external water audit	%			
	Submitting monthly water balance to state pollution control board (SPCB).	%			
Water conservation	Fish Processing units recycling water after treatment	%			
Water demand management	Water demand for washing fish	%			
	Water demand for disposal of fish waste	%			
	Water demand for ice production in fish processing plant	%			
	Water demand for packing fish under ice	%			
	Water demand for preparation of value-added fish products	%			
	Water demand for washing processing units	%			
	Water demand for human consumption	%			
Water productivity	Water consumption (in L) per 1 kg processed fish production	L			
	Water consumption (in L) per 1 Kg value-added fish production	L			
Waste Water	Total Waste Water Generated				
	Wastewater drained out from washing of fish	%			
	Waste water drained out from dressing of fish	%			
	Wastewater drained out from processing of fish	%			
	Wastewater drained out from value-added product units	%			
	Processing plants with waste water treatment plant/Water purification system	%			
	Processing plants received notices from PCB or other agencies for the violation of statute.				

Capacity building	Processing plants conducting training for entrepreneurs/employees for minimizing water use.	%			
Water Economics	Cost of 1 lt Water				
	% of Fish Processing plants paying water bills	%			
Others	% of Fish Processing plants having fish carcass disposable system	%			

Annexure-4.2.4.XIX: Performance indicator for Fish Markets and Fish Landing Centres

Category	**Indicator**	**Unit**	**Bench mark**	**District-1**	**District-2**
Water quantity Measurement	Fish Markets with water meters	%			
	Fish Landing Centres with water meters				
	Fish Markets undertaking internal water audit	%			
	Fish Landing Centres undertaking internal water audit	%			
	Fish Feed plant units undertaking external water audit	%			
	Fish Landing Centres undertaking external water audit	%			
	Submitting monthly water balance to state pollution control board (SPCB).	%			
Water conservation	Fish Markets recycling water after treatment	%			
	Fish Landing Centres recycling water after treatment	%			
Water demand management	Water demand for cleaning/dressing of fish in Fish Market	%			
	Water demand for human consumption in Fish Market				
	Water demand for cleaning/dressing of fish in Fish Landing centres				
	Water demand for human consumption at Fish Landing Centres	%			
Water productivity	Water consumption (in L) per 1 kg sold fish in Fish Market	L			
	Water consumption (in L) per 1 kg sold fish sold at Fish Landing Centre	L			
Waste Water	Total Waste Water Generated				
	Wastewater from Fish Market	%			
	Wastewater from Fish Landing Centres				
	Fish Markets with waste water treatment plant/Water purification system	%			
	Fish Landing Centres with waste water treatment plant/Water purification system				
	Fish Markets received notices from PCB or other agencies for the violation of statute				
	Fish Landing Centres received notices from PCB or other agencies for the violation of statute				
Water Economics	Cost of 1 lt Water for cleaning per kg fish in Fish Market	Per Kg fish sold			
	Cost of 1 lt Water for cleaning per kg fish in Fish Landing Centre	Per Kg fish sold			
	Fish Markets paying water bills	%			
	Fish Landing Centres paying water bills	%			
Others	% of Fish Markets having waste disposable system	%			
	% of Fish Landing centres having waste disposable system	%			

Annexure-4.2.4.XX: Performance indicator for Fish Feed Plants

Category	**Indicator**	**Unit**	**Bench mark**	**District-1**	**District-2**
Water quantity Measurement	Fish Processing units with water meters	%			
	Fish Feed plant units undertaking internal water audit	%			
	Fish Feed plant units undertaking external water audit	%			
	Submitting monthly water balance to state pollution control board (SPCB).	%			
Water conservation	Fish Feed plants units recycling water after treatment	%			

Water demand management	Water demand for Fish Feed plants	%			
	Water demand for Cleaning/Washing of Fish Feed Plant	%			
	Water demand for human consumption	%			
Water productivity	Water consumption (in L) per 1 kg processed fish production	L			
	Water consumption (in L) per 1 Kg value-added fish production	L			
Waste Water	Total Waste Water Generated				
	Wastewater from washing of plant	%			
	Fish Feed plants with waste water treatment plant/Water purification system	%			
	Processing plants received notices from PCB or other agencies for the violation of statute.				
Water Economics	Cost of 1 lt Water	Per Kg feed			
	Fish Feed plants paying water bills	%			
Others	% of Fish Feed plants having waste disposable system	%			

Annexure-4.2.4.XXI: Format for Crop productivity of different commodities

Crop	Average yield of state (t/ha/crop or year)	National average (t/ha/crop or year)	Attainable yield (t/ha/crop or year)	% deviation from national yield	% deviation from attainable yield
	1	2	3	4	5
Polyculture of IMC					
Monoculture of magur					
Monoculture of pangus in earthen ponds					
Monoculture of pangus in cement tanks					
Monoculture of pangus in recirculatory system					
Monoculture of freshwater prawn					
Culture of rainbow trout in raceways					
Culture of mahseer in ponds					
Culture of Pacific white-leg shrimp in inland saline ponds					
Culture of tiger shrimp in brackish water ponds					
Culture of Pacific white-leg shrimp in brackish water ponds					
Culture of brackish water fin fishes					
Monoculture of pangus in cages in reservoirs					
Polyculture of IMC under pen farming in wetlands					

Annexure-4.2.4.XXII: Format for Analysis of water productivity of different commodities

Crop	Existing water productivity (t/ha/crop or year)	Attainable water productivity (t/ha/crop or year)	% deviation from attainable yield	Economic water productivity (t/ha/crop or year)
	1	2	3	4
Polyculture of IMC				
Monoculture of magur				
Monoculture of pangus in earthen ponds				
Monoculture of pangus in cement tanks				
Monoculture of pangus in recirculatory system				
Monoculture of freshwater prawn				
Culture of rainbow trout in raceways				
Culture of mahseer in ponds				
Culture of Pacific white-leg shrimp in inland saline ponds				
Culture of tiger shrimp in brackish water ponds				
Culture of Pacific white-leg shrimp in brackish water ponds				
Culture of brackish water fin fishes				
Monoculture of pangus in cages in reservoirs				
Polyculture of IMC under pen farming in wetlands				

Annexure-4.2.4.XXIII: Format for Aquaculture intensity in Freshwater ponds/tanks

Name of the district	Gross pond/tank area for aquaculture (ha)	Net pond/tank area for aquaculture (ha)	Intensity of aquaculture in ponds/tanks (%)
	1	2	3

Annexure-4.2.4.XXIV: Format for Aquaculture intensity in Brackish water ponds/tanks

Name of the district	Gross pond/tank area for aquaculture (ha)	Net pond/tank area for aquaculture (ha)	Intensity of aquaculture in ponds/tanks (%)
	1	2	3

Annexure-4.2.4.XXV: Format for Aquaculture intensity in Freshwater wetlands

Name of the district	Gross wetland area for fisheries (ha)	Net wetland area utilized for fisheries (ha)	Intensity of fisheries in wetlands (%)
	1	2	3

Annexure-4.2.4.XXVI: Format for Aquaculture intensity in Brackish water wetlands

Name of the district	Gross wetland area for fisheries (ha)	Net wetland area utilized for fisheries (ha)	Intensity of fisheries in wetlands (%)
	1	2	3

Annexure-4.2.4.XXVII: Format for cage culture intensity in reservoirs

Name of the reservoir	Gross reservoir area (ha)	Net reservoir area utilized for cage culture (ha)	Intensity of cage culture in reservoir (%)
	1	2	3

Annexure-4.2.4.XXVIII: Format for pen culture intensity in wetlands

Name of the wetland	Gross wetland area (ha)	Net wetland area utilized for pen culture (ha)	Intensity of pen culture in reservoir (%)
	1	2	3

Annexure-4.2.4.XXIX: Format for intensity of integrated farming

Name of the district	Gross water area (ha)	Net area utilized for integrated farming (ha)	Intensity of integrated farming in reservoir (%)
	1	2	3

Annexure-4.2.4.XXX: Format for annual relative canal water supply

Name of the district	Gross canal area (ha)	Net canal area utilized for fish culture (ha)	Intensity of fish farming in canal (%)
	1	2	3

Annexure-4.2.4.XXXI: Format for establishment of fish feed mills

Name of the district	Quantity of fish feed required for the whole district (ton)	Quantity of fish feed currently produced (ton)	Intensity of feed available currently (%)
	1	2	3

Annexure-4.2.4.XXXII: Format for development of modern post-harvest management infrastructure system for fish

Name of the district	Volume of post-harvest facilities required	Volume of post-harvest facilities available	Intensity of post-harvest facilities (%)
	1	2	3

Annexure-4.2.4.XXXIII: Format for development of cold-chain system for fish and fish products

Name of the district	Volume of cold-chain system required	Volume of cold-chain system available	Intensity of cold-chain system (%)
	1	2	3

Annexure-4.2.4.XXXIV: Format for land use change pattern including conversion of wasteland to productive land

Name of the district	Gross wasteland area (ha)	Net wasteland area utilized for fish culture (ha)	Intensity of wasteland utilized for fish culture (%)
	1	2	3

4.2.3. Industry and Infrastructure

4.2.3.1 Thermal Power Plants

1.0 Subject Matter

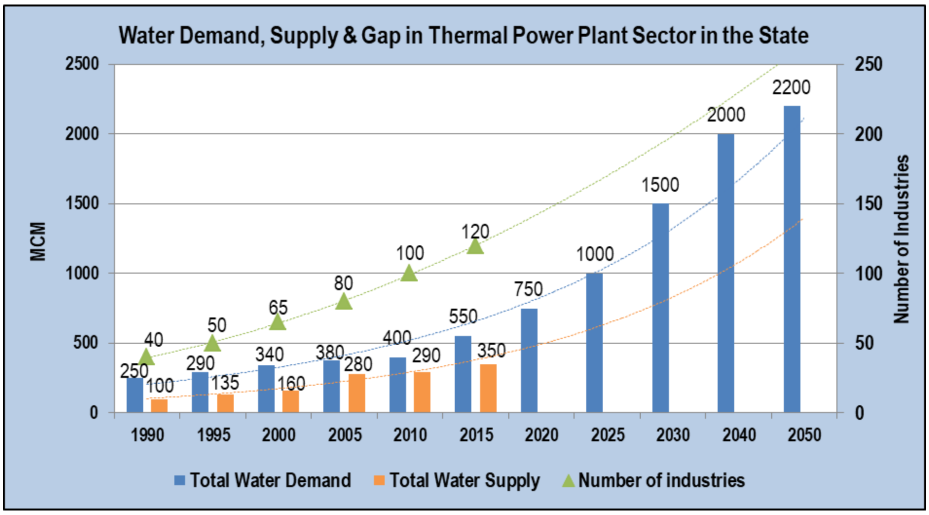
(Present a brief historical background on the growth of industry – a bird's eye view picture and analysis of the Industry using the information/ tables) provided in the annexure.

a) GIS based map depicting location of all the Thermal Power Plants (TPP-*Coal based/Combined cycle gas based/ others)* District level
b) Power generation from Thermal Power Plants (TPP) in the State: Table-1.
c) Time trend of the number (growth) of Thermal Power Plants. Table-2.

2.0 Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Thermal Power Plants

2.1 Water Supply & Demand for Thermal Power Plants in the State

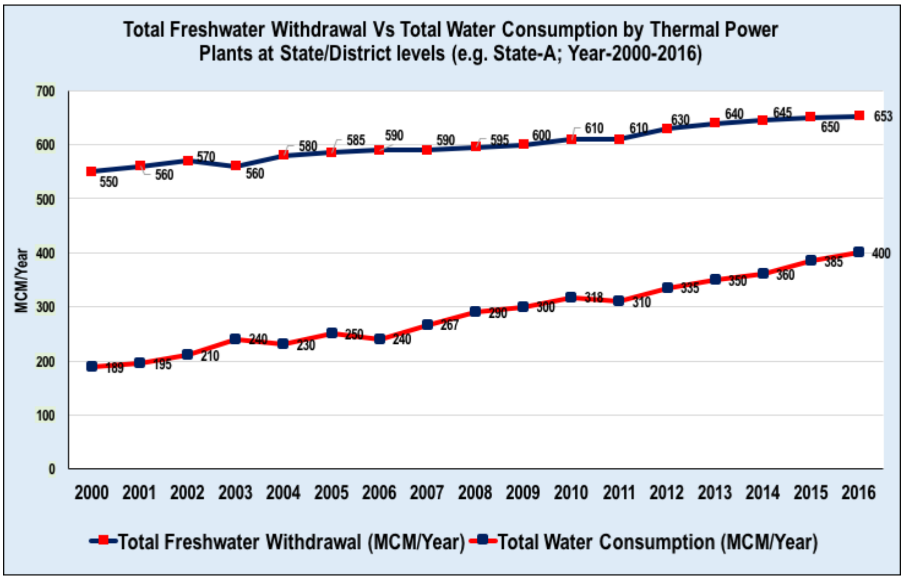
a) Time trend of total water demand and actual current water supplied to the TPPs along with growth of TPP in the state. *Provide trend analysis (10-15 years) with breakup. (Annexures-2, 3a, 3b)*
An example is presented for trend analysis for water demand and supply below (for illustration only)



2.2 Total Freshwater Withdrawal and Actual Water Consumption by Thermal Power Plants in the State

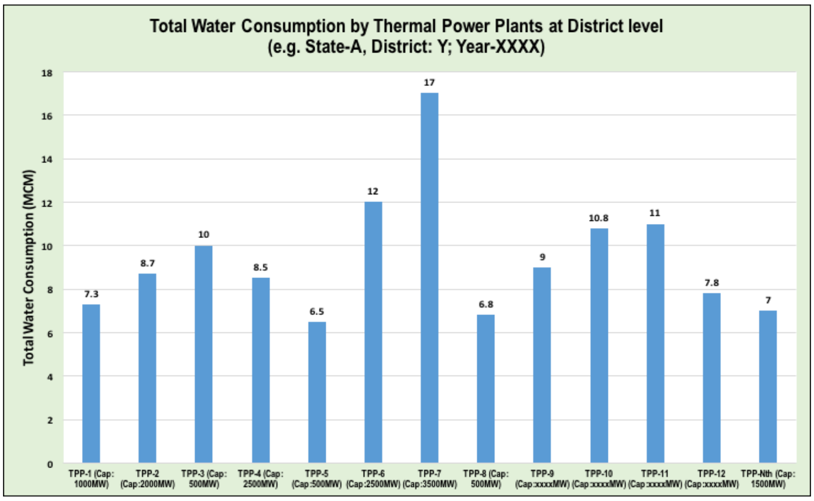
a) Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Thermal Power Plants in a State:

It represents a comparative trend of the Total Freshwater Withdrawal by Thermal Power Plants in a State Vs the Actual Water Consumption by all the Thermal Power Plants in the State (Unit: e.g. MCM/Year)*(Refer Annexure-4&5).* Besides reflecting the magnitude of water consumption against withdrawal over a period, it also indirectly reflects the impact of use of efficient technologies and processes such as wastewater recycle/reuse that reduces the demand and rate of freshwater withdrawal. For understanding the trends, data comparison can be done for last 15 years and continued on annual basis. An example (for illustration only) is given below.



(The target should be that the freshwater withdrawal and actual water consumption curves move close to each other and at the end reach the status of zero discharge; the smallest possible gap between withdrawal and consumption).

b) Comparative status of total water consumption by each thermal power plant level:
Represents a comparative status of Total Actual Water Consumption by all the Thermal Power Plants (Unit: MCM/Year) *(Refer Annexure-3(b)).*It gives variation and priority focus amongst the individual TPPs. For understanding the trends, it can be generated at 5 years' intervals up to current year (viz. for the years 2000, 2005, 2010, 2015) and subsequently every year viz. 2016, 2017 and so on. An example (for illustration only) is given below.



c) State Water Budgeting: *(Refer Annexure-3).*

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All TPPs				
GRAND TOTAL	xxx	xxx	xxx	xxx

3.0 Issues and Challenges

Illustrative issues and challenges may include

- Waste water disposal and associated surface and ground water contamination
- Water demand and supply issues in the TPP sector in the state, provide details
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.

- Issues related to water pricing in TPP
- Technology availability, affordability and efficiency related issues
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0 Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0 Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Thermal Power Plant sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the TPPin state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the industrial water consumption and supply.

Governing body for Thermal Power Plants	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Ministry of Power (MOP)	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by thermal power plants for the benefit of neighborhood/ local community/ Environment.

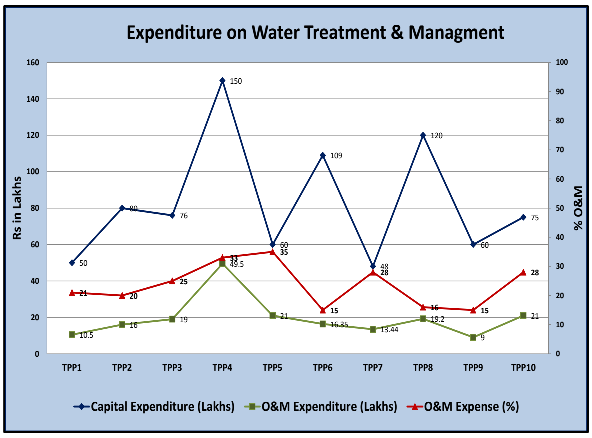
TPP	Any OE[2] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

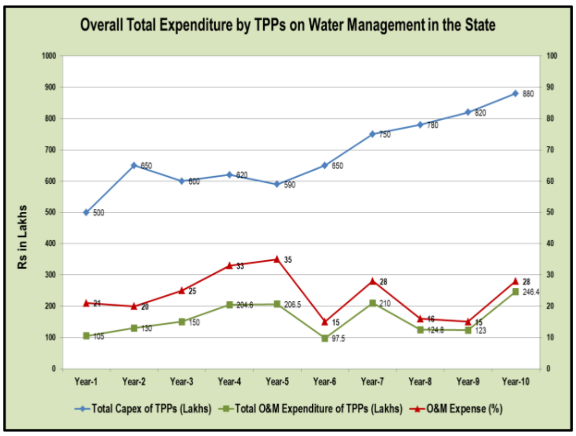
TPP	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics& Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost(Refer Annexure 6(a) & 6(b))
- Expenditure on Water management(Refer Annexure 6(c) & 6(d))





[2]Overexploited block of groundwater

6.0 Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, industrial process and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Industry Sector.

- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring: Example is provided below
  No Designated/ responsible Official / team for Water management
  Lack of measurement equipment &standard infrastructure
  Unskilled manpower for Measurement & Monitoring
  No centralized data base and analytical support etc

7.0 Performance Indicators:

a. Benchmarks on water use *(Refer table-13)*
b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Category	Indicator		Bench Mark/ Unit	TPP.1	TPP.2	TPP.3
Measurement	**Water Quantity**					
	Measurement at Raw water source	Real Time/ Automatic	Yes/No			
		Use of ICT (SCADA)	Yes/No			
	Measurement at Industrial process	Real Time/ Automatic	Yes/No			
		Use of ICT (SCADA)	Yes/No			
	Waste Water (generation, recycle/reuse & discharge)	Real Time/ Automatic	Yes/No			
		Use of ICT (SCADA)	Yes/No			
	Undertaken internal Water Audit in the last Year?		Yes/No			
	Undertaken Third party Water Audit in the last Year?		Yes/No			
	Submitting monthly water balance to state pollution control board (SPCB)?	Yes/No	Yes/No			

Performance Indicators

Category	Indicator	Benchmark/ Units	TPP.1	TPP.2	TPP.3
Management Plans	Having Water Management Plans?	Yes/No			
	Whether Water Managements are operational	Yes/No			
Water Conservation	Have taken up RWH/ GW Recharge?				

	% of total Water requirement being met from Treated Waste Water				
	Have taken up Restoration measures?				
	% of reduction of water consumption compared to the previous year.				
	Introduction water efficient technologies in process to reduce water consumption.	Yes/No			
Water Use Efficiency *(Annexure-7)*	**Specific Water Consumption** (SWC); (m^3/MWh) *(refer Annexure-7(a),(b) & (c))*				
	Have specific water consumption within the norms/bench marks/standards				
Water Productivity*(Annexure-8)*	**Water Productivity** (INR/m^3) Quantity of water necessary to produce these goods *(refer Annexure-8(a)&(b))*				
Water Intensity *(Annexure-9)*	**Water Intensity**; (m^3/1000 Rs or m^3/US$) Volume of water used per unit of gross value added (GVA) *(refer Annexure-9(a)&(b))*				
Water Foot print *(Annexure-10)*	Total volume of freshwater used directly and/or indirectly for the industrial operation/product *(refer Annexure-10(a))*				
Waste Water *(Annexure-11)*	Total Waste Water Generated				
	% Waste Water Treated				
	% Treated waste water recycled				
	Implementation/ achieved zero liquid discharge (ZLD).				
Water Quality *(Annexure-12)*	Installation of online water quality monitoring systems.				
	Compliance with the wastewater quality discharged norms.				
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).				
	No. of Industrial areas where Water Quality has adversely affected				
Economics	Whether economic incentives are in place by state to encourage water efficiency & conservation?				

	Whether economic disincentive mechanisms like penalties etc. are in place by state to discourage water wastage & inefficient use?				
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?				

8.0 Reforms undertaken/ being undertaken/ proposed if any

9.0 Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1. Total number, types & power generation capacity of Thermal Power Plants in the State

Total Power Generation from Thermal Power Plants in the State				
Fuel type	**No of TPPs**	**Total Installed Capacity of all the TPP** (MW)	**Total Power Generation Capacity of all the TPP** (MW)	**Daily Average Power Generation of all the TPP** (MW)
Coal				
Gas / Liquid Fuel				
Liquid Fuel				
Total				

2. Growth Trend of Thermal Power Plants over a period and Water Demand and Supply position

TPP		**Years**					
		1990	**1995**	**2000**	**2005**	**2010**	**2017**
No. of Industries							
Coal							
Gas / Liquid Fuel							
Liquid Fuel							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3. Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Thermal Power Plants: (MCM) Present Water Year: 1st June to 31st May next year										
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Thermal Power Plants: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for TPP

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All TPPs	xxx	xxx	xxx	xxx

4. Proportion of Water withdrawal and consumption by TPP against total industries in the State

TPP –Fuel type	Total Water Withdrawal by all TPP (%) *(Refer Annexure-4(a))*	Total water withdrawal by all the Industries in state	Total Water Consumption by all TPP (%) *(Refer Annexure-4(b))*	Total water Consumption by all the Industries in state

Coal				
Gas / Liquid Fuel				
Liquid Fuel				
Others				
Total				

4(a) Total Water Withdrawal/Abstraction by **Thermal Power Plants** (**TPP**) in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by TPP Sector (\%)} = \frac{\text{(Total water withdrawal by all the TPP in the State)} \times 100}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **Thermal Power Plants** in the state as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water consumption by TPP Sector (\%)} = \frac{\text{(Total actual water consumption by all TPP in State)} \times 100}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal by all TPP and Total Actual Water Consumption by all TPP in the State

	CY-11	**CY-10**	**CY-9**	**CY-8**	**CY-7**	**CY-6**	**CY-5**	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Total Fresh Water Withdrawal by all TPP (MCM)												
Total Actual Water Consumption by all TPP (MCM)												

5. Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Total Fresh Water Withdrawal by all TPP (%) *(Refer Annexure-5(a))*						
Total Actual Water Consumption by all TPP (%) *(Refer Annexure-5(b)*						

5(a) Total Water Withdrawal/Abstraction by **Thermal Power Plants** (**TPP**) in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by TPP Sector (\%)} = \frac{\text{(Total water withdrawal by all the TPP in the State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Thermal Power Plants** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by TPP Sector (\%)} = \frac{\text{(Total actual water consumption by all TPP in State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

6. Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	**CY-5**	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex of TPPs (Lakhs)						
Total O&M Expenditure of TPPs (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure Plant level for the Current Year- CY

TPP	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
TPP1				
TPP2				
TPP3				
TPP4				
TPP5				
TPP6				
Total				

7. **Water Use Efficiency**:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit of product produced. In case of Thermal Power Plants it can be represented as the total volume of water used/consumed (m^3) per unit MWh (megawatt hour) of power generated/produced.

Specific Water Consumption (SWC) of Thermal Power Plants (TPP):

$$\textbf{Specific Water Consumption (SWC)};\ (m^3/MWh) = \frac{\text{Volume of water consumed by the TPP, } (m^3)}{\text{(Total Power Generated by the TPP), (MWh)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol.of Water Consumed(m^3)	Total Power Generated (MWh)	**SWC** (m^3/MWh)
TPP.1			
TPP.2			
TPP.3			

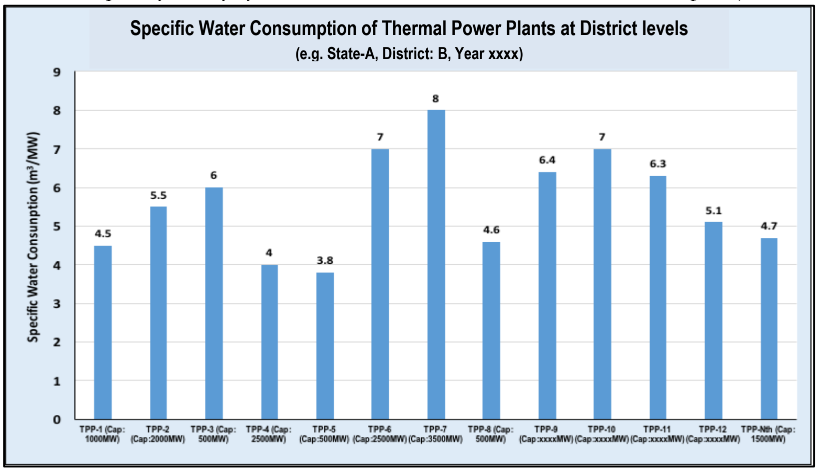
7(b) Average SWC of TPPs for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of TPPs in State						

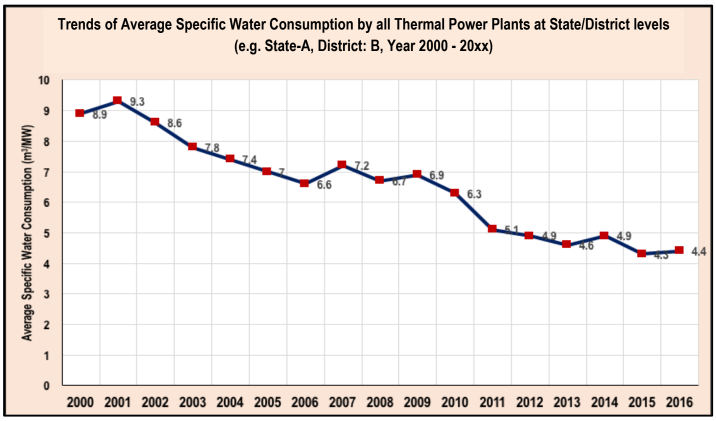
7(c) Specific Water Consumption (**SWC**)

SWC of Thermal Power Sector in the **State** {in **categories** such as **Small** (up to 500 MW), **Medium** (500-2500 MW) &**Large** (more than 2500 MW)}; Decadal trends or 15 years trend to be provided. This may be represented as below

- **Comparative Specific Water Consumption (SWC) of Thermal Power Plants:** Comparative reflection of SWC of all the thermal power plants in a district of a state (gives variation and priority focus amongst the TPP in each districts). For understanding the trends, it can be generated at 5 years' intervals up to 2015 (viz. for the years 2000, 2005, 2010, 2015) and subsequently every year viz. 2016, 2017 and so on. An example (for illustration only) is given below.



- **Trend of Specific Water Consumption (SWC) of Thermal Power Plants average and plant level:** It represents the average SWC of all the thermal power plants taken together at state & district levels (gives variation and priority focus amongst States & amongst districts within a state). For understanding the trends, it can be generated for last 15 years and continued on annual basis. An example (for illustration only) is given below.



- **Percentage of industries having specific water consumption within the norms/bench marks/standards:**

8. Water productivity:

This indicator relates the quantity of goods and services to the quantity of water necessary to produce these goods. The quantity of produced industrial goods and services can be measured in physical units (number of the products, weight etc.) or in monetary units (gross domestic product, gross added value). *Water productivity is the ratio of value of the amount of water withdrawal (in m3 or in m3 per capita) to the value of output from the industrial activities using this water.*
For e.g. *(illustrative purpose only)*

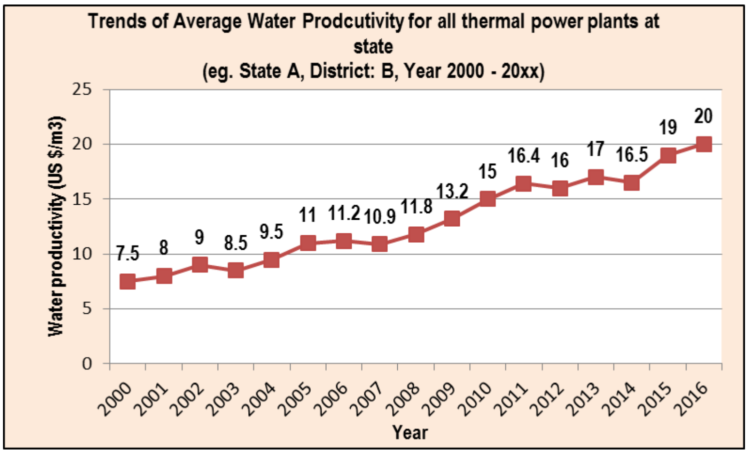
- **Water Productivity** as the total economic value created of the output/product by the Industry in the State per unit volume of water withdrawal or consumption

$$\textbf{Water Productivity}\ (\text{INR/m}^3) = \frac{\text{(Total economic value created of the output/product by the Industry), INR}}{\text{(Total Volume of freshwater withdrawn/consumed), m}^3}$$

OR

Water Productivity in terms of **GVA (Gross Value Added)**; (INR/m³)

$$= \frac{\text{(Total Value of Power Production – Value of inputs other than water), INR}}{\text{(Total Volume of freshwater consumed), m}^3}$$



8(a) Water Productivity in terms of **GVA for Current Year**

	Value of Power Production	Value of inputs other than water	Total Volume of freshwater consumed	**(Gross Value Added)**; (INR/m³)
TPP.1				
TPP.2				
TPP.3				
Total				

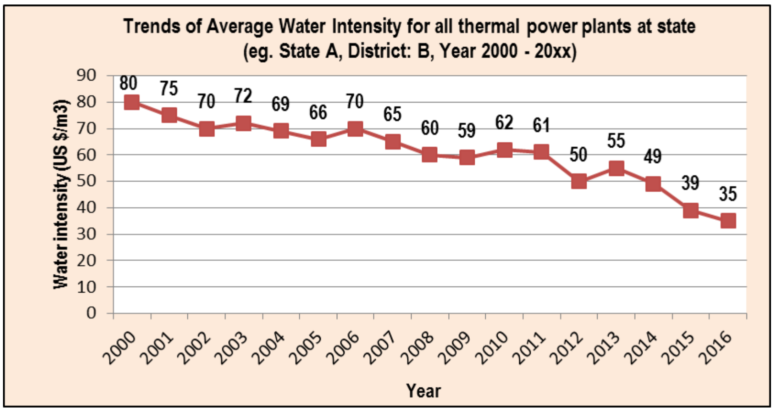
8(b) Average Water Productivity in terms of **GVA for the State – time trend (also represent through Graph)**

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Average Water Productivity (GVA); (INR/m³)						

9. Water Intensity:

Intensity of water use in a particular economic sector is defined as the volume of water used per unit of gross value added (GVA) and measures the pressure of the economy on water resources in relation to its economic impact, a relevant indicator for sustainable development and resource efficiency policies. It can be used primarily for policies of water allocation among different sectors of the economy since in water-scarce regions, where there is competition for water between various uses, water is likely to be allocated to the less intensive use. An example (for illustration only) is given below.

$$\textbf{Water Intensity}; (m^3/1000\text{ Rs or } m^3/US\$) = \frac{\text{Volume of water consumed by the Industry, } (m^3)}{\text{(Unit value added by Power Generation), (1000 Rs or US\$)}}$$



9(a) Water Intensity for Current Year

	Volume of water consumed	Unit value added by Power Generation	**Water Intensity**; (m³/1000 Rs or m³/Rs)
TPP.1			
TPP.2			
TPP.3			
Total			

9(b) Average Water Intensity in terms
for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Intensity (m^3/1000 Rs or m^3/Rs)						

10. Water Footprint:

The total volume of freshwater used directly and/or indirectly for the industrial operation/product. It includes the water used in industries own operation/process and its supply chain. Total Water footprints are composed of estimates for blue water (used from freshwater sources), green water (rain or soil water taken up by plants), and grey water (water required to dilute wastewater to be fit for discharge).

Water Footprint for Thermal Power Generation

Water Footprint (WF) of electricity production = Sum of WF of Operations of the plant and WF of Supply Chain

i.e. **Water Footprint[3] (WF) = $WF_{\text{Supply Chain}} + WF_{\text{Operations}}$**

$$WF_{e,total} = WF_{h,f}[f] \times FEE[f] + WF_{e,c}[f] + WF_{e,o}[f] \times E[F]$$

Where,
$WF_{h,f}[f]$ is the WF of fuel f per unit of thermal energy ($m^3\ TJ_h^{-1}$), FEE[f] is the annual consumption of fuel f to produce electricity (TJ_h per year), $WF_{e,c}[f]$ is the WF related to the construction of the power plant expressed per unit of electricity produced over the lifetime of the plant ($m^3\ TJ_e^{-1}$), $WF_{e,o}[f]$ is the operational WF per unit of electricity produced from fuel f ($m^3\ TJ_e^{-1}$), and E[f] is the annual production of electricity from fuel f (TJ_e per year).

10(a) Water Foot print for Current Year

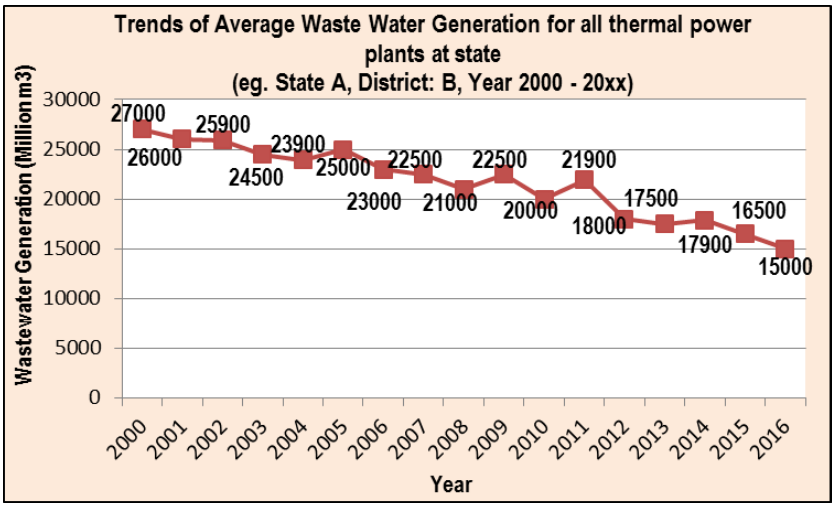
	$WF_{\text{Supply Chain}}$	$WF_{\text{Operations}}$	Total
TPP.1			
TPP.2			
TPP.3			
Total			

11. Waste Water

	Bench Mark/ Units	TPP.1	TPP.2	TPP.3
Total Waste Water Generated				
% Waste Water Treated				
% Waste Water Recycled				
• % Treated waste water used in Industrial activity				
• % Treated waste water used in Green belt				
• % Treated waste water used in others				
% Total quantum of wastewater discharged.				
Implementation/ achieved zero liquid discharge (ZLD).				

An example (for illustration only) is given below.

[3]**Source**: Mesfin M. Mekonnen, P. W. Gerbens-Leenes and Arjen Y. Hoekstra; The consumptive water footprint of electricity and heat: a global assessment; Environmental Science Water Research & Technology; Royal Society of Chemistry; 2015; DOI: 10.1039/c5ew00026b



11(a) Use of Treated Waste Water

	Source of Waste Water	Source of Treated Waste Water for reuse	Qty. of Treated WW consumed	Total Water Consumption	% use of Treated WW out of total Water Consumption
TPP1					
TPP.2					
TPP.3					

12. Water Quality

		Bench Mark	TPP.1	TPP.2	
Water Quality	Installation of online water quality monitoring systems.				
	Compliance with the wastewater regulatory quality discharge norms.				
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

13. Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for each industrial sector in state.

13(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	Unit Value	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	m^3/MWh		
2	Waste Water generation	m^3/MWh		
3	Waste Water discharged	m^3/MWh		

13(b) Existing benchmarks/norms in certain sectors for reference

Benchmarks:

Thermal power sector

	Parameters	Unit Value	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	m^3/MWh	2.5 - 3.5[4]	0.1 – 0.15 (dry cooling)

[4]http://cbip.org/25262017ConferenceBatraji/Presentation/6.New%20Env.Norms.pdf

				2.2 – 2.4 (wet cooled)[5]
2	Waste Water generation	m^3/MWh		
3	Waste Water discharged	m^3/MWh	Zero discharge (for SWC 2.5)	

Norms:
Thermal power plants[6]:
MOEF Notification (07th December 2015)

- All plants with once-through cooling shall install cooling towers and achieve specific water consumption max. 3.5 m^3/MWh within 2 years period.
- All existing CT based plants shall reduce specific water consumption up to maximum 3.5 m^3/MWh within a period of two years.
- New plants to be installed after 1st January 2017 shall have to meet specific water consumption up to maximum of 2.5 m^3/MWh and achieve zero wastewater discharge.

Also, in the revised (Electricity) tariff policy notified by the government of India on January 28, 2016, there is a provision that now requires that "the thermal power plant(s) including the existing plants located within 50 km radius of sewage treatment plant of any municipality / local bodies / similar organization shall… mandatorily use treated sewage water produced by these bodies…"

The recovered water from ZLD-ETP through Reverse Osmosis (R.O.)/ Multi Effect Evaporator (MEE) shall be re-used in the process by the units and no ground water abstraction is allowed except for make-up water and drinking water purpose as assessed by respective State Pollution Control Board (SPCBs)/Pollution Control Committee (PCCs).

[5] http://www.wrc.org.za/Knowledge%20Hub%20Documents/Research%20Reports/2383-1-14.pdf
[6] http://cbip.org/25262017ConferenceBatraji/Presentation/6.New%20Env.Norms.pdf

4.2.3.2 Textiles and Jute

1.0 Subject Matter

(Present a brief historical background on the growth of industry – a bird's eye view picture and analysis of the Industry using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Textile industries - District level
Type and total no. of Textiles industries in the State along-with production details *(Refer Annexure: Table-1)*
Time trend of the number (growth) of Textile industries in the state and Water Demand & Supply position. *(Refer Annexure: Table-2)*

2.0 Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Textile industries

Water Supply & Demand for Textile industries in the State

Time trend of total water demand and actual current water supplied to the Textile industries along with growth of industries in the state.
Provide trend analysis (10-15 years) with breakup. (Refer Annexure: Table – 2, 3a, 3b)

Total Freshwater Withdrawal and Actual Water Consumption by Textile industries in the State

Comparative trend of Total Freshwater Withdrawal vs Actual Water Consumption by Textile industries in the State:

State Water Budgeting: *Refer Annexure- Table 3(e)*

SECTOR (District-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
District 1				
District 2				
GRAND TOTAL	xxx	xxx	xxx	xxx

3.0 Issues and Challenges

Illustrative issues and challenges may include

- Waste water disposal and associated surface and ground water contamination
- Water demand and supply issues in the Textile sector in the state, provide details
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.
- Issues related to water pricing in Textile sector
- Technology availability, affordability and efficiency related issues
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0 Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0 Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Textile sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the Textile sector in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the industrial water consumption and supply.

Governing body for Textile sector	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Ministry of Textiles (MOT)	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by textile industries for the benefit of neighborhood/ local community/ Environment.

Textiles	Any OE[7] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Textiles	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics & Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure: Table 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure: Table 6(c) & 6(d))*

6.0 Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, industrial process and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Industry Sector.
- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring

7.0 Performance Indicators:
a. Benchmarks on water use *(Refer Annexure: Table-13)*
b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Performance Indicators

Category	**Indicator**	**Bench Mark** *(as applicable)*	**District- 1**	**District- 2**
Water Quantity Measurement	**Water Quantity**			
	% of textile industries with water flow meters			

[7]Overexploited block of groundwater

	% of textile industries undertaken internal water audit in the last year			
	% of textile industries undertaken external water audit in the last year			
	% of textile industries undertaken Third party Water Audit in the last Year			
Water Conservation	% of textile industries with water harvesting structures?			
	% reduction of total water demand compared to the previous year.			

Performance Indicators

Category	Indicator	Benchmark *(as applicable)*	District 1	District 2
Water Use Efficiency *(Annexure-7)*	**Specific Water Consumption** (SWC); (m^3/kg or tonne or m^3/metre of cloth produced) *(refer Annexure-7(a),(b) & (c))*			
	Have specific water consumption norms/bench marks established	Yes/No		
Waste Water *(Annexure-8)*	% reduction in wastewater generation as compared to previous year?			
Water Quality *(Annexure-9)*	% of Textile units with online water quality monitoring systems installed.			
	% of Textile units having compliance with the wastewater quality discharge norms.			
	% of Textile units discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?			
	% of Textile units notified for violating effluent discharge norms for discharge in natural resources (surface/ground)?			
Economics	Whether economic incentives are in place by state to encourage water efficiency & conservation?	Yes/No		
	Whether economic disincentive mechanisms like penalties etc. are in place by state to discourage water wastage & inefficient use?	Yes/No		
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?	Yes/No		

8.0 Reforms undertaken/ being undertaken/ proposed if any

9.0 Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1 Total number, types & production of Textile industries in the State

Type of Textile industries in the State and production details		
Type (based on raw material)	**No. of Textile industries**	**Daily Average Production** (kg or tonnes/day)
Cotton & blended		
Wool & blended		
Jute		
Silk		
Man-made (Polyester, Viscose, etc.)		
Total		

2 Growth Trend of Textile industries over a period and Water Demand and Supply position

Textiles		**Years**					
		1990	**1995**	**2000**	**2005**	**2010**	**2017**
No. of Industries							
Cotton & blended							
Wool & blended							
Jute							
Silk							
Man-made (Polyester, Viscose, etc.)							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3 Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Textile Industries: (MCM) Present Water Year: 1st June to 31st May next year										
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Textile Industries: (MCM)												
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**							**TOTAL**
Rain Water	Directly Harvested Rain Water											
Total												
Surface Water	Springs, Nallahs											
	Major Projects											
	Medium Projects											
	Minor Projects											
	Ponds, Tanks											
	Wetlands											
	Sea Water /Desalinated Water											
	Inter Basin Transfer											
Total												
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)											
	Dug cum Bore well (Total No. x Draft)											
	Bore/Tube wells (Total No. x Draft)											
	Others etc											
Total												
Treated Waste Water												
GRAND TOTAL												

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Textiles

Textiles in state (District-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All districts	xxx	xxx	xxx	xxx

4 Proportion of Water withdrawal and consumption by Textile industries against total industries in the State

Textiles – Raw material type	Total Water Withdrawal by Textile industries (%) *(Refer 4(a) below)*	Total water withdrawal by all the Industries in state	Total Water Consumption by Textile industries (%) *(Refer 4(b) below)*	Total water Consumption by all the Industries in state
Cotton & blended				
Wool & blended				
Jute				
Silk				
Man-made				
Total				

4(a) Total Water Withdrawal/Abstraction by **Textile industries** in the State as percentage of total water withdrawal by all industries in the State

$$\text{Total water withdrawal by Textile Sector (\%)} = \frac{\text{(Total water withdrawal by Textile units in the State) x 100}}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **Textile industries** in the State as percentage of total water consumption by all industries in the State

$$\text{Total water consumption by Textile Sector(\%)} = \frac{\text{(Total actual water consumption by Textile units in State) x100}}{\text{(Total water consumption by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal and Total Actual Water Consumption by all Textile industries in the State

	CY -11	CY -10	CY -9	CY -8	CY -7	CY -6	CY -5	CY -4	CY -3	CY -2	CY -1	CY / 2017
Total Fresh Water Withdrawal by all Textile industries (MCM)												
Total Actual Water Consumption by all Textile industries (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Fresh Water Withdrawal by all Textile industries (%) *(Refer 5(a) below)*						
Total Actual Water Consumption by all Textile industries (%) *(Refer 5(b) below)*						

5(a) Total Water Withdrawal/Abstraction by **Textile industries** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by Textile Sector (\%)} = \frac{\text{(Total water withdrawal by all the Textile units in the State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Textile industries** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by Textile Sector(\%)} = \frac{\text{(Total actual water consumption by all Textile units in State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	CY-4	CY-3	CY-2	CY-1

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Textile industries on water treatment and management (Lakhs)						
Total O&M Expenditure by Textile industries on water treatment and management (Lakhs)						
Total						

O&M Expense (%)						

6(d) Expenditure by Textile units at district level for the Current Year- CY

Textiles	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
District 1				
District 2				
District 3				
District 4				
District 5				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit of product produced. In case of Textiles it can be represented as the total volume of water used/consumed (m^3) per unit (kg/tonne/metre) of cloth produced.

Specific Water Consumption (SWC) of Textiles:

Specific Water Consumption; (m^3/kg or tonne or mtr.) = $\dfrac{\text{Volume of water consumed by the Textile unit, } (m^3)}{\text{(Total Production by the unit), (kg/tonne/mtr.)}}$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol.of Water Consumed(m^3)	Total Production kg/tonne/mtr.)	**SWC** (m^3/kg or tonne or mtr.)
District 1			
District 2			
District 3			

7(b) Average SWC of Textile units for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of Textile units in State						

7(c) Specific Water Consumption (**SWC**)

SWC of Textile Sector in the **State** {in **categories** such as **Cotton & blended, Wool & blended, Jute, Silk & Man-made**; Decadal trends or 15 years trend to be provided.
Trend of average Specific Water Consumption (SWC) of Textile industries at district level.

Percentage of industries having specific water consumption within the norms/bench marks/standards (**as applicable**)

8Waste Water

	Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
Total Waste Water Generated from Textile units in the state (m^3/annum)				
% Total quantum of wastewater discharged after recycling				

9Water Quality

		Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**

Water Quality	% of Textile units with online water quality monitoring systems installed.				
	% of Textile units with compliance of wastewater regulatory quality discharge norms.				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

10Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for each industrial sector in state.

Benchmark for Water Consumption, Waste Water Generation etc. – Provide Category-wise benchmarks

	Parameters	Unit	Indian Bench Mark	International Bench Mark
Cotton & blended				
1	Specific Water Consumption	m^3/kg or tonne or mtr.		
2	Waste Water generation	m^3/kg or tonne or mtr.		
3	Waste Water discharged	m^3/kg or tonne or mtr.		
Wool & blended				
1	Specific Water Consumption	m^3/kg or tonne or mtr.		
2	Waste Water generation	m^3/kg or tonne or mtr.		
3	Waste Water discharged	m^3/kg or tonne or mtr.		
Jute				
1	Specific Water Consumption	m^3/kg or tonne or mtr.		
2	Waste Water generation	m^3/kg or tonne or mtr.		
3	Waste Water discharged	m^3/kg or tonne or mtr.		
Silk				
1	Specific Water Consumption	m^3/kg or tonne or mtr.		
2	Waste Water generation	m^3/kg or tonne or mtr.		
3	Waste Water discharged	m^3/kg or tonne or mtr.		
Man-made				
1	Specific Water Consumption	m^3/kg or tonne or mtr.		
2	Waste Water generation	m^3/kg or tonne or mtr.		
3	Waste Water discharged	m^3/kg or tonne or mtr.		

Existing benchmarks/norms in certain sectors for reference

Benchmarks:

Textile sector

	Parameters	Unit Value	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	m^3/tonne	200-250[8]	Less than 100
2	Waste Water generation	m^3/tonne		
3	Waste Water discharged	m^3/tonne	ZLD (draft)	

Norms:

Textile Sector[9]:

The draft notification for standards for effluents from textile industries came in 2015. It stated the following:

Textiles unit (having dyeing process/cotton or woollen processing units and all integrated textile units) where wastewater discharge is greater than 25 KLD shall establish Zero Liquid Discharge (ZLD) – Effluent Treatment Plant (ETP).

The recovered water from ZLD-ETP through Reverse Osmosis (R.O.)/ Multi Effect Evaporator (MEE) shall be re-used in the process by the units and no ground water abstraction is allowed except for make-up water and drinking water purpose as assessed by respective State Pollution Control Board (SPCBs)/Pollution Control Committee (PCCs).

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[8]http://www.cseindia.org/dte-supplement/industry20040215/misuse.htm

[9]http://www.moef.nic.in/sites/default/files/Effluents%20from%20textile%20Industry.PDF

4.2.3.3 Pulp & Paper

1.0 Subject Matter

(Present a brief historical background on the growth of industry – a bird's eye view picture and analysis of the Industry using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Pulp & Paper industries - District level
Type of Pulp & Paper industries in the State along-with total production *(Refer Annexure: Table-1)*
Time trend of the number (growth) of Pulp & Paper industries in the state and water demand and supply position. *(Refer Annexure: Table-2)*

2.0 Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Pulp & Paper industries

Water Supply & Demand for Pulp & Paper industries in the State

Time trend of total water demand and actual current water supplied for different categories of Pulp & Paper industries along with growth of industries in the state.
Provide trend analysis (10-15 years) with breakup. (Refer Annexure: Table – 2, 3a, 3b)

Total Freshwater Withdrawal and Actual Water Consumption by Pulp & Paper industries in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by different categories of Pulp & Paper industries in the State:

State Water Budgeting: *Refer Annexure- Table 3(e)*

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Pulp & Paper industries				
GRAND TOTAL	Xxx	xxx	Xxx	xxx

3.0 Issues and Challenges

Illustrative issues and challenges may include

- Waste water disposal and associated surface and ground water contamination
- Water demand and supply issues in the Pulp & Paper sector in the state, provide details
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.
- Issues related to water pricing in Pulp & Paper sector
- Technology availability, affordability and efficiency related issues
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data
- Scattered nature and small scale of operations of industries

(Supporting data & analysis for above points may also be furnished)

4.0 Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0 Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Pulp & Paper sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the Pulp & Paper sector in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the industrial water consumption and supply.

Governing body for Pulp & Paper sector	Water allocation & Monitoring authority	Waste water discharge monitoring
Ministry of Industry, Government of India	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by Pulp & Paper industries for the benefit of neighborhood/ local community/ Environment.

Pulp & Paper	Any OE[10] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Pulp & Paper	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics & Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure: Table 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure: Table 6(c) & 6(d))*

6.0 Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, industrial process and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Industry Sector.

- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.

- **Constraints** with respect to the measurement & monitoring

7.0 Performance Indicators:

a. Benchmarks on water use *(Refer Annexure: Table-13)*

b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Category	**Indicator**		**Bench Mark/ Unit** *(as applicable)*	**Unit 1**	**Unit 2**	**Unit 3**
Measurement	**Water Quantity**					
	Measurement at Raw water source	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			

[10]Overexploited block of groundwater

		Use of ICT (SCADA)	Yes/No			
	Measurement at Major water usage areas	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
		Use of ICT (SCADA)	Yes/No			
	Waste Water (generation, recycle/reuse & discharge)	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
		Use of ICT (SCADA)	Yes/No			
	Undertaken internal Water Audit in the last Year?		Yes/No			
	Undertaken Third party Water Audit in the last Year?		Yes/No			
	Submitting monthly water balance to state pollution control board (SPCB)?		Yes/No			

Performance Indicators

Category	Indicator	Bench Mark/ Unit *(as applicable)*	Unit 1	Unit 2	Unit 3
Management Plans	Having Water Management Plans?	Yes/No			
	Whether Water Managements are operational	Yes/No			
Water Conservation	Have taken up RWH/ GW Recharge?	Yes/No			
	% of total Water requirement being met from Treated Waste Water				
	% reduction in water consumption compared to the previous year.				
	Introduction water efficient technologies in process to reduce water consumption.	Yes/No			
Water Use Efficiency *(Annexure: Table 7)*	**Specific Water Consumption** (SWC); (m^3/kg or tonne of paper produced) *(refer Annexure: Table 7(a),(b) & (c))*				
	Have specific water consumption within the norms/bench marks/standards	Yes/No			
Water Productivity *(Annexure: Table 8)*	**Water Productivity** (INR/m^3) Quantity of water necessary to produce these goods *(refer Annexure: Table 8(a)&(b))*				
Water Intensity *(Annexure: Table 9)*	**Water Intensity**; (m^3/1000 Rs or m^3/US$) Volume of water used per unit of gross value added (GVA) *(refer Annexure-9(a)&(b))*				
Water Foot print *(Annexure: Table 10)*	Total volume of freshwater used directly and/or				

Category	Indicator	Bench Mark/ Unit *(as applicable)*	Unit 1	Unit 2	Unit 3
	indirectly for the industrial operation/product *(refer Annexure: Table 10(a))*				
Waste Water *(Annexure: Table 11)*	Total Waste Water Generated				
	% of Waste Water Treated				
	% of Treated waste water recycled				
	Implemented/ achieved zero liquid discharge (ZLD)				
Waste Water Quality *(Annexure: Table 12)*	Installation of online water quality monitoring systems.	Yes/No			
	Compliance with the wastewater quality discharged norms.	Yes/No			
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).	Yes/No			
Economics	Whether economic incentives are in place by state to encourage water efficiency & conservation?	Yes/No			
	Whether economic disincentive mechanisms like penalties etc. are in place by state to discourage water wastage & inefficient use?	Yes/No			
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?	Yes/No			

Performance Indicators

Category	Indicator	Bench Mark/ Unit *(as applicable)*	District 1	District 2	District 3
Water Quantity Measurement	% of Pulp & Paper industries with water flow meters				
	% of Pulp & paper industries undertaken internal water audits in the last year				
	% of Pulp & Paper industries undertaken external water audit in the last year				
	% of Pulp & Paper industries submitting water balance to SPCB (state pollution control board)				

8.0 Reforms undertaken/ being undertaken/ proposed if any
9.0 Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Water incentives to industries
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1 Total number, types & production of Pulp & Paper industries in the State

Pulp & Paper industries in the State		
Type (based on raw material)	**No. of industries**	**Average Production** (kg or tonnes/day)
Wood based Pulp & Paper mills		
- Bleached grade		
- Unbleached grade		
Total (A)		
Agro based Pulp & Paper mills		
- Bleached grade		
- Unbleached grade		
Total (B)		
RCF & Market pulp based Paper mills		
- Bleached grade		
- Unbleached grade		
Total (C)		
RCF & Market pulp based Specialty Paper mills		
Total (A+B+C)		

2 Growth Trend of Pulp & Paper industries over a period and Water Demand and Supply position

Pulp & Paper (P&P) – Type based on raw material		Years					
		1990	1995	2000	2005	2010	2017
No. of Industries							
Wood based Pulp & Paper mills							
Agro based Pulp & Paper mills							
RCF & Market pulp based (Bleached & Unbleached) Paper mills							
RCF & Market pulp based Specialty Paper mills							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3 Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Pulp & Paper: (MCM) Present Water Year: 1st June to 31st May next year										
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Pulp & Paper: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										

	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				

Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Pulp & Paper

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Pulp & Paper units	xxx	xxx	xxx	xxx

4 Proportion of Water withdrawal and consumption by Pulp & Paper industries against total industries in the State

Pulp & Paper (P&P) – Raw material type	Total Water Withdrawal by all Pulp & Paper industries (%) *(Refer 4(a) below)*	Total water withdrawal by all the Industries in state	Total Water Consumption by all Pulp & Paper industries (%) *(Refer 4(b) below)*	Total water Consumption by all the Industries in state
Wood based Pulp & Paper mills				
Agro based Pulp & Paper mills				
RCF & Market pulp based (Bleached & Unbleached) Paper mills				
RCF & Market pulp based Specialty Paper mills				
Total				

4(a) Total Water Withdrawal/Abstraction by **Pulp & Paper industries** in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by Pulp \& Paper Sector (\%)} = \frac{\text{(Total water withdrawal by all the P\&P units in the State) x 100}}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **Pulp & Paper industries** in the state as percentage of Total water consumption by all the industries in the State

$$\text{Total water consumption by P\&P Sector (\%)} = \frac{\text{(Total actual water consumption by all P\&P units in State) x100}}{\text{(Total water consumption by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal and Total Actual Water Consumption by all Pulp & Paper industries in the State

	CY -11	**CY -10**	**CY -9**	**CY -8**	**CY -7**	**CY -6**	**CY -5**	**CY -4**	**CY -3**	**CY -2**	**CY -1**	**CY / 2017**
Total Fresh Water Withdrawal by all Pulp & Paper industries (MCM)												
Total Actual Water Consumption by all Pulp & Paper industries (MCM)												

5 Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Fresh Water Withdrawal by all Pulp & Paper industries (%) *Refer Annexure: Table 5(a)*						
Total Actual Water Consumption by all Pulp & Paper industries (%) *Refer Annexure: Table 5(b)*						

5(a) Total Water Withdrawal/Abstraction by **Pulp & Paper industries** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by Pulp \& Paper Sector (\%)} = \frac{\text{(Total water withdrawal by all the P\&P units in the State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Pulp & Paper industries** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by Pulp \& Paper Sector (\%)} = \frac{\text{(Total actual water consumption by all P\&P units in State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

6 Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	CY-4	CY-3	CY-2	CY-1

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Pulp & Paper industries on water treatment and management (Lakhs)						
Total O&M Expenditure by Pulp & Paper industries on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by each industry for the Current Year- CY

Pulp & Paper	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
UNIT 1				
UNIT 2				

UNIT 3				
UNIT 4				
UNIT 5				
UNIT 6				
Total				

7 **Water Use Efficiency**:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit of product produced. In case of Pulp & Paper it can be represented as the total volume of water used/consumed (m^3) per unit (kg/tonne) of product produced.

Specific Water Consumption (SWC) of Pulp & Paper:

$$\textbf{Specific Water Consumption}; (m^3/\text{kg or tonne}) = \frac{\text{Volume of water consumed by the Pulp \& Paper unit, } (m^3)}{\text{(Total Production by the unit), (kg or tonne)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol. of Water Consumed(m^3)	Total Production kg or tonne)	**SWC** (m^3/kg or tonne)
Unit 1			
Unit 2			
Unit 3			

7(b) Average SWC of Pulp & Paper units for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of Pulp & Paper units in State						

7(c) Specific Water Consumption (**SWC**)

SWC of Pulp & Paper Sector in the **State** {in **categories** such as **Wood based, Agro based, RCF & Market pulp based, Speciality paper based**; Decadal trends or 15 years trend to be provided.

Trend of average Specific Water Consumption (SWC) of Pulp & Paper industries: Category-wise

Percentage of industries having specific water consumption within the norms/bench marks/standards **(if applicable)**

8 **Water productivity:**

- **Water Productivity** as the total economic value created of the output/product by the Industry in the State per unit volume of water withdrawal or consumption

$$\textbf{Water Productivity } (INR/m^3) = \frac{\text{(Total economic value created of the output/product by the Industry), INR}}{\text{(Total Volume of freshwater withdrawn/consumed), } m^3}$$

OR

Water Productivity in terms of **GVA (Gross Value Added)**; (INR/m^3)

$$= \frac{\text{(Total Value of Paper Production – Value of inputs other than water), INR}}{\text{(Total Volume of freshwater consumed), } m^3}$$

8(a) Water Productivity in terms of **GVA for Current Year**

	Value of Paper Production	Value of inputs other than water	Total Volume of freshwater consumed	**(Gross Value Added)**; (INR/m^3)
Unit 1				
Unit 2				
Unit 3				
Total				

8(b) Average Water Productivity in terms of **GVA for the State – time trend (also represent through Graph)**

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Productivity (GVA); (INR/m^3)						

9 **Water Intensity**:

$$\textbf{Water Intensity}; (m^3/1000\text{ Rs or } m^3/\text{US\$}) = \frac{\text{Volume of water consumed by the Industry, } (m^3)}{(\text{Unit value added by Paper production}), (1000\text{ Rs or US\$})}$$

9(a) Water Intensity for Current Year

	Volume of water consumed	Unit value added by Paper production	**Water Intensity**; (m^3/1000 Rs or m^3/Rs)
Unit 1			
Unit 2			
Unit 3			
Total			

9(b) Average Water Intensity in terms for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Intensity (m^3/1000 Rs or m^3/Rs)						

10 Water Footprint:

Water Footprint for Pulp & Paper industries

Water Footprint (WF) of pulp & paper production = Sum of WF of Operations of the plant and WF of Supply Chain

10(a) Water Foot print for Current Year

	$\textbf{WF}_{\textbf{Supply Chain}}$	$\textbf{WF}_{\textbf{Operations}}$	Total
Unit 1			
Unit 2			
Unit 3			
Total			

11 Waste Water

	Bench Mark/ Units *(as applicable)*	**Unit 1**	**Unit 2**	**Unit 3**
Total Waste Water Generated				
% Waste Water Treated				

% Waste Water Recycled				
• % Treated waste water used in Industrial activity				
• % Treated waste water used in Green belt				
• % Treated waste water used in others				
% Total quantum of wastewater discharged.				
Implementation/ achieved zero liquid discharge (ZLD).				

11(a) Use of Treated Waste Water

	Source of Waste Water	Source of Treated Waste Water for reuse	Qty. of Treated WW consumed	Total Water Consumption	% use of Treated WW out of total Water Consumption
UNIT 1					
UNIT 2					
UNIT 3					

12 Water Quality

		Bench Mark/regulatory norms *(as applicable)*	UNIT 1	UNIT 2	
Water Quality	Installation of online water quality monitoring systems.				
	Compliance with the wastewater regulatory quality discharge norms.				
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

13 Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for each industrial sector in state. The benchmarks to be given category wise

13(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	Unit	Indian Bench Mark	International Bench Mark
4.2.3.3.1.1Wood based Pulp & Paper mills				
1	Specific Water Consumption	m^3/kg or tonne		
2	Waste Water generation	m^3/kg or tonne		
3	Waste Water discharged	m^3/kg or tonne		
4.2.3.3.1.2 Agro based Pulp & Paper mills				
1	Specific Water Consumption	m^3/kg or tonne		
2	Waste Water generation	m^3/kg or tonne		
3	Waste Water discharged	m^3/kg or tonne		
4.2.3.3.1.3 RCF and Market Pulp based (Bleached & Unbleached) mills				
1	Specific Water Consumption	m^3/kg or tonne		
2	Waste Water generation	m^3/kg or tonne		
3	Waste Water discharged	m^3/kg or tonne		
4.2.3.3.1.4 RCF and Market Pulp based Specialty Paper mills				
1	Specific Water Consumption	m^3/kg or tonne		
2	Waste Water generation	m^3/kg or tonne		
3	Waste Water discharged	m^3/kg or tonne		

13(b) Existing benchmarks/norms in certain sectors for reference

Pulp & Paper sector

	Parameters	Unit Value	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	m^3/tonne	Wood based mills: 63 Waste paper based mills: 9 - 19[11]	Wood based mills: 30 – 70 Waste paper based mills: 8 - 10[5]
2	Waste Water generation	m^3/tonne		
3	Waste Water discharged	m^3/tonne	Wood based mills: 50[5&12]	

[11]http://cpcb.nic.in/newitems/45.pdf
[12]http://cpcb.nic.in/GeneralStandards.pdf

4.2.3.4 Iron and Steel

1.0 Subject Matter

(Present a brief historical background on the growth of industry – a bird's eye view picture and analysis of the Industry using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Iron and Steel industries *(Crude steel/Pig iron/sponge iron/finished steel based/ others)* District level
Iron and Steel production from Iron and Steel Plants in the State: *(Refer Annexure Table-1).*
Time trend of the number (growth) of Iron and Steel Plants. *(Refer Annexure Table-2).*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Iron and Steel Plants

Water Supply & Demand for Iron and Steel Plants in the State

Time trend of total water demand and actual current water supplied to the Iron and Steel Plants along with growth of Iron and Steel Plants (ISP) in the state. *(Refer Annexure Tables-2, 3)*

Total Freshwater Withdrawal and Actual Water Consumption by Iron and Steel Plants in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Iron and Steel Plants in a State

Comparative status of total water consumption by each Iron and Steel Plant level

State Water Budgeting: *(Refer Annexure Table-3(d)).*

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Iron and Steel Plants				
GRAND TOTAL	xxx	xxx	xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include

- Waste water disposal and associated surface and ground water contamination
- Water demand and supply issues in the Iron and Steel sector in the state, provide details
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.
- Issues related to water pricing in Iron and Steel Plants
- Technology availability, affordability and efficiency related issues
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Iron and Steel Plant sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the Iron and Steel Plants in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the industrial water consumption and supply.

Governing body for Iron and Steel Plants	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Ministry of Steel (MOS)	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by Iron and Steel Plants for the benefit of neighborhood/ local community/ Environment.

Iron and Steel Plant	Any OE[13] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Iron and Steel Plant	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics& Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure Table 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure Table 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, process and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.
- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring.

[13]Overexploited block of groundwater

7.0Performance Indicators:
a. Benchmarks on water use *(Refer table-13)*
b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Category	**Indicator**		**Bench Mark/ Unit** *(as applicable)*	**ISP 1**	**ISP 2**	**ISP 3**
Measurement	**Water Quantity**					
	Measurement at Raw water source	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Measurement at major water usage areas	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Waste Water (generation, recycle/reuse & discharge)	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Undertaken internal Water Audit in the last Year?		Yes/No			
	Undertaken Third party Water Audit in the last Year?		Yes/No			
	Submitting monthly water balance to state pollution control board (SPCB)?		Yes/No			
Management Plans	Having Water Management Plans?		Yes/No			
	Whether Water Managements are operational		Yes/No			
Water Conservation	Have taken up RWH/ GW Recharge?		Yes/No			
	% of total Water requirement being met from Treated Waste Water					
	Have taken up Restoration measures?		Yes/No			
	% of reduction of water demand compared to the previous year.					
	Introduction of water efficient technologies in process to reduce water consumption.		Yes/No			
Water Use Efficiency *(Annexure- Table 7)*	**Specific Water Consumption** (SWC); (**m^3/tcs**) *(refer Annexure-Table 7(a), (b) & (c))*					
	Have specific water consumption benchmarks/ standards established		Yes/No			
	Have specific water consumption within the norms/bench marks/standards		Yes/No			
Water Productivity *(Annexure- Table 8)*	**Water Productivity** (INR/m^3) Quantity of water necessary to produce these goods *(refer Annexure- Table 8(a)&(b))*					
Water Intensity *(Annexure- Table 9)*	**Water Intensity**; (m^3/1000 Rs or m^3/US$)					

	Volume of water used per unit of gross value added (GVA) *(refer Annexure- Table 9(a)&(b))*					
Water Foot print *(Annexure- Table 10)*	Total volume of freshwater used directly and/or indirectly for the industrial operation/product *(refer Annexure- Table 10(a))*					
Waste Water *(Annexure- Table 11)*	Total Waste Water Generated					
	% Waste Water Treated					
	% Treated waste water recycled					
	Implementation/ achieved zero liquid discharge (ZLD).		Yes/No			
Water Quality *(Annexure-Table 12)*	Installation of online water quality monitoring systems.		Yes/No			
	Compliance with the wastewater quality discharged norms.		Yes/No			
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?					
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).		Yes/No			
	No. of areas near iron and steel plants where Water Quality has adversely affected					
Economics	Whether economic incentives are in place to encourage water efficiency & conservation?		Yes/No			
	Whether economic disincentive mechanisms like penalties etc. are in place to discourage water wastage & inefficient use?		Yes/No			
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?		Yes/No			
Public Interface	Operationalization of online water quality portal for information dissemination and feedback		Yes/No			

Category	**Indicator**	**Bench Mark/ Unit** *(as applicable)*	**District 1**	**District 2**	**District 3**
Water Quantity Measurement	% of Iron and Steel plants with water flow meters				
	% of water sources of Iron and Steel plants geotagged				

	% of Iron and Steel plants undertaking internal water audits in last year				
	% of Iron and Steel plants undertaking external water audits in last year				
	% of Iron and Steel plants submitting water balance to SPCB (state pollution control board)				

8.0Reforms undertaken/ being undertaken/ proposed if any

9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number, types & capacity of Iron and Steel Plants in the State

Total Production from Iron and Steel Plants in the State				
Raw Material type	**No. of ISPs**	**Total Installed Capacity of all the ISP** (tcs)	**Total Production Capacity of all the ISP** (tcs)	**Daily Average Production of all the ISP** (tcs)
Crude Steel				
Pig Iron				
Sponge Iron				
Finished Steel				
Others				
Total				

2Growth Trend of Iron and Steel Plants over a period and Water Demand and Supply position

ISP		**Years**					
		1990	**1995**	**2000**	**2005**	**2010**	**2017**
No. of Industries							
Crude Steel							
Pig Iron							
Sponge Iron							
Finished Steel plants							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Iron & Steel Plants: (MCM) Present Water Year: 1st June to 31st May next year									
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Iron & Steel Plants: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for ISP

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All ISPs	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by ISP against total industries in the State

ISP – Raw Material type	Total Water Withdrawal by all ISP (%) *(Refer Annexure-4(a))*	Total water withdrawal by all the Industries in state	Total Water Consumption by all ISP (%) *(Refer Annexure-4(b))*	Total water Consumption by all the Industries in state
Crude Steel				
Pig Iron				
Sponge Iron				
Finished Steel				
Others				
Total				

4(a) Total Water Withdrawal/Abstraction by **Iron and Steel Plants** (**ISP**) in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by ISP Sector (\%)} = \frac{\text{(Total water withdrawal by all the ISP in the State) x 100}}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **Iron and Steel Plants** in the state as percentage of Total water consumption by all the industries in the State

$$\text{Total water consumption by ISP Sector (\%)} = \frac{\text{(Total actual water consumption by all ISP in State) x 100}}{\text{(Total water consumption by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal by all ISP and Total Actual Water Consumption by all ISP in the State

	CY -11	CY -10	CY -9	CY -8	CY -7	CY -6	CY -5	CY -4	CY -3	CY -2	CY -1	CY / 2017
Total Fresh Water Withdrawal by all ISP (MCM)												
Total Actual Water Consumption by all ISP (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Fresh Water Withdrawal by all ISP (%) *(Refer Annexure-5(a))*						
Total Actual Water Consumption by all ISP (%) *(Refer Annexure-5(b)*						

5(a) Total Water Withdrawal/Abstraction by **Iron and Steel Plants** (**ISP**) in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by ISP Sector (\%)} = \frac{\text{(Total water withdrawal by all the ISP in the State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Iron and Steel Plants** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by ISP Sector (\%)} = \frac{\text{(Total actual water consumption by all ISP in State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	CY-4	CY-3	CY-2	CY-1

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by ISPs on water treatment and management (Lakhs)						
Total O&M Expenditure by ISPs on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure at Plant level for the Current Year- CY

ISP	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
ISP1				
ISP2				
ISP3				
ISP4				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit of product produced. In case of Iron and Steel Plants it can be represented as the total volume of water used/consumed (m^3) per unit tonnes of crude steel (*tcs*) of steel produced.

Specific Water Consumption (SWC) of Iron and Steel Plants (ISP):

$$\text{Specific Water Consumption (SWC); } (\mathbf{m^3/tcs}) = \frac{\text{Volume of water consumed by the ISP, } (m^3)}{\text{(Total Production by the ISP), (tcs)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol.of Water Consumed(m^3)	Total Steel Produced (tcs)	SWC (**m^3/tcs**)
ISP 1			
ISP 2			
ISP 3			

7(b) Average SWC of ISPs for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of ISPs in State						

7(c) Specific Water Consumption (**SWC**)
Comparative Specific Water Consumption (SWC) of Iron and Steel Plants
Trend of Specific Water Consumption (SWC) of each Iron and Steel Plant
Percentage of industries having specific water consumption within the norms/bench marks/standards **(if applicable)**

8Water productivity:
For e.g. *(illustrative purpose only)*

- **Water Productivity** as the total economic value created of the output/product by the Industry in the State per unit volume of water withdrawal or consumption

$$\textbf{Water Productivity} \ (\text{INR/m}^3) = \frac{\text{(Total economic value created of the output/product by the Industry), INR}}{\text{(Total Volume of freshwater withdrawn/consumed), m}^3}$$

OR

Water Productivity in terms of **GVA (Gross Value Added)**; (INR/m^3)

$$= \frac{\text{(Total Value of Steel Production – Value of inputs other than water), INR}}{\text{(Total Volume of freshwater consumed), m}^3}$$

8(a) Water Productivity in terms of **GVA for Current Year**

	Value of Steel Production	Value of inputs other than water	Total Volume of freshwater consumed	**(Gross Value Added)**; (INR/m^3)
ISP 1				
ISP 2				
ISP 3				
Total				

8(b) Average Water Productivity in terms of **GVA**
for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Productivity (GVA); (INR/m^3)						

9Water Intensity:

$$\textbf{Water Intensity}; \ (\text{m}^3/1000 \text{ Rs or m}^3/\text{US\$}) = \frac{\text{Volume of water consumed by the Industry, (m}^3)}{\text{(Unit value added by Steel Production), (1000 Rs or US\$)}}$$

9(a) Water Intensity for Current Year

	Volume of water consumed	Unit value added by Steel Production	**Water Intensity**; (m^3/1000 Rs or m^3/Rs)
ISP 1			
ISP 2			
ISP 3			
Total			

9(b) Average Water Intensity in terms
for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Intensity (m^3/1000 Rs or m^3/Rs)						

10Water Footprint:

Water Footprint for Steel Production

Water Footprint (WF) of steel production = Sum of WF of Operations of the plant and WF of Supply Chain

i.e. **Water Footprint (WF) = $WF_{\text{Supply Chain}} + WF_{\text{Operations}}$**

10(a) Water Foot print for Current Year

	$WF_{\text{Supply Chain}}$	$WF_{\text{Operations}}$	Total
ISP 1			
ISP 2			
ISP 3			
Total			

11Waste Water

	Bench Mark/ Units *(as applicable)*	**ISP 1**	**ISP 2**	**ISP 3**
Total Waste Water Generated				
% Waste Water Treated				
% Waste Water Recycled				
• % Treated waste water used in Industrial activity				
• % Treated waste water used in Green belt				
• % Treated waste water used in others				
% Total quantum of wastewater discharged.				
Implementation/ achieved zero liquid discharge (ZLD).				

11(a) Use of Treated Waste Water

	Source of Waste Water	Source of Treated Waste Water for reuse	Qty. of Treated WW consumed	Total Water Consumption	% use of Treated WW out of total Water Consumption
ISP 1					
ISP 2					
ISP 3					

12Water Quality

		Bench Mark ***(as applicable)***	**ISP 1**	**ISP 2**	
Water Quality	Installation of online water quality monitoring systems.				
	Compliance with the wastewater regulatory quality discharge norms.				
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				

	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

13Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for each industrial sector in state.

13(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	**Unit**	**Indian Bench Mark**	**International Bench Mark**
1	Specific Water Consumption	m^3/tcs		
2	Waste Water generation	m^3/tcs		
3	Waste Water discharged	m^3/tcs		

4.2.3.5 Heavy Engineering Industries & Automobiles

1.0Subject Matter

(Present a brief historical background on the growth of industry – a bird's eye view picture and analysis of the Heavy Engineering Industry using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Heavy Engineering industries *(Automobile, Power Plant Equipment, Locomotives, Machine Tools, Vessels, etc./ others)* District level
Production from Heavy Engineering industries in the State. *(Refer Annexure Table-1).*
Time trend of the number (growth) of Heavy Engineering industries. (Refer Annexure *Table-2).*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Heavy Engineering industries

Water Supply & Demand for Heavy Engineering industries in the State

Time trend of total water demand and actual current water supplied to the Heavy Engineering industries along with growth of Heavy Engineering industries in the state. *(Refer Annexure Tables-2, 3)*

Total Freshwater Withdrawal and Actual Water Consumption by Heavy Engineering industries in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Heavy Engineering industries in a State

Comparative status of total water consumption by each Heavy Engineering industries

State Water Budgeting: *(Refer Annexure Table-3(d)).*

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Heavy Engineering industries				
GRAND TOTAL	xxx	xxx	xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include

- Waste water disposal and associated surface and ground water contamination
- Water demand and supply issues in the Heavy Engineering sector in the state, provide details
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.
- Issues related to water pricing in Heavy Engineering industries
- Technology availability, affordability and efficiency related issues
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Heavy Engineering sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the Heavy Engineering industries in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the industrial water consumption and supply.

Governing body for Heavy Engineering industries	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Department/ Associations of Heavy Engineering industries	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by Heavy Engineering industries for the benefit of neighborhood/ local community/ Environment.

Heavy Engineering industries	Any OE[14] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Heavy Engineering industries	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics& Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, industrial process and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.

- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring.

[14]Overexploited block of groundwater

7.0Performance Indicators:

a. Benchmarks on water use *(Refer table-13)*

b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Category	Indicator		Bench Mark/ Unit *(as applicable)*	Heavy Engineering industry 1	Heavy Engineering industry 2	Heavy Engineering industry 3
Measurement	**Water Quantity**					
	Measurement at Raw water source	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Measurement at major water usage areas	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Waste Water (generation, recycle/reuse & discharge)	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Undertaken internal Water Audit in the last Year?		Yes/No			
	Undertaken Third party Water Audit in the last Year?		Yes/No			
	Submitting monthly water balance to state pollution control board (SPCB)?		Yes/No			
Management Plans	Having Water Management Plans?		Yes/No			
	Whether Water Managements are operational		Yes/No			
Water Conservation	Have taken up RWH/ GW Recharge?		Yes/No			
	% of total Water requirement being met from Treated Waste Water					
	Have taken up Restoration measures?		Yes/No			
	% of reduction of water demand compared to the previous year.					
	Introduction of water efficient technologies in process to reduce water consumption.		Yes/No			
Water Use Efficiency *(Annexure- Table 7)*	**Specific Water Consumption** (SWC); (**m^3/tonne**) *(refer Annexure-Table 7(a), (b) & (c))*					
	Have specific water consumption benchmarks/ standards established		Yes/No			
	Have specific water consumption within the norms/bench marks/standards		Yes/No			
Water Productivity *(Annexure- Table 8)*	**Water Productivity** (INR/m^3) Quantity of water necessary to produce these goods					

	(refer Annexure- Table 8(a)&(b))					
Water Intensity *(Annexure- Table 9)*	**Water Intensity**; (m^3/1000 Rs or m^3/US$) Volume of water used per unit of gross value added (GVA) *(refer Annexure- Table 9(a)&(b))*					
Water Foot print *(Annexure- Table 10)*	Total volume of freshwater used directly and/or indirectly for the industrial operation/product *(refer Annexure- Table 10(a))*					
Waste Water *(Annexure- Table 11)*	Total Waste Water Generated					
	% Waste Water Treated					
	% Treated waste water recycled					
	Implementation/ achieved zero liquid discharge (ZLD).		Yes/No			
Water Quality *(Annexure-Table 12)*	Installation of online water quality monitoring systems.		Yes/No			
	Compliance with the wastewater quality discharged norms.		Yes/No			
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?					
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).		Yes/No			
	No. of areas near Heavy Engineering industry where Water Quality has adversely affected					
Economics	Whether economic incentives are in place to encourage water efficiency & conservation?		Yes/No			
	Whether economic disincentive mechanisms like penalties etc. are in place to discourage water wastage & inefficient use?		Yes/No			
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?		Yes/No			
Public Interface	Operationalization of online water quality portal for information dissemination and feedback		Yes/No			

Category	Indicator	Bench Mark/ Unit *(as applicable)*	District 1	District 2	District 3
Water Quantity Measurement	% of Heavy Engineering industries with water flow meters				
	% of water sources of Heavy Engineering industries geotagged				
	% of Heavy Engineering industries undertaking internal water audits in last year				
	% of Heavy Engineering industries undertaking external water audits in last year				
	% of Heavy Engineering industries submitting water balance to SPCB (state pollution control board)				

8.0Reforms undertaken/ being undertaken/ proposed if any

9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number, types & capacity of Heavy Engineering industries in the State

Total Production from Heavy Engineering industries in the State				
Type	**No. of Heavy Engineering industries**	**Total Installed Capacity of all the Heavy Engineering industries** (tonne)	**Total Production Capacity of all the Heavy Engineering industries** (tonne)	**Daily Average Production of all the Heavy Engineering industries** (tonne)
Automobile				
Power Plant Equipment				
Locomotives				
Vessels				
Machine Tools				
Others				
Total				

2Growth Trend of Heavy Engineering industries over a period and Water Demand and Supply position

Heavy Engineering industries	Years					
	1990	1995	2000	2005	2010	2017
Automobile						
Power Plant Equipment						
Locomotives						
Vessels						
Machine Tools						
Others						
Total						

Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Heavy Engineering Industries: (MCM) Present Water Year: 1st June to 31st May next year									
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Heavy Engineering Industries: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										

	Others etc									
Total										
Treated Waste Water										
GRAND TOTAL										

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Heavy Engineering Industries

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Heavy Engineering Industries	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Heavy Engineering industries against total industries in the State

Heavy Engineering industries	Total Water Withdrawal by all Heavy Engineering industries (%) *(Refer Annexure-4(a))*	Total water withdrawal by all the Industries in state	Total Water Consumption by all Heavy Engineering industries (%) *(Refer Annexure-4(b))*	Total water Consumption by all the Industries in state
Automobile				
Power Plant Equipment				
Locomotives				
Vessels				
Machine Tools				
Others				
Total				

4(a) Total Water Withdrawal/Abstraction by **Heavy Engineering industries (HEI)** in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by HEI Sector (\%)} = \frac{\text{(Total water withdrawal by all the HEI in the State)} \times 100}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **Heavy Engineering industries** in the state as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water consumption by HEI Sector (\%)} = \frac{\text{(Total actual water consumption by all HEI in State)} \times 100}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal by all Heavy Engineering industries and Total Actual Water Consumption by all Heavy Engineering industries in the State

	CY -11	**CY -10**	**CY -9**	**CY -8**	**CY -7**	**CY -6**	**CY -5**	**CY -4**	**CY -3**	**CY -2**	**CY -1**	**CY / 2017**
Total Fresh Water Withdrawal by all Heavy Engineering industries (MCM)												
Total Actual Water Consumption by all Heavy Engineering industries (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Fresh Water Withdrawal by all Heavy Engineering industries (%) *(Refer Annexure-5(a))*						
Total Actual Water Consumption by all Heavy Engineering industries (%) *(Refer Annexure-5(b)*						

5(a) Total Water Withdrawal/Abstraction by **Heavy Engineering industries (HEI)** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by HEI Sector (\%)} = \frac{\text{(Total water withdrawal by all the HEI in the State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Heavy Engineering industries** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by HEI Sector (\%)} = \frac{\text{(Total actual water consumption by all HEI in State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	CY-4	CY-3	CY-2	CY-1

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Heavy Engineering industries on water treatment and management (Lakhs)						
Total O&M Expenditure by Heavy Engineering industries on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure at Heavy Engineering industry level for the Current Year- CY

Heavy Engineering industries	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)

Heavy Engineering industry 1				
Heavy Engineering industry 2				
Heavy Engineering industry 3				
Heavy Engineering industry 4				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit of product produced. In case of Heavy Engineering industries, it can be represented as the total volume of water used/consumed (m^3) per unit tonnes of product produced.

Specific Water Consumption (SWC) of Heavy Engineering industries:

$$\textbf{Specific Water Consumption (SWC)}; (m^3/\text{tonne}) = \frac{\text{Volume of water consumed by the HEI, } (m^3)}{\text{(Total Production by the HEI), (tonnes)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol. of Water Consumed (m^3)	Total Product Produced (tonnes)	SWC (**m^3/tonne**)
Heavy Engineering industry 1			
Heavy Engineering industry 2			
Heavy Engineering industry 3			

7(b) Average SWC of Heavy Engineering industries for the State – time trend (also represent through Graph)

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Average SWC of Heavy Engineering industries in State						

7(c) Specific Water Consumption (**SWC**)
Comparative Specific Water Consumption (SWC) of Heavy Engineering industries
Trend of average Specific Water Consumption (SWC) of Heavy Engineering industries
Percentage of industries having specific water consumption within the norms/bench marks/standards **(if applicable)**

8Water productivity:
For e.g. *(illustrative purpose only)*

- **Water Productivity** as the total economic value created of the output/product by the Industry in the State per unit volume of water withdrawal or consumption

$$\textbf{Water Productivity } (INR/m^3) = \frac{\text{(Total economic value created of the output/product by the Industry), INR}}{\text{(Total Volume of freshwater withdrawn/consumed), } m^3}$$

OR

Water Productivity in terms of **GVA (Gross Value Added)**; (INR/m^3)

$$= \frac{\text{(Total Value of Product – Value of inputs other than water), INR}}{\text{(Total Volume of freshwater consumed), m}^3}$$

8(a) Water Productivity in terms of **GVA for Current Year**

	Value of Product	Value of inputs other than water	Total Volume of freshwater consumed	**(Gross Value Added)**; (INR/m³)
Heavy Engineering industry 1				
Heavy Engineering industry 2				
Heavy Engineering industry 3				
Total				

8(b) Average Water Productivity in terms of **GVA**
for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Productivity (GVA); (INR/m³)						

9Water Intensity:

$$\textbf{Water Intensity}\text{; (m}^3\text{/1000 Rs or m}^3\text{/US\$)} = \frac{\text{Volume of water consumed by the Industry, (m}^3\text{)}}{\text{(Unit value added by Product), (1000 Rs or US\$)}}$$

9(a) Water Intensity for Current Year

	Volume of water consumed	Unit value added by Product	**Water Intensity**; (m³/1000 Rs or m³/Rs)
Heavy Engineering industry 1			
Heavy Engineering industry 2			
Heavy Engineering industry 3			
Total			

9(b) Average Water Intensity in terms
for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Intensity (m³/1000 Rs or m³/Rs)						

10Water Footprint:

The total volume of freshwater used directly and/or indirectly for the industrial operation/product. It includes the water used in industries own operation/process and its supply chain. Total Water footprints are composed of estimates for blue water (used from freshwater sources), green water (rain or soil water taken up by plants), and grey water (water required to dilute wastewater to be fit for discharge).

Water Footprint for Heavy Engineering Product

Water Footprint (WF) of product = Sum of WF of Operations of the plant and WF of Supply Chain

i.e. **Water Footprint (WF) = WF $_{\text{Supply Chain}}$ + WF $_{\text{Operations}}$**

10(a) Water Foot print for Current Year

	WF $_{\text{Supply Chain}}$	WF $_{\text{Operations}}$	Total
Heavy Engineering industry 1			
Heavy Engineering industry 2			
Heavy Engineering industry 3			
Total			

11Waste Water

	Bench Mark/ Units *(as applicable)*	**Heavy Engineering Industry 1**	**Heavy Engineering Industry 2**	**Heavy Engineering Industry 3**
Total Waste Water Generated				
% Waste Water Treated				
% Waste Water Recycled				
• % Treated waste water used in Industrial activity				
• % Treated waste water used in Green belt				
• % Treated waste water used in others				
% Total quantum of wastewater discharged.				
Implementation/ achieved zero liquid discharge (ZLD).				

11(a) Use of Treated Waste Water

	Source of Waste Water	Source of Treated Waste Water for reuse	Qty. of Treated WW consumed	Total Water Consumption	% use of Treated WW out of total Water Consumption
Heavy Engineering industry 1					
Heavy Engineering industry 2					
Heavy Engineering industry 3					

12Water Quality

		Bench Mark *(as applicable)*	**Heavy Engineering industry 1**	**Heavy Engineering industry 2**	
Water Quality	Installation of online water quality monitoring systems.				
	Compliance with the wastewater regulatory quality discharge norms.				
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

13Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for Heavy Engineering industry sector in state.

13(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	**Unit**	**Indian Bench Mark**	**International Bench Mark**
1	Specific Water Consumption	m^3/tonne		
2	Waste Water generation	m^3/tonne		
3	Waste Water discharged	m^3/tonne		

4.2.3.6 Pharmaceuticals

1.0Subject Matter

(Present a brief historical background on the growth of industry – a bird's eye view picture and analysis of the Industry using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Pharmaceutical industries - District level
Type and total no. of Pharmaceutical industries in the State along-with production details *(Refer Annexure: Table-1)*
Time trend of the number (growth) of Pharmaceutical industries in the state and Water Demand & Supply position.*(Refer Annexure: Table-2)*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Pharmaceutical industries

Water Supply & Demand for Pharmaceutical industries in the State

Time trend of total water demand and actual current water supplied to the Pharmaceutical industries along with growth of industries in the state. *Provide trend analysis (10-15 years) with breakup.(Refer Annexure: Table – 2, 3a, 3b)*

Total Freshwater Withdrawal and Actual Water Consumption by Pharmaceutical industries in the State

Comparative trend of Total Freshwater Withdrawal vs Actual Water Consumption by Pharmaceutical industries in the State:

State Water Budgeting: *Refer Annexure- Table 3(e)*

SECTOR (District-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
District 1				
District 2				
GRAND TOTAL	xxx	xxx	xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include

- Waste water disposal and associated surface and ground water contamination
- Water demand and supply issues in Pharmaceutical sector in the state, provide details
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.
- Issues related to water pricing in Pharmaceutical sector
- Technology availability, affordability and efficiency related issues
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Pharmaceutical sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.

- Has the state notified any regulations including for zero liquid discharge for the Pharmaceutical sector in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the industrial water consumption and supply.

Governing body for Pharmaceutical sector	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State Pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by Pharmaceutical industries for the benefit of neighborhood/ local community/ Environment.

Pharmaceuticals	Any OE[15] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Pharmaceuticals	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics& Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost*(Refer Annexure: Table 6(a) & 6(b))*
- Expenditure on Water management*(Refer Annexure: Table 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, industrial process and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Industry Sector.

- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.

- **Constraints** with respect to the measurement & monitoring

7.0Performance Indicators:
a. Benchmarks on water use *(Refer Annexure: Table-13)*
b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Performance Indicators

Category	**Indicator**	**Bench Mark** *(as applicable)*	**District- 1**	**District- 2**
Water Quantity Measurement	**Water Quantity**			
	% of Pharmaceutical industries with water flow meters			

[15]Overexploited block of groundwater

	% of Pharmaceutical industries undertaken internal water audit in the last year			
	% of Pharmaceutical industries undertaken external water audit in the last year			
	% of Pharmaceutical industries undertaken Third party Water Audit in the last Year			
Water Conservation	% of Pharmaceutical industries with water harvesting structures?			
	% reduction of total water demand compared to the previous year.			

Performance Indicators

Category	Indicator	Benchmark*(as applicable)*	District 1	District 2
Water Use Efficiency *(Annexure-7)*	**Specific Water Consumption** (SWC); (litres per unit of product) *(refer Annexure-7(a),(b) & (c))*			
	Have specific water consumption norms/bench marks established	Yes/No		
Waste Water *(Annexure-8)*	% reduction in wastewater generation as compared to previous year?			
Water Quality *(Annexure-9)*	% of Pharmaceutical units with online water quality monitoring systems installed.			
	% of Pharmaceutical units having compliance with the wastewater quality discharge norms.			
	% of Pharmaceutical units discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?			
	% of Pharmaceutical units notified for violating effluent discharge norms for discharge in natural resources (surface/ground)?			
Economics	Whether economic incentives are in place by state to encourage water efficiency & conservation?	Yes/No		
	Whether economic disincentive mechanisms like penalties etc. are in place by state to discourage water wastage &inefficient use?	Yes/No		
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?	Yes/No		

8.0Reforms undertaken/ being undertaken/ proposed if any

9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number, types &production of Pharmaceutical industries in the State

Total no. of Pharmaceutical industries in the State and production details		
District-wise	**No. of Pharmaceutical industries**	**Daily Average Production (in litres or tonnes)**
District 1		
District 2		
District 3		
Total		

2Growth Trend of Pharmaceutical industries over a period and Water Demand and Supply position

Pharmaceuticals		**Years**					
		1990	**1995**	**2000**	**2005**	**2010**	**2017**
Total no. of Pharmaceutical Industries							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Pharmaceuticals Industries: (MCM) Present Water Year: 1st June to 31st May next year										
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Pharmaceuticals Industries: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Pharmaceuticals

Pharmaceuticals in state (District-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All districts	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Pharmaceutical industries against total industries in the State

Total Water Withdrawal by Pharmaceutical industries (%) *(Refer 4(a) below)*	Total water withdrawal by all Industries in the state	Total Water Consumption by Pharmaceutical industries (%) *(Refer 4(b) below)*	Total water Consumption by all Industries in the state

4(a) Total Water Withdrawal/Abstraction by **Pharmaceutical industries** in the State as percentage of total water withdrawal by all industries in the State

$$\text{Total water withdrawal (\%)} = \frac{\text{(Total water withdrawal by Pharmaceutical units in the State)} \times 100}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **Pharmaceutical industries** in the State as percentage of total water consumption by all industries in the State

$$\text{Total water consumption (\%)} = \frac{\text{(Total actual water consumption by Pharmaceutical units in State)} \times 100}{\text{(Total water consumption by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal and Total Actual Water Consumption by all Pharmaceutical industries in the State

	CY -11	CY -10	CY -9	CY -8	CY -7	CY -6	CY -5	CY -4	CY -3	CY -2	CY -1	CY / 2017
Total Fresh Water Withdrawal by all Pharmaceutical industries (MCM)												
Total Actual Water Consumption by all Pharmaceutical industries (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Fresh Water Withdrawal by all Pharmaceutical industries (%) *(Refer 5(a) below)*						
Total Actual Water Consumption by all Pharmaceutical industries (%) *(Refer 5(b) below)*						

5(a) Total Water Withdrawal/Abstraction by **Pharmaceutical industries** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by Pharmaceutical Sector (\%)} = \frac{\text{(Total water withdrawal by all the Pharmaceutical units in the State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Pharmaceutical industries** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by Pharmaceutical Sector(\%)} = \frac{\text{(Total actual water consumption by all Pharmaceutical units in State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	CY-4	CY-3	CY-2	CY-1

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Pharmaceutical industries on water treatment and management (Lakhs)						
Total O&M Expenditure by Pharmaceutical industries on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by Pharmaceutical units at district level for the Current Year- CY

Pharmaceuticals	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
District 1				
District 2				
District 3				
District 4				
District 5				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit of product. In case of Pharmaceuticals it can be represented as the total volume of water used/consumed (litres) per unit of medicinal product.

Specific Water Consumption (SWC) of Pharmaceuticals:

$$\textbf{Specific Water Consumption}\text{; (litres per unit of medicinal product)} = \frac{\text{Volume of water consumed by the Pharmaceutical unit, (litres)}}{\text{(Total Production by the unit)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol. of Water Consumed (litres)	Total Production (in litres or tonnes)	**SWC** Lit./litre of product or litre/tonne of product
District 1			
District 2			
District 3			

7(b) Average SWC of Pharmaceutical units for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of Pharmaceutical units in State						

7(c) Specific Water Consumption (**SWC**)

SWC of Pharmaceutical Sector in the **State**; Decadal trends or 15 years trend to be provided.

Trend of average Specific Water Consumption (SWC) of Pharmaceutical industries at district level.

Percentage of industries having specific water consumption within the norms/bench marks/standards (**as applicable**)

8Waste Water

	Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
Total Waste Water Generated from Pharmaceutical units in the state (m^3/annum)				
% Total quantum of wastewater discharged after recycling				

9Water Quality

		Bench Mark*(as applicable)*	**District 1**	**District 2**	**District 3**
Water Quality	% of Pharmaceutical units with online water quality monitoring systems installed.				
	% of Pharmaceutical units with compliance of wastewater regulatory quality discharge norms.				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

10Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for each industrial sector in state.

Benchmark for Water Consumption, Waste Water Generation etc. – Provide Category-wise benchmarks

	Parameters	Unit	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	litre/litre of product or litre/tonne of product		
2	Waste Water generation	litre/litre of product or litre/tonne of product		
3	Waste Water discharged	litre/litre of product or litre/tonne of product		

4.2.3.7 Fertilizers

1.0Subject Matter

(Present a brief historical background on the growth of Fertilizer industry – a bird's eye view picture and analysis of the industry using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Fertilizer industries - District level
Type of Fertilizer industries in the State along-with total production *(Refer Annexure: Table-1)*
Time trend of the number (growth) of Fertilizer industries in the state and water demand and supply position *(Refer Annexure: Table-2)*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Fertilizer industries

Water Supply & Demand for Fertilizer industries in the State

Time trend of total water demand and actual current water supplied to the Fertilizer industries along with growth of industries in the state.
Provide trend analysis (10-15 years) with breakup. (Refer Annexure: Table – 2, 3a, 3b)

Total Freshwater Withdrawal and Actual Water Consumption by Fertilizer industries in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Fertilizer industries in the State:

State Water Budgeting: *Refer Annexure- Table 3(e)*

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Fertilizer industries				
GRAND TOTAL	xxx	xxx	xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include

- Waste water disposal and associated surface and ground water contamination
- Water demand and supply issues in the Fertilizer sector in the state, provide details
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.
- Issues related to water pricing in Fertilizer sector
- Technology availability, affordability and efficiency related issues
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Fertilizer sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the Fertilizer sector in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the industrial water consumption and supply.

Governing body for Fertilizer sector	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Ministry of Chemicals & Fertilizers	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by Fertilizer industries for the benefit of neighborhood/ local community/ Environment.

Fertilizer	Any OE[16] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Fertilizer	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics & Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure: Table 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure: Table 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, industrial process and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Industry Sector.
- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring.

7.0Performance Indicators:

a. Benchmarks on water use *(Refer Annexure: Table-13)*

b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Category	Indicator		Bench Mark/ Unit *(as applicable)*	Unit 1	Unit 2	Unit 3
Measurement	**Water Quantity**					
	Measurement at Raw water source	Manual	Yes/No			
		Real Time/	Yes/No			

[16]Overexploited block of groundwater

		Automatic				
		Use of ICT (SCADA)	Yes/No			
	Measurement at major water usage areas	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
		Use of ICT (SCADA)	Yes/No			
	Waste Water (generation, recycle/reuse & discharge)	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
		Use of ICT (SCADA)	Yes/No			
	Undertaken internal Water Audit in the last Year?		Yes/No			
	Undertaken Third party Water Audit in the last Year?		Yes/No			
	Submitting monthly water balance to state pollution control board (SPCB)?		Yes/No			

Performance Indicators

Category	Indicator	Bench Mark/ Unit *(as applicable)*	Unit 1	Unit 2	Unit 3
Management Plans	Having Water Management Plans?	Yes/No			
	Whether Water Managements are operational	Yes/No			
Water Conservation	Have taken up RWH/ GW Recharge?	Yes/No			
	% of total Water requirement being met from Treated Waste Water				
	% reduction in water consumption compared to the previous year.				
	Introduction of water efficient technologies in process to reduce water consumption.	Yes/No			
Water Use Efficiency *(Annexure: Table 7)*	**Specific Water Consumption** (SWC); (m^3/MT of fertilizer produced) *(refer Annexure: Table 7(a),(b) & (c))*				
	Have specific water consumption norms/benchmarks established	Yes/No			
Water Productivity *(Annexure: Table 8)*	**Water Productivity** (INR/m^3) Quantity of water necessary to produce these goods *(refer Annexure: Table 8(a)&(b))*				
Water Intensity *(Annexure: Table 9)*	**Water Intensity**; (m^3/1000 Rs or m^3/US$) Volume of water used per unit of gross value added (GVA) *(refer Annexure-9(a)&(b))*				
Water Foot print *(Annexure: Table 10)*	Total volume of freshwater used directly and/or indirectly for the industrial operation/product *(refer Annexure: Table 10(a))*				
Waste Water *(Annexure: Table 11)*	Total Waste Water Generated				
	% of Waste Water Treated				
	% of Treated waste water recycled				
	Implemented/ achieved zero liquid discharge (ZLD)				

Category	Indicator	Bench Mark/ Unit *(as applicable)*	Unit 1	Unit 2	Unit 3
Waste Water Quality *(Annexure: Table 12)*	Installation of online water quality monitoring systems.	Yes/No			
	Compliance with the wastewater quality discharged norms.	Yes/No			
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).	Yes/No			
Economics	Whether economic incentives are in place by state to encourage water efficiency & conservation?	Yes/No			
	Whether economic disincentive mechanisms like penalties etc. are in place by state to discourage water wastage & inefficient use?	Yes/No			
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?	Yes/No			

Performance Indicators

Category	Indicator	Bench Mark/ Unit *(as applicable)*	District 1	District 2	District 3
Water Quantity Measurement	% of Fertilizer industries with water flow meters				
	% of Fertilizer industries undertaken internal water audits in the last year				
	% of Fertilizer industries undertaken external water audit in the last year				
	% of Fertilizer industries submitting water balance to SPCB (State Pollution Control Board)				

8.0Reforms undertaken/ being undertaken/ proposed if any

9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number, types & production of Fertilizer industries in the State

Total Production from Fertilizer industries in the State		
Type – Based on Ownership	**No. of Fertilizer industries**	**Daily Average Production** in metric tonne (MT/day)
Government		
Private		
Cooperative		
Total		

2Growth Trend of Fertilizer industries over a period and Water Demand and Supply position

Fertilizers – Based on Ownership		**Years**					
		1990	**1995**	**2000**	**2005**	**2010**	**2017**
No. of Industries							
Government							
Private							
Cooperative							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Fertilizer Industries: (MCM) Present Water Year: 1st June to 31st May next year										
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Fertilizer Industries: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Fertilizer

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Fertilizer units	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Fertilizer industries against total industries in the State

Fertilizer – Type based on product	Total Water Withdrawal by Fertilizer industries (%) *(Refer 4(a) below)*	Total water withdrawal by all the Industries in state	Total Water Consumption by all Fertilizer industries (%) *(Refer 4(b) below)*	Total water Consumption by all Industries in the state
Straight Nitrogenous (SN)				
Straight Phosphatic (SP)				
Complex Fertilizers (CF)				
Total				

4(a) Total Water Withdrawal/Abstraction by **Fertilizer industries** in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by Fertilizer Sector (\%)} = \frac{\text{(Total water withdrawal by all the Fertilizer units in the State)} \times 100}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **Fertilizer industries** in the state as percentage of Total water consumption by all the industries in the State

$$\text{Total water consumption by Fertilizer Sector(\%)} = \frac{\text{(Total actual water consumption by all Fertilizer units in State)} \times 100}{\text{(Total water consumption by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal and Total Actual Water Consumption by all Fertilizer industries in the State

	CY -11	CY -10	CY -9	CY -8	CY -7	CY -6	CY -5	CY -4	CY -3	CY -2	CY -1	CY / 2017
Total Fresh Water Withdrawal by all Fertilizer industries (MCM)												
Total Actual Water Consumption by all Fertilizer industries (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Fresh Water Withdrawal by all Fertilizer industries (%) *(Refer Annexure: Table 5(a))*						
Total Actual Water Consumption by all Fertilizer industries (%) *(Refer Annexure: Table 5(b)*						

5(a) Total Water Withdrawal/Abstraction by **Fertilizer industries** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by Fertilizer Sector (\%)} = \frac{\text{(Total water withdrawal by all the Fertilizer units in the State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Fertilizer industries** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by Fertilizer Sector(\%)} = \frac{\text{(Total actual water consumption by all Fertilizer units in State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Fertilizer industries on water treatment and management (Lakhs)						
Total O&M Expenditure by Fertilizer industries on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by each industry for the Current Year- CY

Fertilizers	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
UNIT 1				
UNIT 2				
UNIT 3				
UNIT 4				
UNIT 5				
UNIT 6				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit of product. In case of Fertilizer it can be represented as the total volume of water used/consumed (m^3) per metric tonne of fertilizer produced.

Specific Water Consumption (SWC) of Fertilizer:

$$\textbf{Specific Water Consumption}; (m^3/MT) = \frac{\text{Volume of water consumed by the Fertilizer unit, } (m^3)}{\text{Total Fertilizer produced by the unit (tonne)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol. of Water Consumed (m^3)	Total Fertilizer produced (tonne)	**SWC** (m^3/tonne)
Unit 1			
Unit 2			
Unit 3			

7(b) Average SWC of Fertilizer units for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of Fertilizer units in State						

7(c) Specific Water Consumption (**SWC**)

SWC of Fertilizer Sector in the **State (in categories such as (Straight Nitrogenous (SN), Straight Phosphatic (SP), Complex Fertilizers (CF))**; Decadal trends or 15 years trend to be provided.

Trend of average Specific Water Consumption (SWC) of Fertilizer industries at district level:

Percentage of industries having specific water consumption within the norms/bench marks/standards **(if applicable)**

8Water productivity:

- **Water Productivity** as the total economic value created of the output/product by the Industry in the State per unit volume of water withdrawal or consumption

$$\textbf{Water Productivity}\ (INR/m^3) = \frac{\text{(Total economic value created of the output/product by the Industry), INR}}{\text{(Total Volume of freshwater withdrawn/consumed), } m^3}$$

OR

Water Productivity in terms of **GVA (Gross Value Added)**; (INR/m^3)

$$= \frac{\text{(Total Value of Fertilizer Production – Value of inputs other than water), INR}}{\text{(Total Volume of freshwater consumed), } m^3}$$

8(a) Water Productivity in terms of **GVA for Current Year**

	Value of Fertilizer Production	Value of inputs other than water	Total Volume of freshwater consumed	**(Gross Value Added)**; (INR/m^3)
Unit 1				
Unit 2				
Unit 3				
Total				

8(b) Average Water Productivity in terms of **GVA**
for the State – time trend (also represent through Graph)

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Average Water Productivity (GVA); (INR/m^3)						

9Water Intensity:

$$\textbf{Water Intensity};\ (m^3/1000\ Rs\ or\ m^3/US\$) = \frac{\text{Volume of water consumed by the Industry, } (m^3)}{\text{(Unit value added by Fertilizer production), (1000 Rs or US\$)}}$$

9(a) Water Intensity for Current Year

	Volume of water consumed	Unit value added by Fertilizer production	**Water Intensity**; (m^3/1000 Rs or m^3/Rs)
Unit 1			
Unit 2			
Unit 3			
Total			

9(b) Average Water Intensity for the State – time trend (also represent through Graph)

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Average Water Intensity (m^3/1000 Rs or m^3/Rs)						

10Water Footprint:

Water Footprint for Fertilizer industries

Water Footprint (WF) of Fertilizer production = Sum of WF of Operations of the plant and WF of Supply Chain

10(a) Water Foot print for Current Year

	$\text{WF}_{\text{Supply Chain}}$	$\text{WF}_{\text{Operations}}$	Total
Unit 1			
Unit 2			
Unit 3			
Total			

11Waste Water

	Bench Mark/ Units *(as applicable)*	**Unit 1**	**Unit 2**	**Unit 3**
Total Waste Water Generated				
% Waste Water Treated				
% Waste Water Recycled				
• % Treated waste water used in Industrial activity				
• % Treated waste water used in Green belt				
• % Treated waste water used in others				
% Total quantum of wastewater discharged.				
Implementation/ achieved zero liquid discharge (ZLD).				

12Water Quality

		Bench Mark/regulatory norms *(as applicable)*	UNIT 1	UNIT 2	
Water Quality	Installation of online water quality monitoring systems.				
	Compliance with the wastewater regulatory quality discharge norms.				
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

13Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for each industrial sector in state. The benchmarks to be given category-wise as mentioned below:

13(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	Unit	Indian Bench Mark	International Bench Mark
	Straight Nitrogenous			
1	Specific Water Consumption	m^3/tonne		
2	Waste Water generation	m^3/tonne		
3	Waste Water discharged	m^3/tonne		
	Straight Phosphatic			
1	Specific Water Consumption	m^3/tonne		
2	Waste Water generation	m^3/tonne		
3	Waste Water discharged	m^3/tonne		
	Complex fertiliser			
1	Specific Water Consumption	m^3/tonne		
2	Waste Water generation	m^3/tonne		
3	Waste Water discharged	m^3/tonne		

13(b) Existing benchmarks/norms in certain sectors for reference

Fertilizer sector

Type of plant	Unit	Indian Bench Mark
Nitrogenous fertiliser plant	m^3/tonne	5.0 - 20.0
Straight phosphatic plant	m^3/tonne	1.4 - 2.0
Complex fertiliser	m^3/tonne	0.2 - 5.4

Textile sector

	Parameters	Unit	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	m^3/tonne	200-250	Less than 100
2	Waste Water generation	m^3/tonne		
3	Waste Water discharged	m^3/tonne	ZLD (draft)	

Pulp & Paper sector

	Parameters	Unit	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	m^3/tonne	Wood based mills: 63 Waste paper based mills: 9 - 19	Wood based mills: 30 – 70 Waste paper based mills: 8 - 10
2	Waste Water generation	m^3/tonne		
3	Waste Water discharged	m^3/tonne	Wood based mills: 50	

4.2.3.8 Food Processing

[States/ UT are requested to develop this Template in similar lines on their own.]

4.2.3.9 Mining

1.0Subject Matter

(Present a brief historical background on the growth of industry – a bird's eye view picture and analysis of the Industry using the information/ tables) provided in the annexure.

GIS based map depicting location of all the mines (based on underground mines, open cast mines, beneficiation plant/ others) District level.
Number of mines in the State. *(Refer Annexure- Table-1).*
Time trend of the number (growth) of Mines. *(Refer Annexure- Table-2).*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Mining sector

Water Supply & Demand for Mining sector in the State

Time trend of total water demand and actual current water supplied to the mining sector along with growth of mining sector in the state. *(Refer Annexure- Table 2, 3)*

Total Freshwater Withdrawal and Actual Water Consumption by Mining Sector in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Mining Sector in a State

Comparative status of total water consumption by each Mining site

State Water Budgeting: *(Refer Annexure- Table 3(e)).*

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
Mine 1				
Mine 2				
All Mines				
Others (viz. beneficiation plants)				
GRAND TOTAL	xxx	xxx	Xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include matter like wastewater disposal, water demand and supply gap, surface and groundwater contamination, water pricing, etc.

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions
5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Mining sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the Mining sector in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the industrial water consumption and supply.

Governing body for Mining	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Ministry of Mining	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by Mining sector for the benefit of neighborhood/ local community/ Environment.

Mines	Any OE[17] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Mines	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics & Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure Table 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure Table 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, various processes and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.
- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring.

7.0Performance Indicators:

a. Benchmarks on water use *(Refer Annexure- table-13)*

b. Status of various Performance Indicators– for comparison across Districts/Mines

Category	**Indicator**		**Bench Mark/ Unit** *(as applicable)*	**Mine 1**	**Mine 2**	**Mine 3**
Measurement	**Water Quantity**					
	Measurement at Raw water source	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Measurement at major water usage areas	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Waste Water (generation, recycle/reuse & discharge)	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Undertaken internal Water Audit in the last Year?		Yes/No			

[17] Overexploited block of groundwater

	Undertaken Third party Water Audit in the last Year?		Yes/No			
	Submitting monthly water balance to state pollution control board (SPCB)?		Yes/No			
Management Plans	Having Water Management Plans?		Yes/No			
	Whether Water Managements are operational		Yes/No			
Water Conservation	Have taken up RWH/ GW Recharge?		Yes/No			
	% of total Water requirement being met from Treated Waste Water					
	Have taken up Restoration measures?		Yes/No			
	% of reduction of water demand compared to the previous year.					
	Introduction of water efficient technologies in process to reduce water consumption.		Yes/No			
Water Use Efficiency *(Annexure- Table7)*	**Specific Water Consumption** (SWC); (m^3/tonne) *(refer Annexure-Table 7(a), (b) & (c))*					
	Have specific water consumption within the norms/bench marks/standards		Yes/No			
Water Productivity *(Annexure-Table 8)*	**Water Productivity** (INR/m^3) Quantity of water necessary to produce these goods *(refer Annexure- Table 8(a)&(b))*					
Water Intensity *(Annexure- Table 9)*	**Water Intensity**; (m^3/1000 Rs or m^3/US$) Volume of water used per unit of gross value added (GVA) *(refer Annexure- Table 9(a)&(b))*					
Water Foot print *(Annexure- Table 10)*	Total volume of freshwater used directly and/or indirectly for the industrial operation/product *(refer Annexure- Table 10(a))*					
Waste Water *(Annexure- Table 11)*	Total Waste Water Generated					
	% Waste Water Treated					
	% Treated waste water recycled					
	Implementation/ achieved zero liquid discharge (ZLD).		Yes/No			
Water Quality *(Annexure-Table 12)*	Installation of online water quality monitoring systems.		Yes/No			
	Compliance with the wastewater quality discharged norms.		Yes/No			
	Discharging wastewater into open area/ earthen nallah					

	/open drain/ municipal sewer?					
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).		Yes/No			
	No. of mining areas where Water Quality has adversely affected					
Economics	Whether economic incentives are in place to encourage water efficiency & conservation?		Yes/No			
	Whether economic disincentive mechanisms like penalties etc. are in place to discourage water wastage & inefficient use?		Yes/No			
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?		Yes/No			
Public Interface	Operationalization of online water quality portal for information dissemination and feedback		Yes/No			

Category	**Indicator**	**Bench Mark/ Unit** *(as applicable)*	**District 1**	**District 2**	**District 3**
Water Quantity Measurement	% of Mines with water flow meters				
	% of water sources for mines geotagged				
	% of Mines undertaking internal water audits in last year				
	% of Mines undertaking external water audits in last year				
	% of Mines submitting water balance to SPCB (state pollution control board)				

8.0Reforms undertaken/ being undertaken/ proposed if any

9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number, types & capacity of Mines in the State

Total Production from Mines in the State			
Type of Mines	**No of Mines**	**Total capacity (Planned) of Mines in Metric Tonne**	**Total Production in a year in Metric Tonne**
Underground mines			
Opencast mines			
Others (viz. beneficiation plants)			
Total			

2Growth Trend of Mines over a period and Water Demand and Supply position

Mines		**Years**					
		1990	**1995**	**2000**	**2005**	**2010**	**2017**
No. of Industries							
Underground mines							
Opencast mines							
Others (viz. beneficiation plants)							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Municipal Supply						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Mining Industries: (MCM) Present Water Year: 1st June to 31st May next year										
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Mining Industries: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Mines

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Mines	xxx	Xxx	Xxx	xxx

4Proportion of Water withdrawal and consumption by Mines against total industries in the State

Mines	Total Water Withdrawal by all Mines (%) *(Refer Annexure-4(a))*	Total water withdrawal by all the Industries in state	Total Water Consumption by all Mines (%) *(Refer Annexure-4(b))*	Total water Consumption by all the Industries in state
Underground mines				
Opencast mines				
Beneficiation plant				
Others				
Total				

4(a) Total Water Withdrawal/Abstraction by **Mining sector** in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by Mining Sector (\%)} = \frac{\text{(Total water withdrawal by all the Mines in the State)} \times 100}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **Mining sector** in the state as percentage of Total water consumption by all the industries in the State

$$\text{Total water consumption by Mining Sector (\%)} = \frac{\text{(Total actual water consumption by all Mines in State)} \times 100}{\text{(Total water consumption by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal by all Mines and Total Actual Water Consumption by all Mines in the State

	CY -11	CY -10	CY -9	CY -8	CY -7	CY -6	CY -5	CY -4	CY -3	CY -2	CY -1	CY / 2017
Total Fresh Water Withdrawal by all Mines (MCM)												
Total Actual Water Consumption by all Mines (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Fresh Water Withdrawal by all Mines (%) *(Refer Annexure-5(a))*						
Total Actual Water Consumption by all Mines (%) *(Refer Annexure-5(b)*						

5(a) Total Water Withdrawal/Abstraction by **Mining sector** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by Mining Sector (\%)} = \frac{\text{(Total water withdrawal by all the Mines in the State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Mining sector** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by Mining Sector (\%)} = \frac{\text{(Total actual water consumption by all Mines in State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs.)

Year wise cost of procurement of Water				
CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Mines on water treatment and management (Lakhs)						

Total O&M Expenditure by Mines on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by each Mine for the Current Year- CY

Mines	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
Mine 1				
Mine 2				
Mine 3				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit of product produced. In case of Mining, it can be represented as the total volume of water used/consumed (m^3) per tonne of mineral produced/beneficiated.

Specific Water Consumption (SWC) of Mines:

Specific Water Consumption (SWC); (**m^3/tonne**)

$$= \frac{\text{Volume of water consumed by the Mines, } (m^3)}{\text{Total Production by the mine, (tonne)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol. of Water Consumed(m^3)	Total Mineral Production (tonne)	SWC (**m^3/tonne**)
Mine 1			
Mine 2			
Mine 3			

7(b) Average SWC of Mines for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of Mines in State						

7(c) Specific Water Consumption (**SWC**)

- **Comparative Specific Water Consumption (SWC) of Mines**
- **Trend of Specific Water Consumption (SWC) of each mine**

Percentage of mines having specific water consumption within the norms/bench marks/standards **(if applicable)**.

8Water productivity:

For e.g. *(illustrative purpose only)*

- **Water Productivity** as the total economic value created of the output/product by the Industry in the State per unit volume of water withdrawal or consumption

$$\textbf{Water Productivity } (INR/m^3) = \frac{\text{(Total economic value created of the output/product by the Industry), INR}}{\text{(Total Volume of freshwater withdrawn/consumed), } m^3}$$

OR

Water Productivity in terms of **GVA (Gross Value Added)**; (INR/m^3)

$$= \frac{\text{(Total Value of Mineral Production – Value of inputs other than water), INR}}{\text{(Total Volume of freshwater consumed), } m^3}$$

8(a) Water Productivity in terms of **GVA for Current Year**

	Value of Mineral Production	Value of inputs other than water	Total Volume of freshwater consumed	**(Gross Value Added)**; (INR/m^3)
Mine 1				
Mine 2				
Mine 3				
Total				

8(b) Average Water Productivity in terms of **GVA**
for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Productivity (GVA); (INR/m^3)						

9Water Intensity:

$$\textbf{Water Intensity}; (m^3/1000 \text{ Rs or } m^3/US\$) = \frac{\text{Volume of water consumed by the Mines, } (m^3)}{\text{(Unit value added by mineral production), (1000 Rs or US\$)}}$$

9(a) Water Intensity for Current Year

	Volume of water consumed	Unit value added by Mineral production	**Water Intensity**; (m^3/1000 Rs or m^3/Rs)
Mine 1			
Mine 2			
Mine 3			
Total			

9(b) Average Water Intensity for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Intensity (m^3/1000 Rs or m^3/Rs)						

10Water Footprint:

Water Footprint (WF) of per unit of mineral = Sum of WF of Operations of the unit and WF of Supply Chain

i.e. **Water Footprint (WF) = $\text{WF}_{\text{Supply Chain}}$ + $\text{WF}_{\text{Operations}}$**

10(a) Water Foot print for Current Year

	$\text{WF}_{\text{Supply Chain}}$	$\text{WF}_{\text{Operations}}$	Total
Mine 1			
Mine 2			
Mine 3			
Total			

11Waste Water

	Bench Mark/ Units *(as applicable)*	**Mine 1**	**Mine 2**	**Mine 3**
Total Waste Water Generated				
% Waste Water Treated				
% Waste Water Recycled				
• % Treated waste water used in Industrial activity				
• % Treated waste water used in Green belt				
• % Treated waste water used in others				
% Total quantum of wastewater discharged.				
Implementation/ achieved zero liquid discharge (ZLD).				

11(a) Use of Treated Waste Water

	Source of Waste Water	Source of Treated Waste Water for reuse	Qty. of Treated WW consumed	Total Water Consumption	% use of Treated WW out of total Water Consumption
Mine 1					
Mine 2					
Mine 3					

12Water Quality

		Bench Mark/regulatory norms *(as applicable)*	**Mine 1**	**Mine 2**	
Water Quality	Installation of online water quality monitoring systems.				
	Compliance with the wastewater regulatory quality discharge norms.				
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

13Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for mining sector in state.

13(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	**Unit**	**Indian Bench Mark**	**International Bench Mark**
1	Specific Water Consumption	m^3/tonne		
2	Waste Water generation	m^3/tonne		
3	Waste Water discharged	m^3/tonne		

4.2.3.10 Infrastructure

[States/ UT are requested to develop this Template in similar lines on their own.]

4.2.3.11 Construction

[States/ UT are requested to develop this Template in similar lines on their own.]

4.2.3.12 Water Transport

[States/ UT are requested to develop this Template in similar lines on their own.]

4.2.3.13 Road /Bus Transport

1.0Subject Matter

(Present a brief historical background on the growth of bus transport – a bird's eye view picture and analysis of the bus transport using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Bus Depots and Inter-State Bus Terminals (ISBTs) District level Number of passengers from Bus Depots/ISBTs in the State. (Refer Annexure- Table-1).
Time trend of the number (growth) of Bus Depots/ISBTs. (Refer Annexure- Table-2).

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Bus Transport

Water Supply & Demand for Bus Transport in the State

Time trend of total water demand and actual current water supplied to the Bus Depots & ISBTs along with growth of Bus Depots & ISBTs in the state. *(Annexures- Tables-2, 3)*

Total Freshwater Withdrawal and Actual Water Consumption by Bus Transport Sector in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Bus Transport Sector in a State.

State Water Budgeting: *(Refer Annexure- Table 3).*

Bus Depots/ISBTs (district wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
District 1				
District 2				
GRAND TOTAL	Xxx	xxx	xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include matters of waste water disposal and associated surface and ground water contamination, water demand and supply issues in the Bus transport sector in the state, issues related to water pricing in bus depots/ISBTs, etc.

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Bus Transport sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the Bus Depot/ISBT in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the water consumption and supply.

Governing body for Bus Transport	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Department of Transportation (Bus)	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by Bus Transport sector for the benefit of neighborhood/ local community/ Environment.

Bus Depot/ ISBT	Any OE[18] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Bus Depot/ ISBT	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics & Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, process and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.
- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring.

7.0Performance Indicators:

a. Benchmarks on water use *(Refer Annexure- table-13)*
b. Status of various Performance Indicators– for comparison across Districts

Category	Indicator	Bench Mark *(as applicable)*	District- 1	District- 2
Water Quantity Measurement	**Water Quantity**			
	% of bus depots/ISBT's with water flow meters			
	% of water sources of bus depots/ISBTs geotagged			
	% of bus depots/ISBT's undertaken internal water audit in the last year			
	% of bus depots/ISBT's undertaken external water audit in the last year			
	% of bus depots/ISBT's Undertaken Third party Water Audit in the last Year			
Water Conservation	% of bus depots/ISBT's with water harvesting structures?			
	% reduction of total water demand compared to the previous year.			
Water Use Efficiency *(Annexure- Table 7)*	Specific Water Consumption in **Water consumption per passenger (L/passenger)** *(refer Annexure Table-7(a),(b) & (c))*			

[18]Overexploited block of groundwater

	Have specific water consumption norms/benchmarks established	Yes/No		
	% of bus depots/ISBTs with specific water consumption within the norms/bench marks/standards			
Waste Water *(Annexure-Table 8)*	% reduction in wastewater generation as compared to previous year			
Water Quality *(Annexure-Table 9)*	% of bus depots/ISBTs with online water quality monitoring systems installed.			
	% of bus depots/ISBTs having compliance with the wastewater quality discharge norms.			
	% of bus depots/ISBTs discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?			
	% of bus depots/ISBTs notified for violating effluent discharge norms for discharge in natural resources (surface/ground)?			
Economics	Whether economic incentives are in place to encourage water efficiency & conservation?	Yes/No		
	Whether economic disincentive mechanisms like penalties etc. are in place to discourage water wastage & inefficient use?	Yes/No		
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?	Yes/No		

8.0Reforms undertaken/ being undertaken/ proposed if any

9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number, types & capacity of Bus Depots/ISBTs in the State

Total Production from Bus Depots/ISBTs in the State			
Type	**No of Bus Depots/ISBTs**	**Total Capacity of all the Bus Depots/ ISBTs (Million Passengers per Annum)**	**Daily Average passengers at all the Bus Depots/ISBTs**
Bus Depots			
ISBTs			
Others			
Total			

2Growth Trend of Bus Depots/ISBTs over a period and Water Demand and Supply position

bus depots/ISBTs	**Years**					
	1990	**1995**	**2000**	**2005**	**2010**	**2017**
Bus Depots						

ISBTs							
Others							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Municipal Supply						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Bus Depots: (MCM) Present Water Year: 1st June to 31st May next year										
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Bus Depots: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water*	Dug wells (Total No. x Draft)										

(Dynamic / Static)	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Bus depots/ISBTs

Bus Depots/ISBTs in State (district-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Districts	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Bus Depots/ISBTs against total industries in the State

Bus depots/ISBTs – Based on capacity	Total Water Withdrawal by all bus depots/ISBTs (%) *(Refer Annexure-4(a))*	Total water withdrawal by all the Industries in state	Total Water Consumption by all bus depots/ISBTs (%) *(Refer Annexure-4(b))*	Total water Consumption by all the Industries in state
Bus Depots				
ISBTs				
Others				
Total				

4(a) Total Water Withdrawal/Abstraction by **bus depots/ISBTs** in the State as percentage of Total water withdrawal by all the industries in the State

Total water withdrawal by Bus Transport Sector (%)

$$= \frac{\text{(Total water withdrawal by all the bus depots/ISBTs in the State)} \times 100}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **bus depots/ISBTs** in the state as percentage of Total water consumption by all the industries in the State

Total water consumption by Bus Transport Sector (%)

$$= \frac{\text{(Total actual water consumption by all bus depots/ISBTs in State)} \times 100}{\text{(Total water consumption by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal by all bus depots/ISBTs and Total Actual Water Consumption by all bus depots/ISBTs in the State

	CY -11	**CY -10**	**CY -9**	**CY -8**	**CY -7**	**CY -6**	**CY -5**	**CY -4**	**CY -3**	**CY -2**	**CY -1**	**CY / 2017**
Total Fresh Water Withdrawal by all bus depots/ISBTs (MCM)												
Total Actual Water Consumption by all bus depots/ISBTs (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**

Total Fresh Water Withdrawal by all bus depots/ISBTs (%) *(Refer Annexure-5(a))*						
Total Actual Water Consumption by all bus depots/ISBTs (%) *(Refer Annexure-5(b)*						

5(a) Total Water Withdrawal/Abstraction by **bus depots/ISBTs** in the State as percentage of Total available freshwater resources of the State

Total water withdrawal by Bus Transport Sector (%)

$$= \frac{(\text{Total water withdrawal by all the bus depots/ISBTs in the State}) \times 100}{(\text{Total available freshwater resources of the state})}$$

5(b) Total Actual Water Consumption by **bus depots/ISBTs** in the state as percentage of Total available freshwater resources of the State

Total water consumption by Bus Transport Sector (%)

$$= \frac{(\text{Total actual water consumption by all bus depots/ISBTs in State}) \times 100}{(\text{Total available freshwater resources of the state})}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by bus depots/ISBTs on water treatment and management (Lakhs)						
Total O&M Expenditure by bus depots/ISBTs on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure at district level for the Current Year- CY

District	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
District 1				
District 2				
District 3				

Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit. In case of Bus transport it can be represented as the total volume of water used/consumed (m^3) per passenger.

Specific Water Consumption (SWC) of bus depots/ISBTs:

Specific Water Consumption (SWC); (**Litre/ passenger**)

$$= \frac{\text{Volume of water consumed by the bus depots/ISBTs, (Litre)}}{\text{(Total No. of Passengers), (passenger)}}$$

7(a) Specific Water Consumption in **Litre/passenger** for Current Year

	Vol. of Water Consumed(m^3)	Total no. of passengers (passenger)	SWC (**m^3/passenger**)
District 1			
District 2			
District 3			

7(b) Average Water Consumption per passenger at bus depots/ISBTs for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Consumption per passenger at bus depots/ISBTs in State						

7(c) Specific Water Consumption (**Water Consumption per Passenger**)
Trend of Water Consumption per Passenger at bus depots/ISBTs at district level
Percentage of bus depots/ISBTs having specific water consumption (Water Consumption per passenger) within the norms/bench marks/standards (**if applicable**)

8Waste Water

	Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
Total Waste Water Generated from bus depots/ISBTs (m^3/annum)				
% Total quantum of wastewater discharged after recycling				

9Water Quality

		Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
Water Quality	% of bus depots/ISBTs with online water quality monitoring systems installed.				
	% of bus depots/ISBTs with compliance of wastewater regulatory quality discharge norms.				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

10Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for bus depots/ISBTs in state.

10(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	Unit	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	m^3/passenger		
2	Waste Water generation	m^3/passenger		
3	Waste Water discharged	m^3/ passenger		

4.2.3.14 Railways & Metro Rail

1.0Subject Matter

(Present a brief historical background on the growth of industry – a bird's eye view picture and analysis of railways and metro rail using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Railway & Metro Stations, Railway & Metro Depots, Railway & Metro Colonies/Hospitals/Others-District level
Number of passengers at Railway & Metro Stations in the State *(Refer Annexure Table-1).*
Time trend of the number (growth) of Railway & Metro Stations. *(Refer Annexure Table-2).*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Railway & Metro Stations

Water Supply & Demand for Railway & Metro Stations in the State

Time trend of total water demand and actual current water supplied to the Railway & Metro Stations along with growth of Railway & Metro Stations in the state. *(Refer Annexure Tables-2, 3)*

Total Freshwater Withdrawal and Actual Water Consumption by Railway & Metro Stations in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Railway & Metro Stations in a State

State Water Budgeting: *(Refer Annexure Table-3(e)).*

Railway & Metro Stations (district-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
District 1				
District 2				
GRAND TOTAL	xxx	xxx	xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include

- Waste water disposal and associated surface and ground water contamination
- Water demand and supply issues in the Railway & Metro sector in the state, provide details
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.
- Issues related to water pricing in Railway & Metro Stations
- Technology availability, affordability and efficiency related issues
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Railway & Metro Station sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the Railway & Metro Stations in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the industrial water consumption and supply.

Governing body for Railway & Metro Stations	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Ministry of Railways *Metro Corporations*	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by Railway & Metro Stations for the benefit of neighborhood/ local community/ Environment.

Railway & Metro Station	Any OE[19] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Railway & Metro Station	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics& Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure Tables 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure Tables 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, various processes and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.

- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.

- **Constraints** with respect to the measurement & monitoring.

[19]Overexploited block of groundwater

7.0Performance Indicators:

a. Benchmarks on water use *(Refer table-10)*

b. Status of various Performance Indicators– for comparison across Districts.

Category	Indicator	Bench Mark *(as applicable)*	District- 1	District- 2
Water Quantity Measurement	**Water Quantity**			
	% of Railway & Metro stations with water flow meters			
	% of water sources of Railway & Metro stations geo-tagged			
	% of Railway & Metro stations undertaken internal water audit in the last year			
	% of Railway & Metro stations Undertaken Third party Water Audit in the last Year			
Water Conservation	% of Railway & Metro stations with water harvesting structures?			
	% of Railway & Metro stations having storm management structures-infiltration basis			
	% reduction of total water demand compared to the previous year.			
Water Management Plants	% of Railway & Metro stations **not** having water management plants			
	% of Railway & Metro stations implementing their water management plans and achieving 90% of desired results			
Demand Management	% of Railway & Metro stations using automatic valves with built in actuating mechanism			
	% of Railway & Metro stations using SCADA based control systems			
Water Use Efficiency *(Annexure- Table 7)*	Specific Water Consumption in **m^3/passenger** *(refer Annexure Table-7(a),(b) & (c))*			
	Have specific water consumption norms/benchmarks established	Yes/No		
	% of Railway & Metro stations with specific water consumption within the norms/bench marks/standards			
Waste Water *(Annexure-Table 8)*	% reduction in wastewater generation as compared to previous year			
Water Quality *(Annexure-Table 9)*	% of Railway & Metro stations with online water quality monitoring systems installed			
	% of Railway & Metro stations having compliance with the wastewater quality discharge norms.			
	% of Railway & Metro stations discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?			
	% of Railway & Metro stations notified for violating effluent discharge norms for discharge in natural resources (surface/ground)?			
Economics	Whether economic incentives are in place to encourage water efficiency & conservation?	Yes/No		
	Whether economic disincentive mechanisms like penalties etc. are in place to discourage water wastage & inefficient use?	Yes/No		
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?	Yes/No		

8.0Reforms undertaken/ being undertaken/ proposed if any

9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number, types & capacity of Railway & Metro Stations in the State

Total Production from Railway & Metro Stations in the State			
Type of Railways/Metro Rail stations/Depots	**No of Railway & Metro stations/Depots**	**Total Capacity of all the Railway & Metro stations/depots**	**Daily Average Passengers at all the Railway and Metro Stations**
Railway & Metro Stations			
Small			
Medium			
Large			
Railway & Metro Depots			
Others			
Total			

2Growth Trend of Railway & Metro Stations over a period and Water Demand and Supply position

Railway & Metro Stations		**Years**					
		1990	**1995**	**2000**	**2005**	**2010**	**2017**
Railway & Metro Stations							
Small							
Medium							
Large							
Railway & Metro Depots							
Others							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Railway & Metro Stations: (MCM) Present Water Year: 1st June to 31st May next year										
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Railway & Metro Stations: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for RS

Railway & Metro Stations in state (district-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Districts	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Railway & Metro stations against total industries in the State

Railway & Metro stations – Based on capacity	Total Water Withdrawal by all Railway & Metro stations (%) *(Refer Annexure-4(a))*	Total water withdrawal by all the Industries in state	Total Water Consumption by all Railway & Metro stations (%) *(Refer Annexure-4(b))*	Total water Consumption by all the Industries in state
Railway & Metro Stations				
Small				
Medium				
Large				
Railway & Metro Depots				
Others				
Total				

4(a) Total Water Withdrawal/Abstraction by **Railway & Metro Stations (R/MS)** in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by R/MS Sector (\%)} = \frac{\text{(Total water withdrawal by all the R/MS in the State)} \times 100}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **Railway & Metro Stations** in the state as percentage of Total water consumption by all the industries in the State

$$\text{Total water consumption by R/MS Sector (\%)} = \frac{\text{(Total actual water consumption by all R/MS in State) x 100}}{\text{(Total water consumption by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal by all Railway & Metro stations and Total Actual Water Consumption by all Railway & Metro stations in the State

	CY -11	CY -10	CY -9	CY -8	CY -7	CY -6	CY -5	CY -4	CY -3	CY -2	CY -1	CY / 2017
Total Fresh Water Withdrawal by all Railway & Metro stations (MCM)												
Total Actual Water Consumption by all Railway & Metro stations (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Fresh Water Withdrawal by all Railway & Metro stations (%) *(Refer Annexure-5(a))*						
Total Actual Water Consumption by all Railway & Metro stations (%) *(Refer Annexure-5(b)*						

5(a) Total Water Withdrawal/Abstraction by **Railway & Metro Stations** (**R/MS**) in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by R/MS Sector (\%)} = \frac{\text{(Total water withdrawal by all the R/MS in the State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Railway Stations** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by R/MS Sector (\%)} = \frac{\text{(Total actual water consumption by all R/MS in State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m^3)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Railway & Metro stations on water treatment and management (Lakhs)						
Total O&M Expenditure by Railway & Metro stations on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by Railway & Metro stations at district level for the Current Year- CY

District	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
District 1				
District 2				
District 3				
District 4				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit. In case of Railway & Metro Stations, it can be represented as the total volume of water used/consumed (m^3) per passenger.

Specific Water Consumption (SWC) of Railway Stations (R/MS):

$$\text{Specific Water Consumption (SWC); } (\mathbf{m^3/passenger}) = \frac{\text{Volume of water consumed by the R/MS, } (m^3)}{\text{(Total no. of passengers), (passenger)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol. of Water Consumed(m^3)	Total no. of passengers (passenger)	SWC (**m^3/passenger**)
District 1			
District 2			
District 3			

7(b) Average SWC of Railway & Metro stations for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of Railway & Metro stations in State						

7(c) Specific Water Consumption (**SWC**)

Comparative Specific Water Consumption per passenger of the Railway & Metro stations
Trend of Average Specific Water Consumption (SWC) of Railway & Metro Stations at district level

Percentage of industries having specific water consumption within the norms/bench marks/standards (**if applicable**)

8Waste Water

	Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
Total Waste Water Generated from Railway & Metro Stations (m^3/annum)				
% Total quantum of wastewater discharged after recycling				

9Water Quality

	Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
% of Railway & Metro Stations with online water quality monitoring systems installed.				
% of Railway & Metro Stations with compliance of wastewater regulatory quality discharge norms.				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

10Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for Railway & Metro stations in state.

10(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	**Unit**	**Indian Bench Mark**	**International Bench Mark**
1	Specific Water Consumption	m^3/passenger		
2	Waste Water generation	m^3/passenger		
3	Waste Water discharged	m^3/passenger		

4.2.3.15 Airports

1.0Subject Matter

(Present a brief historical background on the growth of airports – a bird's eye view picture and analysis of the airport using the information/ tables) provided in the annexure.

GIS based map depicting location of all the airports (based on Metro, Tier I, Tier II, Tier III/ others)
Number of fixed and floating population at the Airports in the State. *(Refer Annexure- Table-1).*
Time trend of the number (growth) of Airports. *(Refer Annexure- Table-2).*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Airports

Water Supply & Demand for Airports in the State

Time trend of total water demand and actual current water supplied to the Airports along with growth of Airports in the state. *(Refer Annexures- Table 2, 3)*

Total Freshwater Withdrawal and Actual Water Consumption by Airport Sector in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Airport Sector in a State

Comparative status of total water consumption by each Airport:

State Water Budgeting: *(Refer Annexure- Table 3(d)).*

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
Airport 1				
Airport 2				
All Airports				
GRAND TOTAL	xxx	xxx	Xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include problems of waste water disposal and associated surface and ground water contamination, water pricing, monitoring and data reporting, etc.

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Airport sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the Airport in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the water consumption and supply.

Governing body for Airport	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Airport Authority of India	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Schemes, Economics & Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure- Table 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure- Table 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, various processes and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.

- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring.

7.0Performance Indicators:

a. Benchmarks on water use *(Refer Annexure- table 10)*

b. Status of various Performance Indicators– for comparison across Airports/Districts

Category	Indicator		Bench Mark/ Unit *(as applicable)*	Airport 1	Airport 2	Airport 3
Measurement	**Water Quantity**					
	Measurement at Raw water source	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Measurement at major water usage areas	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Waste Water (generation, recycle/reuse & discharge)	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Undertaken internal Water Audit in the last Year?		Yes/No			
	Undertaken Third party Water Audit in the last Year?		Yes/No			
	Submitting monthly water balance to state pollution control board (SPCB)?		Yes/No			
Management Plans	Having Water Management Plans?		Yes/No			
	Whether Water Managements are operational		Yes/No			
Water Conservation	Have taken up RWH/ GW Recharge?		Yes/No			
	% of total Water requirement being met from Treated Waste Water					
	Have taken up Restoration measures?		Yes/No			

	% of reduction of water demand compared to the previous year.					
	Introduction of water efficient technologies in process to reduce water consumption.		Yes/No			
Water Use Efficiency *(Annexure- Table 7)*	Specific Water Consumption (**Water Consumption per Passenger**); (**m³/passenger**) *(refer Annexure-Table 7(a), (b) & (c))*					
	Have specific water consumption benchmarks established?		Yes/No			
	Have specific water consumption within the norms/bench marks/standards		Yes/No			
Waste Water *(Annexure- Table 8)*	Total Waste Water Generated					
	% Waste Water Treated					
	% Treated waste water recycled					
	Implementation/ achieved zero liquid discharge (ZLD).		Yes/No			
Water Quality *(Annexure-Table 9)*	Installation of online water quality monitoring systems.		Yes/No			
	Compliance with the wastewater quality discharged norms.		Yes/No			
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?					
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).		Yes/No			
	No. of areas near airport where Water Quality has adversely affected					
Economics	Whether economic incentives are in place to encourage water efficiency & conservation?		Yes/No			
	Whether economic disincentive mechanisms like penalties etc. are in place to discourage water wastage & inefficient use?		Yes/No			
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?		Yes/No			
Public Interface	Operationalization of online water quality portal for information dissemination and feedback		Yes/No			

Category	Indicator	Bench Mark/ Unit *(as applicable)*	District 1	District 2	District 3
Water Quantity Measurement	% of Airports with water flow meters				
	% of water sources of Airports geotagged				
	% of Airports undertaking internal water audits in last year				
	% of Airports undertaking external water audits in last year				
	% of Airports submitting water balance to SPCB (state pollution control board)				

8.0Reforms undertaken/ being undertaken/ proposed if any

9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number, types & capacity of Airports in the State

Type of Airport	No. of Airports	Total Capacity of all the Airports (Million Passengers per Annum)	Daily Average passengers at all the Airports
Tier – I			
Tier – II			
Tier – III			
Metro			
Others			
Total			

2Growth Trend of Airports over a period and Water Demand and Supply position

Airports		Years					
		1990	1995	2000	2005	2010	2017
No. of Airports							
Tier – I							
Tier – II							
Tier – III							
Metro							
Others							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Municipal Supply						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Airports: (MCM) Present Water Year: 1st June to 31st May next year									
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Airports: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Airports

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Airports	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Airports against total industries in the State

Airports	Total Water Withdrawal by all Airports (%) *(Refer Annexure-4(a))*	Total water withdrawal by all the Industries in state	Total Water Consumption by all Airports (%) *(Refer Annexure-4(b))*	Total water Consumption by all the Industries in state
Tier – I				
Tier – II				
Tier – III				
Metro				
Others				
Total				

4(a) Total Water Withdrawal/Abstraction by **Airports** in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by Airport Sector (\%)} = \frac{\text{(Total water withdrawal by all the airports in the State)} \times 100}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **Airports** in the state as percentage of Total water consumption by all the industries in the State

$$\text{Total water consumption by Airport Sector (\%)} = \frac{\text{(Total actual water consumption by all airports in State)} \times 100}{\text{(Total water consumption by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal by all Airports and Total Actual Water Consumption by all Airports in the State

	CY -11	**CY -10**	**CY -9**	**CY -8**	**CY -7**	**CY -6**	**CY -5**	**CY -4**	**CY -3**	**CY -2**	**CY -1**	**CY / 2017**
Total Fresh Water Withdrawal by all airports (MCM)												
Total Actual Water Consumption by all airports (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Total Fresh Water Withdrawal by all airports (%) *(Refer Annexure-5(a))*						
Total Actual Water Consumption by all airports (%) *(Refer Annexure-5(b)*						

5(a) Total Water Withdrawal/Abstraction by **Airports** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by Airport Sector (\%)} = \frac{\text{(Total water withdrawal by all the airports in the State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Airports** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by Airport Sector (\%)} = \frac{\text{(Total actual water consumption by all airports in State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by the airports (Lakhs) on water treatment and management						
Total O&M Expenditure by the airports on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure at each Airport for the Current Year- CY

Units	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
Airport 1				
Airport 2				
Airport 3				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit. In case of Airports, it can be represented as the total volume of water used/consumed (m^3) per passenger.

Specific Water Consumption (SWC) of Airports**:**

$$\text{Specific Water Consumption (SWC); } (\mathbf{m^3/passenger}) = \frac{\text{Volume of water consumed by the Airport, } (m^3)}{\text{(Total no. of passengers at Airports), (passenger)}}$$

7(a) Specific Water Consumption in **m³/Passenger** for Current Year

	Vol. of Water Consumed (m³)	Total no. of passengers (passenger)	SWC (**m³/passenger**)
Airport 1			
Airport 2			
Airport 3			

7(b) Average Water Consumption per passenger at Airports for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Consumption per passenger at Airports in State						

7(c) Specific Water Consumption (**Water Consumption per Passenger**)
Comparative Water Consumption per Passenger of the Airports.
Trend of Water Consumption per Passenger for each Airport.
Percentage of airports having specific water consumption (Water Consumption per Passenger) within the norms/bench marks/standards **(if applicable).**

8Waste Water

	Bench Mark/ Units *(as applicable)*	**Airport 1**	**Airport 2**	**Airport 3**
Total Waste Water Generated				
% Waste Water Treated				
% Waste Water Recycled				
• % Treated waste water used in activities at airport				
• % Treated waste water used in Green belt				
• % Treated waste water used in others				
% Total quantum of wastewater discharged.				
Implementation/ achieved zero liquid discharge (ZLD).				

8(a) Use of Treated Waste Water

	Source of Waste Water	Source of Treated Waste Water for reuse	Qty. of Treated WW consumed	Total Water Consumption	% use of Treated WW out of total Water Consumption
Airport 1					
Airport 2					
Airport 3					

9Water Quality

		Bench Mark/regulatory norms *(as applicable)*	**Airport 1**	**Airport 2**	
Water Quality	Installation of online water quality monitoring systems.				
	Compliance with the wastewater regulatory quality discharge norms.				
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

10Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for airports in state.

10(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	**Unit**	**Indian Bench Mark**	**International Bench Mark**
1	Specific Water Consumption	m^3/passenger		
2	Waste Water generation	m^3/passenger		
3	Waste Water discharged	m^3/passenger		

4.2.3.16 Tannery

1.0Subject Matter

(Present a brief historical background on the growth of industry – a bird's eye view picture and analysis of the Tannery Industry using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Tannery industries *(small, medium, large/ others)*
Leather production from Tanneries in the State. *(Refer Annexure Table-1).*
Time trend of the number (growth) of Tanneries. (Refer Annexure *Table-2).*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Tanneries

Water Supply & Demand for Tanneries in the State

Time trend of total water demand and actual current water supplied to the Tanneries along with growth of Tanneries in the state. *(Refer Annexure Tables-2, 3)*

Total Freshwater Withdrawal and Actual Water Consumption by Tanneries in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Tanneries in a State

Comparative status of total water consumption by each Tanneries

State Water Budgeting: *(Refer Annexure Table-3(d)).*

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Tanneries				
GRAND TOTAL	xxx	xxx	xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include

- Waste water disposal and associated surface and ground water contamination
- Water demand and supply issues in the Tannery sector in the state, provide details
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.
- Issues related to water pricing in Tanneries
- Technology availability, affordability and efficiency related issues
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Tanneries sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.

- Has the state notified any regulations including for zero liquid discharge for the Tanneries in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the industrial water consumption and supply.

Governing body for Tanneries	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Department/ Associations of Tanneries	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by Tanneries for the benefit of neighborhood/ local community/ Environment.

Tanneries	Any OE[20] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Tanneries	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics& Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, industrial process and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.

- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring.

[20]Overexploited block of groundwater

7.0Performance Indicators:

a. **Benchmarks on water use***(Refer table-13)*

b. **Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.**

Category	**Indicator**		**Bench Mark/ Unit** *(as applicable)*	**Tannery 1**	**Tannery 2**	**Tannery 3**
Measurement	**Water Quantity**					
	Measurement at Raw water source	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Measurement at major water usage areas	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Waste Water (generation, recycle/reuse & discharge)	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Undertaken internal Water Audit in the last Year?		Yes/No			
	Undertaken Third party Water Audit in the last Year?		Yes/No			
	Submitting monthly water balance to state pollution control board (SPCB)?		Yes/No			
Management Plans	Having Water Management Plans?		Yes/No			
	Whether Water Managements are operational		Yes/No			
Water Conservation	Have taken up RWH/ GW Recharge?		Yes/No			
	% of total Water requirement being met from Treated Waste Water					
	Have taken up Restoration measures?		Yes/No			
	% of reduction of water demand compared to the previous year.					
	Introduction of water efficient technologies in process to reduce water consumption.		Yes/No			
Water Use Efficiency *(Annexure- Table 7)*	**Specific Water Consumption** (SWC); (**m^3/tonne**) *(refer Annexure-Table 7(a), (b) & (c))*					
	Have specific water consumption benchmarks/ standards established		Yes/No			
	Have specific water consumption within the norms/bench marks/standards		Yes/No			
Water Productivity *(Annexure-Table 8)*	**Water Productivity** (INR/m^3) Quantity of water necessary to produce these goods *(refer Annexure- Table 8(a)&(b))*					
Water Intensity *(Annexure- Table 9)*	**Water Intensity**; (m^3/1000 Rs or m^3/US$)					

	Volume of water used per unit of gross value added (GVA) *(refer Annexure- Table 9(a)&(b))*					
Water Foot print *(Annexure- Table 10)*	Total volume of freshwater used directly and/or indirectly for the industrial operation/product *(refer Annexure- Table 10(a))*					
Waste Water *(Annexure- Table 11)*	Total Waste Water Generated					
	% Waste Water Treated					
	% Treated waste water recycled					
	Implementation/ achieved zero liquid discharge (ZLD).		Yes/No			
Water Quality *(Annexure-Table 12)*	Installation of online water quality monitoring systems.		Yes/No			
	Compliance with the wastewater quality discharged norms.		Yes/No			
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?					
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).		Yes/No			
	No. of areas near tannery industries where Water Quality has adversely affected					
Economics	Whether economic incentives are in place to encourage water efficiency & conservation?		Yes/No			
	Whether economic disincentive mechanisms like penalties etc. are in place to discourage water wastage & inefficient use?		Yes/No			
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?		Yes/No			
Public Interface	Operationalization of online water quality portal for information dissemination and feedback		Yes/No			

Category	Indicator	Bench Mark/ Unit *(as applicable)*	District 1	District 2	District 3
Water Quantity Measurement	% of Tannery industries with water flow meters				
	% of water sources of Tannery industries geotagged				
	% of Tannery industries undertaking internal water audits in last year				

	% of Tannery industries undertaking external water audits in last year				
	% of Tannery industries submitting water balance to SPCB (state pollution control board)				

8.0Reforms undertaken/ being undertaken/ proposed if any
9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number, types & capacity of Tanneries in the State

Total Production from Tanneries in the State				
Type *Based on capacity*	**No of Tanneries**	**Total Installed Capacity of all the Tanneries** (tonne)	**Total Production Capacity of all the Tanneries** (tonne)	**Daily Average Production of all the Tanneries** (tonne)
Small				
Medium				
Large				
Others				
Total				

2Growth Trend of Tanneries over a period and Water Demand and Supply position

Tanneries		**Years**					
		1990	**1995**	**2000**	**2005**	**2010**	**2017**
Small							
Medium							
Large							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Tannery Industries: (MCM) Present Water Year: 1st June to 31st May next year										
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Tannery Industries: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Tanneries

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Tanneries	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Tanneries against total industries in the State

Tanneries	Total Water Withdrawal by all Tanneries (%)	Total water withdrawal by all the Industries in state	Total Water Consumption by all Tanneries (%)	Total water Consumption by all the Industries in state

	(Refer Annexure-4(a))		*(Refer Annexure-4(b))*	
Small				
Medium				
Large				
Others				
Total				

4(a) Total Water Withdrawal/Abstraction by **Tanneries** in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by Tanneries Sector (\%)} = \frac{\text{(Total water withdrawal by all the Tanneries in the State) x 100}}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **Tanneries** in the state as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water consumption by Tanneries Sector (\%)} = \frac{\text{(Total actual water consumption by all Tanneries in State) x 100}}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal by all Tanneries and Total Actual Water Consumption by all Tanneries in the State

	CY -11	**CY -10**	**CY -9**	**CY -8**	**CY -7**	**CY -6**	**CY -5**	**CY -4**	**CY -3**	**CY -2**	**CY -1**	**CY / 2017**
Total Fresh Water Withdrawal by all Tanneries (MCM)												
Total Actual Water Consumption by all Tanneries (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Total Fresh Water Withdrawal by all Tanneries (%) *(Refer Annexure-5(a))*						
Total Actual Water Consumption by all Tanneries (%) *(Refer Annexure-5(b)*						

5(a) Total Water Withdrawal/Abstraction by **Tanneries** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by Tanneries Sector (\%)} = \frac{\text{(Total water withdrawal by all the Tanneries in the State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Tanneries** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by Tanneries Sector (\%)} = \frac{\text{(Total actual water consumption by all Tanneries in State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	CY-4	CY-3	CY-2	CY-1

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Tanneries on water treatment and management (Lakhs)						
Total O&M Expenditure by Tanneries on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure at Tannery level for the Current Year- CY

Tanneries	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
Tannery 1				
Tannery 2				
Tannery 3				
Tannery 4				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit of product produced. In case of Tanneries, it can be represented as the total volume of water used/consumed (m³) per unit tonnes of leather produced.

Specific Water Consumption (SWC) of Tanneries:

$$\textbf{Specific Water Consumption (SWC)};\ (m^3/tonne) = \frac{\text{Volume of water consumed by the Tanneries, } (m^3)}{\text{(Total Production by the Tanneries), (tonnes)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol. of Water Consumed (m³)	Total Leather Produced (tonnes)	SWC (**m³/tonne**)
Tannery 1			

Tannery 2			
Tannery 3			

7(b) Average SWC of Tanneries for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of Tanneries in State						

7(c) Specific Water Consumption (**SWC**)
Comparative Specific Water Consumption (SWC) of Tanneries
Trend of average Specific Water Consumption (SWC) of Tanneries
Percentage of industries having specific water consumption within the norms/bench marks/standards **(if applicable)**

8Water productivity:

For e.g. *(illustrative purpose only)*

- **Water Productivity** as the total economic value created of the output/product by the Industry in the State per unit volume of water withdrawal or consumption

$$\textbf{Water Productivity}\ (\text{INR/m}^3) = \frac{\text{(Total economic value created of the output/product by the Industry), INR}}{\text{(Total Volume of freshwater withdrawn/consumed), m}^3}$$

OR

Water Productivity in terms of **GVA (Gross Value Added)**; (INR/m^3)

$$= \frac{\text{(Total Value of Leather Production – Value of inputs other than water), INR}}{\text{(Total Volume of freshwater consumed), m}^3}$$

8(a) Water Productivity in terms of **GVA for Current Year**

	Value of Leather Production	Value of inputs other than water	Total Volume of freshwater consumed	**(Gross Value Added)**; (INR/m^3)
Tannery 1				
Tannery 2				
Tannery 3				
Total				

8(b) Average Water Productivity in terms of **GVA**
for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Productivity (GVA); (INR/m^3)						

9Water Intensity:

$$\textbf{Water Intensity};\ (\text{m}^3/1000\ \text{Rs or m}^3/\text{US\$}) = \frac{\text{Volume of water consumed by the Industry, (m}^3)}{\text{(Unit value added by Leather Production), (1000 Rs or US\$)}}$$

9(a) Water Intensity for Current Year

	Volume of water consumed	Unit value added by Leather Production	**Water Intensity**; (m^3/1000 Rs or m^3/Rs)
Tannery 1			
Tannery 2			
Tannery 3			
Total			

9(b) Average Water Intensity in terms
for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Intensity (m^3/1000 Rs or m^3/Rs)						

10Water Footprint:

The total volume of freshwater used directly and/or indirectly for the industrial operation/product. It includes the water used in industries own operation/process and its supply chain. Total Water footprints are composed of estimates for blue water (used from freshwater sources), green water (rain or soil water taken up by plants), and grey water (water required to dilute wastewater to be fit for discharge).

Water Footprint for Leather Production

Water Footprint (WF) of leather production = Sum of WF of Operations of the plant and WF of Supply Chain

i.e. **Water Footprint (WF) =** $\mathbf{WF_{Supply\ Chain} + WF_{Operations}}$

10(a) Water Foot print for Current Year

	$WF_{Supply\ Chain}$	$WF_{Operations}$	Total
Tannery 1			
Tannery 2			
Tannery 3			
Total			

11Waste Water

	Bench Mark/ Units *(as applicable)*	**Tannery 1**	**Tannery 2**	**Tannery 3**
Total Waste Water Generated				
% Waste Water Treated				
% Waste Water Recycled				
• % Treated waste water used in Industrial activity				
• % Treated waste water used in Green belt				
• % Treated waste water used in others				
% Total quantum of wastewater discharged.				
Implementation/ achieved zero liquid discharge (ZLD).				

11(a) Use of Treated Waste Water

	Source of Waste Water	Source of Treated Waste Water for reuse	Qty. of Treated WW consumed	Total Water Consumption	% use of Treated WW out of total Water Consumption
Tannery 1					
Tannery 2					
Tannery 3					

12Water Quality

		Bench Mark *(as applicable)*	**Tannery 1**	**Tannery 2**	
Water Quality	Installation of online water quality monitoring systems.				
	Compliance with the wastewater regulatory quality discharge norms.				
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

13Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for tannery sector in state.

13(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	Unit	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	m^3/tonne		
2	Waste Water generation	m^3/tonne		
3	Waste Water discharged	m^3/tonne		

4.2.3.17 Sugar

1.0Subject Matter

(Present a brief historical background on the growth of industry – a bird's eye view picture and analysis of the Industry using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Sugar industries - District level
Production from Sugar industries in the State. *(Refer Annexure: Table-1)*
Time trend of the number (growth) of Sugar industries in the state and water demand and supply position. *(Refer Annexure: Table-2)*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Sugar industries

Water Supply & Demand for Sugar industries in the State

Time trend of total water demand and actual current water supplied to the Sugar industries along with growth of industries in the state.
Provide trend analysis (10-15 years) with breakup. (Refer Annexure: Table – 2, 3a, 3b)

Total Freshwater Withdrawal and Actual Water Consumption by Sugar industries in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Sugar industries in the State.

State Water Budgeting: *Refer Annexure- Table 3(e)*

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Sugar industries				
GRAND TOTAL	xxx	xxx	xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include

- Waste water disposal and associated surface and ground water contamination
- Water demand and supply issues in the Sugar sector in the state, provide details
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.
- Issues related to water pricing in Sugar sector
- Technology availability, affordability and efficiency related issues
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Sugar sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the Sugar sector in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the industrial water consumption and supply.

Governing body for Sugar sector	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Ministry of Consumer Affairs, Food & Public Distribution	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by Sugar industries for the benefit of neighborhood/ local community/ Environment.

Sugar	Any OE[21] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Sugar	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics & Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure: Table 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure: Table 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, industrial process and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Industry Sector.

- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring: Example is provided below

  No Designated/ responsible Official / team for Water management
  Lack of measurement equipment &standard infrastructure
  Unskilled manpower for Measurement & Monitoring
  No centralized data base and analytical support etc

7.0Performance Indicators:

a. Benchmarks on water use *(Refer Annexure: Table-13)*

b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Category	**Indicator**		**Benchmark/ Unit** *(as applicable)*	**Unit 1**	**Unit 2**	**Unit 3**
Measurement	**Water Quantity**					
	Measurement at	Manual	Yes/No			

[21]Overexploited block of groundwater

	Raw water source	Real Time/ Automatic	Yes/No			
		Use of ICT (SCADA)	Yes/No			
	Measurement at Major water usage areas	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
		Use of ICT (SCADA)	Yes/No			
	Waste Water (generation, recycle/reuse & discharge)	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
		Use of ICT (SCADA)	Yes/No			
	Undertaken internal Water Audit in the last Year?		Yes/No			
	Undertaken Third party Water Audit in the last Year?		Yes/No			
	Submitting monthly water balance to state pollution control board (SPCB)?		Yes/No			

Performance Indicators

Category	Indicator	Bench Mark/ Unit *(as applicable)*	Unit 1	Unit 2	Unit 3
Management Plans	Having Water Management Plans?	Yes/No			
	Whether Water Managements are operational	Yes/No			
Water Conservation	Have taken up RWH/ GW Recharge?	Yes/No			
	% of total Water requirement being met from Treated Waste Water				
	% reduction in water consumption compared to the previous year.				
	Introduction water efficient technologies in process to reduce water consumption.	Yes/No			
Water Use Efficiency *(Annexure: Table 7)*	**Specific Water Consumption** (SWC); (m^3/tonne of cane crushed) *(refer Annexure: Table 7(a),(b) & (c))*				
	Have specific water consumption within the norms/bench marks/standards	Yes/No			
Water Productivity *(Annexure: Table 8)*	**Water Productivity** (INR/m^3) Quantity of water necessary to produce these goods *(refer Annexure: Table 8(a)&(b))*				
Water Intensity *(Annexure: Table 9)*	**Water Intensity**; (m^3/1000 Rs or m^3/US$) Volume of water used per unit of gross value added (GVA) *(refer Annexure-9(a)&(b))*				
Water Foot print *(Annexure: Table 10)*	Total volume of freshwater used directly and/or indirectly				

Category	Indicator	Bench Mark/ Unit *(as applicable)*	Unit 1	Unit 2	Unit 3
	for the industrial operation/product *(refer Annexure: Table 10(a))*				
Waste Water *(Annexure: Table 11)*	Total Waste Water Generated				
	% of Waste Water Treated				
	% of Treated waste water recycled				
	Implemented/ achieved zero liquid discharge (ZLD)				
Waste Water Quality *(Annexure: Table 12)*	Installation of online water quality monitoring systems.	Yes/No			
	Compliance with the wastewater quality discharge norms.	Yes/No			
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).	Yes/No			
Economics	Whether economic incentives are in place by state to encourage water efficiency & conservation?	Yes/No			
	Whether economic disincentive mechanisms like penalties etc. are in place by state to discourage water wastage & inefficient use?	Yes/No			
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?	Yes/No			

Performance Indicators

Category	Indicator	Bench Mark/ Unit *(as applicable)*	District 1	District 2	District 3
Water Quantity Measurement	% of Sugar industries with water flow meters installed				
	% of Sugar industries undertaken internal water audit in the last year				
	% of Sugar industries undertaken external water audit in the last year				
	% of Sugar industries submitting water balance to SPCB (state pollution control board)				

8.0Reforms undertaken/ being undertaken/ proposed if any

9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /
Improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number, types & production of Sugar industries in the State

Total no. of Sugar industries in the State and production details		
Type – Based on Capacity	**No. of Sugar industries**	**Daily Average Production** in TCD (tonnes of cane crushed per day)
Small (<3500 tons crushed/day)		
Medium (3500-5000 tons crushed/day)		
Large (>5000 tons crushed/day)		
Total		

2Growth Trend of Sugar industries over a period and Water Demand and Supply position

Sugars – Based on capacity		**Years**					
		1990	**1995**	**2000**	**2005**	**2010**	**2017**
No. of Industries							
Small (<3500 tons crushed/day)							
Medium (3500-5000 tons crushed/day)							
Large (>5000 tons crushed/day)							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Sugar Industries: (MCM) Present Water Year: 1st June to 31st May next year										
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Sugar Industries: (MCM)												
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**

Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks

Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Sugar

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Sugar units	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Sugar industries against total industries in the State

Sugar – Based on capacity	Total Water Withdrawal by Sugar industries (%) *(Refer 4(a) below)*	Total water withdrawal by all Industries in the state	Total Water Consumption by Sugar industries (%) *(Refer 4(b) below)*	Total water Consumption by all Industries in the state
Small (<3500 tons crushed/day)				
Medium (3500-5000 tons crushed/day)				
Large (>5000 tons crushed/day)				
Total				

4(a) Total Water Withdrawal/Abstraction by **Sugar industries** in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by Sugar Sector (\%)} = \frac{\text{(Total water withdrawal by all the Sugar units in the State)} \times 100}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **Sugar industries** in the state as percentage of Total water consumption by all industries in the State

$$\text{Total water consumption by Sugar Sector(\%)} = \frac{\text{(Total actual water consumption by all Sugar units in State)} \times 100}{\text{(Total water consumption by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal and Total Actual Water Consumption by all Sugar industries in the State

	CY -11	CY -10	CY -9	CY -8	CY -7	CY -6	CY -5	CY -4	CY -3	CY -2	CY -1	CY / 2017
Total Fresh Water Withdrawal by all Sugar industries (MCM)												
Total Actual Water Consumption by all Sugar industries (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Fresh Water Withdrawal by all Sugar industries (%) *(Refer Annexure: Table 5(a))*						
Total Actual Water Consumption by all Sugar industries (%) *Refer Annexure: Table 5(b)*						

5(a) Total Water Withdrawal/Abstraction by **Sugar industries** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by Sugar Sector (\%)} = \frac{\text{(Total water withdrawal by all the Sugar units in the State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Sugar industries** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by Sugar Sector(\%)} = \frac{\text{(Total actual water consumption by all Sugar units in State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	CY-4	CY-3	CY-2	CY-1

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Sugar industries on water treatment and management (Lakhs)						
Total O&M Expenditure by Sugar industries on water						

treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by each industry for the Current Year- CY

Sugars	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
UNIT 1				
UNIT 2				
UNIT 3				
UNIT 4				
UNIT 5				
UNIT 6				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit of raw material consumed. In case of Sugar it can be represented as the total volume of water used/consumed (m^3) per tonne of cane crushed.

Specific Water Consumption (SWC) of Sugar:

$$\textbf{Specific Water Consumption}; (m^3/\text{tons of cane crushed}) = \frac{\text{Volume of water consumed by the Sugar unit, } (m^3)}{\text{Total Cane Crushed by the unit (tonnes crushed)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol. of Water Consumed (m^3)	Total Cane Crushed (tonnes crushed)	**SWC** (m^3/tonne crushed)
Unit 1			
Unit 2			
Unit 3			

7(b) Average SWC of Sugar units for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of Sugar units in State						

7(c) Specific Water Consumption (**SWC**)

SWC of Sugar Sector in the **State** {in **categories** such as **Small, Medium, Large**; Decadal trends or 15 years trend to be provided.

Trend of average Specific Water Consumption (SWC) of Sugar industries at district level

Percentage of industries having specific water consumption within the norms/bench marks/standards **(if applicable)**

8Water productivity:

- **Water Productivity** as the total economic value created of the output/product by the Industry in the State per unit volume of water withdrawal or consumption

$$\textbf{Water Productivity}\ (INR/m^3) = \frac{\text{(Total economic value created of the output/product by the Industry), INR}}{\text{(Total Volume of freshwater withdrawn/consumed), } m^3}$$

OR

Water Productivity in terms of **GVA (Gross Value Added)**; (INR/m^3)

$$= \frac{\text{(Total Value of Sugar Production – Value of inputs other than water), INR}}{\text{(Total Volume of freshwater consumed), } m^3}$$

8(a) Water Productivity in terms of **GVA for Current Year**

	Value of Sugar Production	Value of inputs other than water	Total Volume of freshwater consumed	**(Gross Value Added)**; (INR/m^3)
Unit 1				
Unit 2				
Unit 3				
Total				

8(b) Average Water Productivity in terms of **GVA**
for the State – time trend (also represent through Graph)

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Average Water Productivity (GVA); (INR/m^3)						

9Water Intensity:

$$\textbf{Water Intensity};\ (m^3/1000\text{ Rs or } m^3/US\$) = \frac{\text{Volume of water consumed by the Industry, } (m^3)}{\text{(Unit value added by Sugar production), (1000 Rs or US\$)}}$$

9(a) Water Intensity for Current Year

	Volume of water consumed	Unit value added by Sugar production	**Water Intensity**; (m^3/1000 Rs or m^3/Rs)
Unit 1			
Unit 2			
Unit 3			
Total			

9(b) Average Water Intensity in terms
for the State – time trend (also represent through Graph)

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Average Water Intensity (m^3/1000 Rs or m^3/Rs)						

10Water Footprint:

Water Footprint for Sugar industries

Water Footprint (WF) of Sugar production = Sum of WF of Operations of the plant and WF of Supply Chain

10(a) Water Foot print for Current Year

	WF $_{Supply\ Chain}$	WF $_{Operations}$	Total
Unit 1			
Unit 2			
Unit 3			
Total			

11Waste Water

	Bench Mark/ Units *(as applicable)*	**Unit 1**	**Unit 2**	**Unit 3**
Total Waste Water Generated				
% Waste Water Treated				
% Waste Water Recycled				
• % Treated waste water used in Industrial activity				
• % Treated waste water used in Green belt				
• % Treated waste water used in others				
% Total quantum of wastewater discharged.				
Implementation/ achieved zero liquid discharge (ZLD).				

11(a) Use of Treated Waste Water

	Source of Waste Water	Source of Treated Waste Water for reuse	Qty. of Treated WW consumed	Total Water Consumption	% use of Treated WW out of total Water Consumption
UNIT 1					
UNIT 2					
UNIT 3					

12Water Quality

		Bench Mark/regulatory norms *(as applicable)*	UNIT 1	UNIT 2	
Water Quality	Installation of online water quality monitoring systems.	Yes/No			
	Compliance with the wastewater regulatory quality discharge norms.	Yes/No			
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).	Yes/No			

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

13Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for each industrial sector in state.

13(a) Benchmark for Water Consumption, Waste Water Generation (Provide category-wise benchmark)

	Parameters	Unit Value	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	m^3/tonne crushed		
2	Waste Water generation	m^3/tonne crushed		
3	Waste Water discharged	m^3/tonne crushed		

13(b) Existing benchmarks/norms in certain sectors for reference

Benchmarks:

Textile sector

	Parameters	Unit Value	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	m^3/tonne	200-250[22]	Less than 100
2	Waste Water generation	m^3/tonne		
3	Waste Water discharged	m^3/tonne	ZLD (draft)	

Pulp & Paper sector

	Parameters	Unit Value	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	m^3/tonne	Wood based mills: 63 Waste paper based mills: 9 - 19[23]	Wood based mills: 30 – 70 Waste paper based mills: 8 - 10[5]
2	Waste Water generation	m^3/tonne		
3	Waste Water discharged	m^3/tonne	Wood based mills: 50[5&24]	

Thermal power sector

	Parameters	Unit Value	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	m^3/MWh	2.5 - 3.5[25]	0.1 – 0.15 (dry cooling) 2.2 – 2.4 (wet cooled)[26]
2	Waste Water generation	m^3/MWh		
3	Waste Water discharged	m^3/MWh	Zero discharge (for SWC 2.5)	

Norms:

Textile Sector[27]:

The draft notification for standards for effluents from Textile industries came in 2015. It stated the following:

Textile unit (having dyeing process/cotton or woollen processing units and all integrated Textile units) where wastewater discharge is greater than 25 KLD shall establish Zero Liquid Discharge (ZLD) – Effluent Treatment Plant (ETP).

The recovered water from ZLD-ETP through Reverse Osmosis (R.O.)/ Multi Effect Evaporator (MEE) shall be re-used in the process by the units and no ground water abstraction is allowed except for make-up water and drinking water purpose as assessed by respective State Pollution Control Board (SPCBs)/Pollution Control Committee (PCCs).

Pulp & Paper sector[28]:

Wastewater discharge standards as per CPCB & NPC have been evolved with an assumption that around 21% of the input fresh water is lost as vapor in drying section and in boiler section and the balance is discharged as wastewater.

Thermal power plants[29]:

MOEF Notification (07th December 2015)

- All plants with once-through cooling shall install cooling towers and achieve specific water consumption max. 3.5 m^3/MWh within 2 years period.

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[22]http://www.cseindia.org/dte-supplement/industry20040215/misuse.htm
[23]http://cpcb.nic.in/newitems/45.pdf
[24]http://cpcb.nic.in/GeneralStandards.pdf
[25]http://cbip.org/25262017ConferenceBatraji/Presentation/6.New%20Env.Norms.pdf
[26]http://www.wrc.org.za/Knowledge%20Hub%20Documents/Research%20Reports/2383-1-14.pdf
[27]http://www.moef.nic.in/sites/default/files/Effluents%20from%20Textile%20Industry.PDF
[28]http://cpcb.nic.in/newitems/45.pdf
[29]http://cbip.org/25262017ConferenceBatraji/Presentation/6.New%20Env.Norms.pdf

- All existing CT based plants shall reduce specific water consumption up to maximum 3.5 m^3/MWh within a period of two years.
- New plants to be installed after 1st January 2017 shall have to meet specific water consumption up to maximum of 2.5 m^3/MWh and achieve zero wastewater discharge.

Also, in the revised (Electricity) tariff policy notified by the government of India on January 28, 2016, there is a provision that now requires that "the thermal power plant(s) including the existing plants located within 50 km radius of sewage treatment plant of any municipality / local bodies / similar organization shall… mandatorily use treated sewage water produced by these bodies…"

4.2.3.18 Beverage

1.0Subject Matter

(Present a brief historical background on the growth of industry – a bird's eye view picture and analysis of the Industry using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Beverage industries {*Carbonated soft drinks, Non-Carbonated drinks, PDW (Packaged Drinking water), Mineral water, Juices/ others*}
Beverage production from Beverage industries in the State: *(Refer Annexure Table-1).*
Time trend of the number (growth) of Beverage industries. *(Refer Annexure Table-2).*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Beverage industries

Water Supply & Demand for Beverage industries in the State

Time trend of total water demand and actual current water supplied to the Beverage industries along with growth of Beverage industries in the state. *(Refer Annexure Tables-2, 3)*

Total Freshwater Withdrawal and Actual Water Consumption by Beverage industries in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Beverage industries in a State

Comparative status of total water consumption by each beverage industry

State Water Budgeting: *(Refer Annexure Table-3(d)).*

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Beverage industries				
GRAND TOTAL	xxx	xxx	xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include

- Waste water disposal and associated surface and ground water contamination
- Water demand and supply issues in the Beverage industries in the state, provide details
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.
- Issues related to water pricing in Beverage industries
- Technology availability, affordability and efficiency related issues
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Beverage industries in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the Beverage industries in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the industrial water consumption and supply.

Governing body for Beverage industries	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Department of Industries	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by Beverage industries for the benefit of neighborhood/ local community/ Environment.

Beverage industry	Any OE[30] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Beverage industry	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics& Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure Table 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure Table 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, process and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.

- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring.

[30]Overexploited block of groundwater

7.0Performance Indicators:

a. Benchmarks on water use *(Refer table-13)*

b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Category	**Indicator**		**Bench Mark/ Unit** *(as applicable)*	**Beverage industry 1**	**Beverage industry 2**	**Beverage industry 3**
Measurement	**Water Quantity**					
	Measurement at Raw water source	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Measurement at major water usage areas	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Waste Water (generation, recycle/reuse & discharge)	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Undertaken internal Water Audit in the last Year?		Yes/No			
	Undertaken Third party Water Audit in the last Year?		Yes/No			
	Submitting monthly water balance to state pollution control board (SPCB)?		Yes/No			
Management Plans	Having Water Management Plans?		Yes/No			
	Whether Water Managements are operational		Yes/No			
Water Conservation	Have taken up RWH/ GW Recharge?		Yes/No			
	% of total Water requirement being met from Treated Waste Water					
	Have taken up Restoration measures?		Yes/No			
	% of reduction of water demand compared to the previous year.					
	Introduction of water efficient technologies in process to reduce water consumption.		Yes/No			
Water Use Efficiency *(Annexure- Table 7)*	Specific Water Consumption (SWC); (**L/L of beverage produced**) *(refer Annexure-Table 7(a), (b) & (c))*					
	Have specific water consumption benchmarks/ standards established		Yes/No			
	Have specific water consumption within the norms/bench marks/standards		Yes/No			
Water Productivity *(Annexure- Table 8)*	**Water Productivity** (INR/KL) Quantity of water necessary to produce these goods *(refer Annexure- Table 8(a)&(b))*					
Water Intensity *(Annexure- Table 9)*	**Water Intensity**; (KL/1000 Rs or KL/US$)					

	Volume of water used per unit of gross value added (GVA) *(refer Annexure- Table 9(a)&(b))*					
Water Foot print *(Annexure- Table 10)*	Total volume of freshwater used directly and/or indirectly for the industrial operation/product *(refer Annexure- Table 10(a))*					
Waste Water *(Annexure- Table 11)*	Total Waste Water Generated					
	% Waste Water Treated					
	% Treated waste water recycled					
	Implementation/ achieved zero liquid discharge (ZLD).		Yes/No			
Water Quality *(Annexure-Table 12)*	Installation of online water quality monitoring systems.		Yes/No			
	Compliance with the wastewater quality discharged norms.		Yes/No			
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?					
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).		Yes/No			
	No. of areas near beverage industries where Water Quality has adversely affected					
Economics	Whether economic incentives are in place to encourage water efficiency & conservation?		Yes/No			
	Whether economic disincentive mechanisms like penalties etc. are in place to discourage water wastage & inefficient use?		Yes/No			
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?		Yes/No			
Public Interface	Operationalization of online water quality portal for information dissemination and feedback		Yes/No			

Category	**Indicator**	**Bench Mark/ Unit** *(as applicable)*	**District 1**	**District 2**	**District 3**
Water Quantity Measurement	% of Beverage industries with water flow meters				
	% of water sources of Beverage industries geotagged				

	% of Beverage industries undertaking internal water audits in last year				
	% of Beverage industries undertaking external water audits in last year				
	% of Beverage industries submitting water balance to SPCB (state pollution control board)				

8.0Reforms undertaken/ being undertaken/ proposed if any
9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number, types & capacity of Beverage industries in the State

Total Production from Beverage industries in the State				
Type	**No. of Beverage industries**	**Total Installed Capacity of all the beverage industries** (Million Liters Per Day)	**Total Production Capacity of all the beverage industries** (Million Liters Per Day)	**Daily Average Production of all the beverage industries** (Million Liters Per Day)
Carbonated soft drinks				
Non-Carbonated drinks				
PDW (Packaged Drinking water)				
Mineral water				
Juices				
Others				
Total				

2Growth Trend of Beverage industries over a period and Water Demand and Supply position

		Years					
		1990	**1995**	**2000**	**2005**	**2010**	**2017**
No. of Industries							
Carbonated soft drinks							
Non-Carbonated drinks							
PDW (Packaged Drinking water)							
Mineral water							
Juices							
Others							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Beverage Industries: (MCM) Present Water Year: 1st June to 31st May next year										
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Beverage Industries: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Beverage industries

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Beverage industries	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Beverage industries against total industries in the State

Beverage industry	Total Water Withdrawal by all Beverage industries (%) *(Refer Annexure-4(a))*	Total water withdrawal by all the Industries in state	Total Water Consumption by all Beverage industries (%) *(Refer Annexure-4(b))*	Total water Consumption by all the Industries in state
Carbonated soft drinks				
Non-Carbonated drinks				
PDW (Packaged Drinking water)				
Mineral water				
Juices				
Others				
Total				

4(a) Total Water Withdrawal/Abstraction by **Beverage industries** in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by Beverage Sector (\%)} = \frac{\text{(Total water withdrawal by all the Beverage in the State)} \times 100}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **Beverage industries** in the state as percentage of Total water consumption by all the industries in the State

$$\text{Total water consumption by Beverage Sector (\%)} = \frac{\text{(Total actual water consumption by all Beverage in State)} \times 100}{\text{(Total water consumption by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal by all Beverage industries and Total Actual Water Consumption by all Beverage industries in the State

	CY -11	**CY -10**	**CY -9**	**CY -8**	**CY -7**	**CY -6**	**CY -5**	**CY -4**	**CY -3**	**CY -2**	**CY -1**	**CY / 2017**
Total Fresh Water Withdrawal by all Beverage industries (MCM)												
Total Actual Water Consumption by all Beverage industries (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Total Fresh Water Withdrawal by all Beverage industries (%) *(Refer Annexure-5(a))*						
Total Actual Water Consumption by all Beverage industries (%) *(Refer Annexure-5(b)*						

5(a) Total Water Withdrawal/Abstraction by **Beverage industries** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by Beverage Sector (\%)} = \frac{\text{(Total water withdrawal by all the Beverage in the State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Beverage industries** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by Beverage Sector (\%)} = \frac{\text{(Total actual water consumption by all Beverage in State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	CY-4	CY-3	CY-2	CY-1

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Beverage industries on water treatment and management (Lakhs)						
Total O&M Expenditure by Beverage industries on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure at Plant level for the Current Year- CY

Beverage industries	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
Beverage industry 1				
Beverage industry 2				
Beverage industry 3				
Beverage industry 4				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit of product produced. In case of Beverage industries it can be represented as the total volume of water used/consumed (L) per L of beverage produced.

Specific Water Consumption (SWC) of Beverage industries:

$$\text{Specific Water Consumption (SWC); } (\textbf{KL/KL of beverage}) = \frac{\text{Volume of water consumed by the Beverage industry, (L)}}{\text{(Total Production by the beverage), (L of beverage)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol. of Water Consumed(L)	Total beverage produced (L)	SWC (**L/L of beverage**)
Beverage industry 1			
Beverage industry 2			
Beverage industry 3			

7(b) Average SWC of Beverage industries for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of Beverage industries in State						

7(c) Specific Water Consumption (**SWC**)
Comparative Specific Water Consumption (SWC) of Beverage industries
Trend of average Specific Water Consumption (SWC) of each Beverage industry
Percentage of industries having specific water consumption within the norms/bench marks/standards **(if applicable)**

8Water productivity:
For e.g. *(illustrative purpose only)*

- **Water Productivity** as the total economic value created of the output/product by the Industry in the State per unit volume of water withdrawal or consumption

$$\textbf{Water Productivity}\ (INR/m^3) = \frac{\text{(Total economic value created of the output/product by the Industry), INR}}{\text{(Total Volume of freshwater withdrawn/consumed), KL}}$$

OR

Water Productivity in terms of **GVA (Gross Value Added)**; (INR/KL)

$$= \frac{\text{(Total Value of Beverage produced – Value of inputs other than water), INR}}{\text{(Total Volume of freshwater consumed), KL}}$$

8(a) Water Productivity in terms of **GVA for Current Year**

	Value of Beverage produced	Value of inputs other than water	Total Volume of freshwater consumed	**(Gross Value Added)**; (INR/KL)
Beverage industry 1				
Beverage industry 2				
Beverage industry 3				
Total				

8(b) Average Water Productivity in terms of **GVA**
for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Productivity (GVA); (INR/KL)						

9Water Intensity:

$$\textbf{Water Intensity}\text{; (KL/1000 Rs or KL/US\$)} = \frac{\text{Volume of water consumed by the Industry, (KL)}}{\text{(Unit value added by Beverage production), (1000 Rs or US\$)}}$$

9(a) Water Intensity for Current Year

	Volume of water consumed (KL)	Unit value added by Beverage Production	**Water Intensity**; KL/1000 Rs or KL/Rs)
Beverage industry 1			
Beverage industry 2			
Beverage industry 3			
Total			

9(b) Average Water Intensity in terms
for the State – time trend (also represent through Graph)

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Average Water Intensity (KL/1000 Rs or KL/Rs)						

10Water Footprint:

Water Footprint for Beverage Production

Water Footprint (WF) of beverage production = Sum of WF of Operations of the plant and WF of Supply Chain

i.e. **Water Footprint (WF) = WF** $_{\textbf{Supply Chain}}$ **+ WF** $_{\textbf{Operations}}$

10(a) Water Foot print for Current Year

	WF $_{\textbf{Supply Chain}}$	**WF** $_{\textbf{Operations}}$	Total
Beverage industry 1			
Beverage industry 2			
Beverage industry 3			
Total			

11Waste Water

	Bench Mark/ Units *(as applicable)*	**Beverage industry 1**	**Beverage industry 2**	**Beverage industry 3**
Total Waste Water Generated				
% Waste Water Treated				
% Waste Water Recycled				
• % Treated waste water used in Industrial activity				
• % Treated waste water used in Green belt				
• % Treated waste water used in others				
% Total quantum of wastewater discharged.				
Implementation/ achieved zero liquid discharge (ZLD).				

11(a) Use of Treated Waste Water

	Source of Waste Water	Source of Treated Waste Water for reuse	Qty. of Treated WW consumed	Total Water Consumption	% use of Treated WW out of total Water Consumption
Beverage industry 1					
Beverage industry 2					
Beverage industry 3					

12Water Quality

		Bench Mark *(as applicable)*	**Beverage industry 1**	**Beverage industry 2**	
Water Quality	Installation of online water quality monitoring systems.				
	Compliance with the wastewater regulatory quality discharge norms.				
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

13Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for beverage industry in state.

13(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	**Unit**	**Indian Bench Mark**	**International Bench Mark**
1	Specific Water Consumption	L/L of beverage produced		
2	Waste Water generation	L/L of beverage produced		
3	Waste Water discharged	L/L of beverage produced		

4.2.3.19 Special Economic Zones (SEZs)

1.0Subject Matter

(Present a brief historical background on the growth of industry – a bird's eye view picture and analysis of the SEZs using the information/ tables) provided in the annexure.

GIS based map depicting location of all the SEZs {based on central (specific sector, multi sector), state (specific sector, multi sector), private/ others} District level
Number of SEZs in the State. *(Refer Annexure Table-1).*
Time trend of the number (growth) of SEZs. *(Refer Annexure Table-2).*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the SEZs sector

Time trend of total water demand and actual current water supplied to the SEZs sector along with growth of SEZs sector in the state. *(Refer Annexure Tables-2, 3)*

Total Freshwater Withdrawal and Actual Water Consumption by SEZs Sector in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by SEZs Sector in a State

Comparative status of total water consumption by each SEZs level

State Water Budgeting: *(Refer Annexure-3(e)).*

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All SEZs				
GRAND TOTAL	xxx	xxx	Xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include

- Waste water disposal and associated surface and ground water contamination
- Water demand and supply issues in the SEZs sector in the state, provide details
- Issues related to water pricing in SEZs sector
- Technology availability, affordability and efficiency related issues
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the SEZs sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the SEZs sector in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the water consumption and supply.

Governing body for SEZs	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Ministry of commerce and industries	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by SEZ sector for the benefit of neighborhood/ local community/ Environment.

SEZs	Any OE[31] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

SEZs	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics & Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure Table- 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure Table- 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, various processes and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.
- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring.

7.0Performance Indicators:

a. Benchmarks on water use *(Refer table-13)*

b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Category	**Indicator**		**Bench Mark/ Unit** *(as applicable)*	**SEZ 1**	**SEZ 2**	**SEZ 3**
Measurement	**Water Quantity**					
	Measurement at Raw water source	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Measurement at major water usage areas	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			
	Waste Water (generation, recycle/reuse & discharge)	Manual	Yes/No			
		Real Time/ Automatic	Yes/No			

[31]Overexploited block of groundwater

	Undertaken internal Water Audit in the last Year?		Yes/No			
	Undertaken Third party Water Audit in the last Year?		Yes/No			
	Submitting monthly water balance to state pollution control board (SPCB)?		Yes/No			
Management Plans	Having Water Management Plans?		Yes/No			
	Whether Water Managements are operational		Yes/No			
Water Conservation	Have taken up RWH/ GW Recharge?		Yes/No			
	% of total Water requirement being met from Treated Waste Water					
	Have taken up Restoration measures?		Yes/No			
	% of reduction of water demand compared to the previous year.					
	Introduction of water efficient technologies in process to reduce water consumption.		Yes/No			
Water Use Efficiency *(Annexure- Table 7)*	Specific Water Consumption (**Water Consumption per exports in USD**); (**m^3/ export in USD**) *(refer Annexure-Table 7(a), (b) & (c))*					
	Have specific water consumption benchmarks established?		Yes/No			
	Have specific water consumption within the norms/bench marks/standards		Yes/No			
Waste Water *(Annexure- Table 8)*	Total Waste Water Generated					
	% Waste Water Treated					
	% Treated waste water recycled					
	Implementation/ achieved zero liquid discharge (ZLD)		Yes/No			
Water Quality *(Annexure-Table 9)*	Installation of online water quality monitoring systems.		Yes/No			
	Compliance with the wastewater quality discharged norms.		Yes/No			
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?					
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).		Yes/No			
	No. of areas near SEZs where Water Quality has adversely affected					
Economics	Whether economic incentives are in place to		Yes/No			

	encourage water efficiency & conservation?					
	Whether economic disincentive mechanisms like penalties etc. are in place to discourage water wastage & inefficient use?		Yes/No			
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?		Yes/No			
Public Interface	Operationalization of online water quality portal for information dissemination and feedback		Yes/No			

Category	Indicator	Bench Mark/ Unit *(as applicable)*	District 1	District 2	District 3
Water Quantity Measurement	% of SEZs with water flow meters				
	% of water sources of SEZs geotagged				
	% of SEZs undertaking internal water audits in last year				
	% of SEZs undertaking external water audits in last year				
	% of SEZs submitting water balance to SPCB (state pollution control board)				

8.0Reforms undertaken/ being undertaken/ proposed if any

9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number, types & capacity of SEZs in the State

	Total Production from SEZs in the State			
Type of SEZs	**No of SEZs**	**No. of units in SEZs**	**Total Exports in USD**	**Annual Average Export in USD**
Central government				
State government				
Private				
Others				
Total				

2Growth Trend of SEZs over a period and Water Demand and Supply position

Units		**Years**					
		1990	**1995**	**2000**	**2005**	**2010**	**2017**
No. of Industries							
Central government							
State government							
Private							
Others							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Municipal Supply						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

SEZs: (MCM) Present Water Year: 1st June to 31st May next year									
INDUSTRY (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

SEZs: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for SEZs

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All SEZs	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by SEZs against total industries in the State

SEZs	Total Water Withdrawal by all SEZs (%) *(Refer Annexure-4(a))*	Total water withdrawal by all the Industries in state	Total Water Consumption by all SEZs (%) *(Refer Annexure-4(b))*	Total water Consumption by all the Industries in state
Central government				
State government				
Private				
Others				
Total				

4(a) Total Water Withdrawal/Abstraction by **SEZs sector** in the State as percentage of Total water withdrawal by all the industries in the State

Total water withdrawal by SEZs Sector (%) = (Total water withdrawal by all the SEZs in the State) x 100 / (Total water withdrawal by all the industries in the state)

4(b) Total Actual Water Consumption by **SEZs sector** in the state as percentage of Total water withdrawal by all the industries in the State

Total water consumption by SEZs Sector (%) = (Total actual water consumption by all SEZs in State) x 100 / (Total water withdrawal by all the industries in the state)

4(c) Total Freshwater Withdrawal by all SEZs and Total Actual Water Consumption by all SEZs in the State

	CY -11	CY -10	CY -9	CY -8	CY -7	CY -6	CY -5	CY -4	CY -3	CY -2	CY -1	CY / 2017
Total Fresh Water Withdrawal by all SEZs (MCM)												
Total Actual Water Consumption by all SEZs (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Fresh Water Withdrawal by all SEZs (%) *(Refer Annexure-5(a))*						
Total Actual Water Consumption by all SEZs (%) *(Refer Annexure-5(b)*						

5(a) Total Water Withdrawal/Abstraction by **SEZs sector** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by SEZs Sector (\%)} = \frac{\text{(Total water withdrawal by all the SEZs in the State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **SEZs sector** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by SEZs Sector (\%)} = \frac{\text{(Total actual water consumption by all SEZs in State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by SEZs on water treatment and management (Lakhs)						

Total O&M Expenditure by SEZs on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by each SEZs for the Current Year- CY

SEZ	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
SEZ 1				
SEZ 2				
SEZ 3				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit of product produced. In case of SEZs, it can be represented as the total volume of water used/consumed (m^3) per unit of export in USD.

Specific Water Consumption (SWC) of SEZs:

Specific Water Consumption (SWC); (m^3/ export in USD)

$$= \frac{\text{Volume of water consumed by the Units, } (m^3)}{\text{Total Export by the unit, (export in USD.)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol. of Water Consumed(m^3)	Total Exports in (USD)	**SWC** (m^3/exports in USD)
SEZ 1			
SEZ 2			
SEZ 3			

7(b) Average SWC of SEZs for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of SEZs in State						

7(c) Specific Water Consumption (**SWC**)

- **Comparative Specific Water Consumption (SWC) of SEZs**
- **Trend of average Specific Water Consumption (SWC) of SEZs at district level**

Percentage of industries having specific water consumption within the norms/bench marks/standards (if applicable)

8Water productivity:

For e.g. *(illustrative purpose only)*

- **Water Productivity** as the total economic value created of the output/product by the Industry in the State per unit volume of water withdrawal or consumption

$$\textbf{Water Productivity } (INR/m^3) = \frac{\text{(Total economic value created of the output/product by the Industry), INR}}{\text{(Total Volume of freshwater withdrawn/consumed), } m^3}$$

OR

Water Productivity in terms of **GVA (Gross Value Added)**; (INR/m^3)

$$= \frac{\text{(Total Value of Exports – Value of inputs other than water), INR}}{\text{(Total Volume of freshwater consumed), } m^3}$$

8(a) Water Productivity in terms of **GVA for Current Year**

	Value of Exports	Value of inputs other than water	Total Volume of freshwater consumed	**(Gross Value Added)**; (INR/m^3)
SEZ 1				
SEZ 2				
SEZ 3				
Total				

8(b) Average Water Productivity in terms of **GVA**
for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Productivity (GVA); (INR/m^3)						

9Water Intensity:

$$\textbf{Water Intensity}; (m^3/1000 \text{ Rs or } m^3/\text{US\$}) = \frac{\text{Volume of water consumed by the SEZ, } (m^3)}{\text{(Unit value added by Exports), (1000 Rs or US\$)}}$$

9(a) Water Intensity for Current Year

	Volume of water consumed	Unit value added by Exports	**Water Intensity**; (m^3/1000 Rs or m^3/Rs)
SEZ 1			
SEZ 2			
SEZ 3			
Total			

9(b) Average Water Intensity for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average Water Intensity (m^3/1000 Rs or m^3/Rs)						

10Water Footprint:

The total volume of freshwater used directly and/or indirectly for the industrial operation/product. It includes the water used in industries own operation/process and its supply chain. Total Water footprints are composed of estimates for blue water (used from freshwater sources), green water (rain or soil water taken up by plants), and grey water (water required to dilute wastewater to be fit for discharge).

Water Footprint for SEZs Sector

Water Footprint (WF) of per unit of exports = Sum of WF of Operations of the unit and WF of Supply Chain

i.e. $\textbf{Water Footprint (WF)} = \textbf{WF}_{\textbf{Supply Chain}} + \textbf{WF}_{\textbf{Operations}}$

10(a) Water Foot print for Current Year

	WF $_{Supply\ Chain}$	WF $_{Operations}$	Total
SEZ 1			
SEZ 2			
SEZ 3			
Total			

11Waste Water

	Bench Mark/ Units *(as applicable)*	**SEZ 1**	**SEZ 2**	**SEZ 3**
Total Waste Water Generated				
% Waste Water Treated				
% Waste Water Recycled				
• % Treated waste water used in Industrial activity				
• % Treated waste water used in Green belt				
• % Treated waste water used in others				
% Total quantum of wastewater discharged.				
Implementation/ achieved zero liquid discharge (ZLD).				

11(a) Use of Treated Waste Water

	Source of Waste Water	Source of Treated Waste Water for reuse	Qty. of Treated WW consumed	Total Water Consumption	% use of Treated WW out of total Water Consumption
SEZ 1					
SEZ 2					
SEZ 3					

12Water Quality

		Bench Mark *(as applicable)*	**SEZ 1**	**SEZ 2**	
Water Quality	Installation of online water quality monitoring systems.				
	Compliance with the wastewater regulatory quality discharge norms.				
	Discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?				
	Notified for violating effluent discharge norms for discharge in natural resources (surface/ground).				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

13Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for each industrial sector in state.

13(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	**Unit**	**Indian Bench Mark**	**International Bench Mark**
1	Specific Water Consumption	m^3/exports		
2	Waste Water generation	m^3/exports		
3	Waste Water discharged	m^3/exports		

4.2.3.20 IT/ Electronic Industry

[States/ UT are requested to develop this Template in similar lines on their own.]

4.2.3.21 Chemical Industry

[States/ UT are requested to develop this Template in similar lines on their own.]

4.2.4 ESTABLISHMENTS & INSTITUTIONS

4.2.4.1 Higher Education Institutions/ Universities

1.0Subject Matter

(Present a brief historical background on the growth of sector – a bird's eye view picture and analysis of the Sector using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Universities - District level
Type and total no. of Universities in the State – *(Refer Annexure: Table-1)* (Universities include all Central Universities, State Universities, Deemed University, Private University and Affiliated Colleges)
Time trend of the number (growth) of Universities in the state and Water Demand & Supply *(Refer Annexure: Table-2)*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Universities

Water Supply & Demand for all Universities in the State

Time trend of total water demand and actual current water supplied to the Universities along with growth of Universities in the state.
(Refer Annexure: Table – 2, 3a, 3b)

Total Freshwater Withdrawal and Actual Water Consumption by Universities in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Universities in the State.

State Water Budgeting: *Refer Annexure- Table 3(e)*

Universities (district-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All districts				
GRAND TOTAL	Xxx	Xxx	xxx	Xxx

3.0Issues and Challenges

Illustrative issues and challenges may include

- Water demand and supply issues in the University sector in the state, provide details
- Waste water disposal and associated surface and ground water contamination
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.
- Issues related to water pricing in University sector
- Technology availability, affordability and efficiency related issues
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the University sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the University water consumption and supply.

Governing body for Universities sector	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Ministry of Human Resource Development	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Schemes, Economics & Financing-

Existing schemes and programs along with financial allocations, expenditure etc

- Water Tariff and procurement cost *(Refer Annexure: Table 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure: Table 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.
- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters are within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring

7.0Performance Indicators:

a. Benchmarks on water use *((Refer Annexure: Table-10)*

b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Category	Indicator	Bench Mark *(as applicable)*	District- 1	District- 2
Water Quantity Measurement	**Water Quantity**			
	No. of Universities without water flow meters at all withdrawal and consumption points			
	% of water sources of universities geotagged			
	No. of Universities not undertaken internal water audit in the last year			
	No. of Universities not undertaken external water audit in the last year			
	No. of Universities undertaken Third party Water Audit in the last Year			
Water Conservation	No. of Universities with water harvesting structures as prescribed.			
	% reduction of total water demand compared to the previous year.			

Performance Indicators

Category	Indicator	Benchmark *(as applicable)*	Univ. 1	Univ. 2
Water Use Efficiency *(Annexure- Table 7)*	**Specific Water Consumption** (SWC); water per student consumption			

	(litres/student) *(refer Annexure Table-7(a),(b) & (c))*			
	Have specific water consumption norms/bench marks established	Yes/No		
	% of Universities with specific water consumption within the norms/bench marks/standards			
Waste Water *(Annexure-Table 8)*	% reduction in wastewater generation as compared to previous year			
Water Quality *(Annexure-Table 9)*	% of Universities with online water quality monitoring systems installed.			
Economics	Whether economic incentives are in place by state to encourage water efficiency & conservation?	Yes/No		
	Whether economic disincentive mechanisms like penalties etc. are in place by state to discourage water wastage & inefficient use?	Yes/No		
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?	Yes/No		

8.0Reforms undertaken/ being undertaken/ proposed if any
9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number of Universities in the State

Total Number of Universities in the State			
Type – Based on Ownership	**No. of Universities**	**No. of total students**	**No. of total staff**
Central Universities			
State Universities			
Deemed Universities			
Private Universities			
Affiliated Colleges			
Total			

2Growth Trend of Universities over a period and Water Demand and Supply position

Universities – Based on Ownership	**Years**					
	1990	**1995**	**2000**	**2005**	**2010**	**2017**
No. of Universities						
Central Universities						
State Universities						
Deemed Universities						
Private Universities						

Affiliated Colleges							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Universities: (MCM) Present Water Year: 1st June to 31st May next year									
INSTITUTIONS (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Universities: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										

	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Universities

Universities in state (District-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Districts	Xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Universities against total industries in the State

Total Water Withdrawal by all Universities (%) *(Refer 4(a) below)*	Total water withdrawal by all Establishments in state	Total Water Consumption by all Universities (%) *(Refer 4(b) below)*	Total water Consumption by all Establishments in state

4(a) Total Water Withdrawal/Abstraction by **Universities** in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by University Sector (\%)} = \frac{\text{(Total water withdrawal by all Universities in the State) x 100}}{\text{(Total water withdrawal by all Establishments in the state)}}$$

4(b) Total Actual Water Consumption by **Universities** in the state as percentage of Total water consumed by all establishments in the State

$$\text{Total water consumption by Sector(\%)} = \frac{\text{(Total actual water consumed by all Universities in State) x100}}{\text{(Total water consumed by all the Establishments in the state)}}$$

4(c) Total Freshwater Withdrawal and Total Actual Water Consumption by all Universities in the State

	CY -11	**CY -10**	**CY -9**	**CY -8**	**CY -7**	**CY -6**	**CY -5**	**CY -4**	**CY -3**	**CY -2**	**CY -1**	**CY / 2017**
Total Fresh Water Withdrawal by all Universities (MCM)												
Total Actual Water Consumption by all Universities (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Total Fresh Water Withdrawal by all Universities (%) *(Refer 5(a) below)*						
Total Actual Water Consumption by Universities (%) *(Refer 5(b) below)*						

5(a) Total Water Withdrawal/Abstraction by **Universities** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by University Sector (\%)} = \frac{\text{(Total water withdrawal by all the Universities in the State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Universities** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by University Sector(\%)} = \frac{\text{(Total actual water consumption by all Universities in State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	CY-4	CY-3	CY-2	CY-1

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Universities on water treatment and management (Lakhs)						
Total O&M Expenditure by Universities on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by Universities at district level for the Current Year- CY

District	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
District 1				
District 2				
District 3				
District 4				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit. In case of Universities, it can be represented as the total volume of water used/consumed (litres) per student.

Specific Water Consumption (SWC) of Universities:

$$\textbf{Specific Water Consumption}; \text{(litres per student)} = \frac{\text{Volume of water consumed by the University, (litres)}}{\text{Total no. of students (student)}}$$

7(a) Specific Water Consumption (water consumption per student) for Current Year in terms of litres per student

	Total Vol. of Water Consumed (litres)	**Total no. of students**	SWC **(litres per student)**
District 1			
District 2			
District 3			

7(b) Average water consumption per student of Universities for the State – time trend (also represent through Graph)

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Average water consumption per student in Universities for State						

7(c) Specific Water Consumption (**SWC**)

Trend of average Specific Water Consumption (SWC) of Universities at district level:

Percentage of industries having specific water consumption within the norms/bench marks/standards **(if applicable)**

8Waste Water

	Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
Total Waste Water Generated from Universities (m^3/annum)				
% Total quantum of wastewater discharged after recycling				

9Water Quality

		Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
Water Quality	% of Universities with online water quality monitoring systems installed.				
	% of Universities with compliance of wastewater regulatory quality discharge norms.				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

10Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for each industrial sector in state.

10(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	**Unit**	**Indian Bench Mark**	**International Bench Mark**
1	Specific Water Consumption	litres per student		
2	Waste Water generation	litres per student		
3	Waste Water discharged	litres per student		

4.3.4.2 Schools

1.0Subject Matter

(Present a brief historical background on the growth of industry – a bird's eye view picture and analysis of the schools using the information/ tables) provided in the annexure.

GIS based map depicting location of all schools (based on central government, state government, private/ others) District level
Number of students at the schools in the State. *(Refer Annexure Table-1).*
Time trend of the number (growth) of schools. *(Refer Annexure Table-2).*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Schools

Water Supply & Demand for Schools in the State

Time trend of total water demand and actual current water supplied to the Schools along with growth of Schools in the state. *(Refer Annexure Tables-2, 3)*

Total Freshwater Withdrawal and Actual Water Consumption by School Sector in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by School Sector in a State:

State Water Budgeting: *(Refer Annexure-3).*

Schools (district-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Districts				
GRAND TOTAL	Xxx	xxx	xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include

- Waste water disposal and associated surface and ground water contamination
- Water demand and supply issues in the School sector in the state, provide details
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.
- Issues related to water pricing in Schools
- Technology availability, affordability and efficiency related issues
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the School sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.

- Has the state notified any regulations including for zero liquid discharge for the School in state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the water consumption and supply.

Governing body for Schools	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Department of School Education and Literacy	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Schemes, Economics & Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure Tables 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure Tables 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source, industrial process and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.
- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring.

7.0Performance Indicators:

a. Benchmarks on water use *(Refer table-10)*

b. Status of various Performance Indicators– for comparison across Districts

Category	Indicator	Bench Mark *(as applicable)*	District- 1	District- 2
Water Quantity Measurement	**Water Quantity**			
	% of schools with water flow meters			
	% of water sources of schools geotagged			
	% of schools undertaken internal water audit in the last year			
	% of schools undertaken external water audit in the last year			
	% of schools Undertaken Third party Water Audit in the last Year			
Water Conservation	% of schools with water harvesting structures?			
	% reduction of total water demand compared to the previous year.			
Water Use Efficiency *(Annexure- Table 7)*	Specific Water Consumption in **Water consumption per student (L/student)** *(refer Annexure Table-7(a),(b) & (c))*			
	Have specific water consumption norms/benchmarks established	Yes/No		
	% of schools with specific water consumption within the norms/bench marks/standards			
Waste Water *(Annexure-Table 8)*	% reduction in wastewater generation as compared to previous year			
Water Quality *(Annexure-Table 9)*	% of schools with online water quality monitoring systems installed.			
	% of schools having compliance with the wastewater quality discharge norms.			
	% of schools discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?			

	% of schools notified for violating effluent discharge norms for discharge in natural resources (surface/ground)?			
Economics	Whether economic incentives are in place to encourage water efficiency & conservation?	Yes/No		
	Whether economic disincentive mechanisms like penalties etc. are in place to discourage water wastage & inefficient use?	Yes/No		
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?	Yes/No		

8.0Reforms undertaken/ being undertaken/ proposed if any
9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number, types & capacity of Schools in the State

Total Services from Schools in the State		
Type of School	**No. of Schools**	**Total No. of students in all the Schools**
Central Government Schools		
Kendriya Vidyalaya		
Navodaya Vidyalaya		
Other		
State Government Schools		
Elementary		
Secondary		
High		
Private Schools		
Others		
Total		

2Growth Trend of Schools over a period and Water Demand and Supply position

Units	**Years**					
	1990	**1995**	**2000**	**2005**	**2010**	**2017**
Central Government Schools						
Kendriya Vidyalaya						
Navodaya Vidyalaya						
Other						
State Government Schools						
Elementary						
Secondary						
High						

Private Schools							
Others							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Municipal Supply						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Schools: (MCM) Present Water Year: 1st June to 31st May next year										
INSTITUTIONS (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Schools: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water*	Dug wells (Total No. x Draft)										

(Dynamic / Static)	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Schools

Schools in state (district-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Districts	Xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Schools against total establishments in the State

Schools	Total Water Withdrawal by all Schools (%) *(Refer Annexure-4(a))*	Total water withdrawal by all the Establishments in state	Total Water Consumption by all Schools (%) *(Refer Annexure-4(b))*	Total water Consumption by all the Establishments in state
Central Government Schools				
Kendriya Vidyalaya				
Navodaya Vidyalaya				
Other				
State Government Schools				
Elementary				
Secondary				
High				
Private Schools				
Others				
Total				

4(a) Total Water Withdrawal/Abstraction by **Schools** in the State as percentage of Total water withdrawal by all the establishments in the State

$$\text{Total water withdrawal by School Sector (\%)} = \frac{(\text{Total water withdrawal by all the Schools in the State}) \times 100}{(\text{Total water withdrawal by all the establishments in the state})}$$

4(b) Total Actual Water Consumption by **Schools** in the state as percentage of Total water consumption by all the establishments in the State

$$\text{Total water consumption by School Sector (\%)} = \frac{(\text{Total actual water consumption by all Schools in State}) \times 100}{(\text{Total water consumption by all the establishments in the state})}$$

4(c) Total Freshwater Withdrawal by all Schools and Total Actual Water Consumption by all Schools in the State

	CY -11	**CY -10**	**CY -9**	**CY -8**	**CY -7**	**CY -6**	**CY -5**	**CY -4**	**CY -3**	**CY -2**	**CY -1**	**CY / 2017**
Total Fresh Water Withdrawal by all Schools (MCM)												
Total Actual Water Consumption by all Schools (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Fresh Water Withdrawal by all Schools (%) *(Refer Annexure-5(a))*						
Total Actual Water Consumption by all Schools (%) *(Refer Annexure-5(b)*						

5(a) Total Water Withdrawal/Abstraction by **Schools** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by School Sector (\%)} = \frac{\text{(Total water withdrawal by all the Schools in the State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Schools** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by School Sector (\%)} = \frac{\text{(Total actual water consumption by all Schools in State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by schools on water treatment and management (Lakhs)						
Total O&M Expenditure by schools on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by each school at district level for the Current Year- CY

District	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
District 1				
District 2				

District 3				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit. In case of Schools, it can be represented as the total volume of water used/consumed (Litre) per student.

Specific Water Consumption (water consumption per student) of schools:

$$\text{Specific Water Consumption (SWC); (Litre/student)} = \frac{\text{Volume of water consumed by the Schools, (Litre)}}{\text{(Total no. of students), (student)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Vol. of Water Consumed(Litre)	Total no. Of students (students)	SWC (Litre/students)
District 1			
District 2			
District 3			

7(b) Average water consumption per student of School for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average water consumption per student in schools for State						

7(c) Specific Water Consumption (**water consumption per student**)

Trend of average Specific Water Consumption (water consumption per student) of Schools district level

Percentage of establishments having specific water consumption within the norms/bench marks/standards *(if applicable)*

8Waste Water

	Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
Total Waste Water Generated from schools (m^3/annum)				
% Total quantum of wastewater discharged after recycling				

9Water Quality

	Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
% of schools with online water quality monitoring systems installed.				

% of schools with compliance of wastewater regulatory quality discharge norms.				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

10Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for schools in the state.

10(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	Unit	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	L/student		
2	Waste Water generation	L/student		
3	Waste Water discharged	L/student		

4.2.4.3 Hospitals

1.0Subject Matter

(Present a brief historical background on the growth of sector – a bird's eye view picture and analysis of the Sector using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Hospitals - District level
Type and total no. of Hospitals in the State – Central Government, State Government & Private. *(Refer Annexure: Table-1)*
Time trend of the number (growth) of Hospitals in the state and Water Demand & Supply position. *(Refer Annexure: Table-2)*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Hospitals

Water Supply & Demand for all Hospitals in the State

Time trend of total water demand and actual current water supplied to the Hospitals along with growth of Hospitals in the state. *(Refer Annexure: Table – 2, 3a, 3b)*

Total Freshwater Withdrawal and Actual Water Consumption by Hospitals in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Hospitals in the State

State Water Budgeting: *Refer Annexure- Table 3(e)*

Hospital (district-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
District 1				
District 2				
GRAND TOTAL	xxx	Xxx	xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include:

- Water demand and supply issues in the Hospital sector in the state, provide details
- Waste water disposal and associated surface and ground water contamination
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.
- Issues related to water pricing in Hospital sector
- Technology availability, affordability and efficiency related issues
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Hospital sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.
- Has the state notified any regulations including for zero liquid discharge for the Hospitals in the state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the water consumption and supply.

Governing body for Hospitals sector	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Ministry of Health & Family Welfare	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Schemes, Economics & Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure: Table 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure: Table 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.
- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters are within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring.

7.0Performance Indicators:

a. Benchmarks on water use *(Refer Annexure: Table-10)*

b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Category	Indicator	Bench Mark *(as applicable)*	District- 1	District- 2
Water Quantity Measurement	**Water Quantity**			
	% of hospitals with water flow meters			
	% of hospitals undertaken internal water audit in the last year			
	% of hospitals undertaken external water audit in the last year			
	% of hospitals Undertaken Third party Water Audit in the last Year			
Water Conservation	% of Hospitals with water harvesting structures?			
	% reduction of total water demand compared to the previous year.			

Performance Indicators

Category	Indicator	Benchmark *(as applicable)*	District 1	District 2
Water Use Efficiency *(Annexure- Table 7)*	Specific Water Consumption in **Water per in-patient bed days consumption** *(refer Annexure Table-7(a),(b) & (c))*			
	Specific water consumption in **Water per OPD person consumption**			
	Have specific water consumption norms/benchmarks established	Yes/No		

	% of hospitals with specific water consumption within the norms/bench marks/standards			
Waste Water *(Annexure-Table 8)*	% reduction in wastewater generation as compared to previous year			
Water Quality *(Annexure-Table 9)*	% of Hospitals with online water quality monitoring systems installed.			
	% of Hospitals having compliance with the wastewater quality discharge norms.			
	% of Hospitals discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?			
	% of Hospitals notified for violating effluent discharge norms for discharge in natural resources (surface/ground)?			
Economics	Whether economic incentives are in place to encourage water efficiency & conservation?	Yes/No		
	Whether economic disincentive mechanisms like penalties etc. are in place to discourage water wastage & inefficient use?	Yes/No		
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?	Yes/No		

8.0Reforms undertaken/ being undertaken/ proposed if any

9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number of Hospitals in the State

Total Number of Hospitals in the State	
Type – Based on Ownership	
Central Government Hospitals	
- CGHS Hospitals	
- CGHS Dispensary	
- Medical Colleges	
Total	(A)
State Government Hospitals	
- District Hospitals	
- Community Health centers	
- Primary Health centers	
- Medical colleges	-
Total	(B)
Private Hospitals	
- Private Hospitals	
- Clinics	
Total	(C)
Total (A+B+C)	

2Growth Trend of Hospitals over a period and Water Demand and Supply position

Hospitals – Based on ownership		**Years**					
		1990	**1995**	**2000**	**2005**	**2010**	**2017**
No. of Hospitals							
Central Government Hospitals							
State Government Hospitals							
Private Hospitals							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Municipal Supply						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Hospitals: (MCM) Present Water Year: 1st June to 31st May next year									
INSTITUTIONS (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Hospitals: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										

	Inter Basin Transfer									
Total										
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)									
	Dug cum Bore well (Total No. x Draft)									
	Bore/Tube wells (Total No. x Draft)									
	Others etc									
Total										
Treated Waste Water										
GRAND TOTAL										

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				

Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Hospitals

Hospitals in state (district-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Districts	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Hospitals against total industries in the State

Total Water Withdrawal by all Hospitals (%) *(Refer 4(a) below)*	Total water withdrawal by all Industries in state	Total Water Consumption by all Hospitals (%) *(Refer 4(b) below)*	Total water Consumption by all Industries in state

4(a) Total Water Withdrawal/Abstraction by **Hospitals** in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by Hospital Sector (\%)} = \frac{\text{(Total water withdrawal by all Hospitals in the State)} \times 100}{\text{(Total water withdrawal by all industries in the state)}}$$

4(b) Total Actual Water Consumption by **Hospitals** in the state as percentage of Total water consumption by all the industries in the State

$$\text{Total water consumption by Hospital Sector(\%)} = \frac{\text{(Total actual water consumption by all Hospitals in State)} \times 100}{\text{(Total water consumption by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal and Total Actual Water Consumption by all Hospitals in the State

	CY -11	**CY -10**	**CY -9**	**CY -8**	**CY -7**	**CY -6**	**CY -5**	**CY -4**	**CY -3**	**CY -2**	**CY -1**	**CY / 2017**
Total Fresh Water Withdrawal by all Hospitals (MCM)												
Total Actual Water Consumption by all Hospitals (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Total Fresh Water Withdrawal by all Hospitals (%) *(Refer 5(a) below)*						
Total Actual Water Consumption by Hospitals (%)						

(Refer 5(b) below)						

5(a) Total Water Withdrawal/Abstraction by **Hospitals** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by Hospital Sector (\%)} = \frac{\text{(Total water withdrawal by all the Hospitals in the State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Hospitals** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by Hospital Sector(\%)} = \frac{\text{(Total actual water consumption by all Hospitals in State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Hospitals on water treatment and management (Lakhs)						
Total O&M Expenditure by Hospitals on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by hospitals at district level for the Current Year- CY

District	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
District 1				
District 2				
District 3				
District 4				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit. In case of Hospitals, it can be represented as the total volume of water used/consumed (litres) per in-patient bed days consumption or litres per OPD person consumption.

Specific Water Consumption (SWC) of Hospitals:

$$\text{Specific Water Consumption; (\textbf{Litre/in-patient bed days})} = \frac{\text{Volume of water consumed by the Hospital, (Litre)}}{\text{Total no. of in- patient bed days}}$$

$$\text{Specific Water Consumption; (\textbf{Litre/OPD person consumption})} = \frac{\text{Volume of water consumed by the OPD (Litre)}}{\text{Total no. of persons}}$$

7(a) Specific Water Consumption (**Water Consumption per In-Patient or Persons visiting OPD**) for Current Year

	Vol. of Water Consumed (Litres)	**Number**			SWC	
		In-patient bed days	**Persons visiting OPD**	**Total**	**Litre/patient bed days**	**Litres/OPD person consumption**
District 1						
District 2						
District 3						

7(b) Average Water Consumption per In-Patient or Persons visiting OPD in Hospitals for the State – time trend (also represent through Graph)

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Average Water Consumption per In-Patient or Persons visiting OPD in Hospitals of State						

7(c) Specific Water Consumption (**Water Consumption per in-patient bed days or OPD person**)

- Water Consumption per in-patient bed days or OPD person of Hospital Sector in the State in
  - **Litres per in-patient bed days**
  - **Litres per OPD person consumption**
- **Trend of average water consumption per in-patient beds or OPD person in Hospitals at district level**

c) Percentage of Hospitals having specific water consumption within the norms/bench marks/standards (**as applicable**)

8Waste Water

	Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
Total Waste Water Generated from Hospitals (m^3/annum)				
% Total quantum of wastewater discharged after recycling				

9Water Quality

		Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**

Water Quality	% of Hospitals with online water quality monitoring systems installed.				
	% of Hospitals with compliance of wastewater regulatory quality discharge norms.				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

10Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for each industrial sector in state.

10(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	Unit	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	Litres/in-patient bed days		
		Litres per OPD person consumption		
2	Waste Water generation	Litres/in-patient bed days		
		Litres per OPD person consumption		
3	Waste Water discharged	Litres/in-patient bed days		
		Litres per OPD person consumption		

10(b) Existing benchmarks/norms in Hospital sector for reference

Indian Norms for water use in hospitals in Litres/patient bed per day
(as per Bureau of Indian Standards)

S. No.	Category	Unit	SWC
1.	No. of beds <100	Litres per bed	340
2.	No. of beds >100	Litres per bed	450

International Benchmarks for water use in hospitals in litres/patient bed days
(as per Audit Commission U.K., NHS Occupational Paper No. 5)

Acute Hospitals with more than 100 beds		
Litres per patient bed day	1138	Very Poor
	711-1137	Poor
	<520	Good
Long Stay Hospitals with more than 25,000 patient days per annum		
Litres per patient bed day	>690	Very Poor
	412-689	Poor
	331-411	Average
	<330	Good
Long Stay Hospitals with less than 25,000 patient days per annum		
Litres per patient bed day	>380	Very Poor
	218-397	Poor
	<217	Good

International Benchmark for water use in hospitals in Litres/bed/day
(as per US Department of Energy- Water Use Indices)

SWC	in Litre/bed/day	in gallons/bed/day
Range	303-568	80-150
Typical	454	120

4.2.4.4 Government Office & Campuses

1.0Subject Matter

(Present a brief historical background on the growth of offices – a bird's eye view picture and analysis of the sector using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Government Offices - District level
Type and total no. of Government Offices in the State. *(Refer Annexure: Table-1)*
Time trend of the number (growth) of Offices in the state and Water Demand & Supply position. *(Refer Annexure: Table-2)*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Offices

Water Supply & Demand for Offices in the State

Time trend of total water demand and actual current water supplied to the Offices along with growth of offices in the state. *Provide trend analysis (10-15 years) with breakup.(Refer Annexure: Table – 2, 3a, 3b)*

Total Freshwater Withdrawal and Actual Water Consumption by Offices in the State

Comparative trend of Total Freshwater Withdrawal vs Actual Water Consumption by Offices in the State:

State Water Budgeting: *Refer Annexure- Table 3(e)*

SECTOR (District-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
District 1				
District 2				
GRAND TOTAL	xxx	xxx	xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include

- Water demand and supply issues in the Government office and campuses in the state, provide details
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Offices in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines for Offices in state, provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the water consumption and supply.

Governing body for sector	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Government of India	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by Government office and campuses for the benefit of neighborhood/ local community/ Environment.

Govt. Office & Campuses	Any OE[32] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Govt. Office & Campuses	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics& Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost*(Refer Annexure: Table 6(a) & 6(b))*
- Expenditure on Water management*(Refer Annexure: Table 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**
- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.
- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring

7.0Performance Indicators:

a. Benchmarks on water use *(Refer Annexure: Table-13)*

b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Performance Indicators

Category	**Indicator**	**Bench Mark** *(as applicable)*	**District- 1**	**District- 2**
Water Quantity Measurement	**Water Quantity**			
	% of Government Office and campuses with installed water flow meters			
	% of Government Office and campuses undertaken internal water audit in the last year			
	% of Government Office and campuses undertaken external water audit in the last year			
	% of Government Office and campuses undertaken Third party Water Audit in the last Year			
Water Conservation	% of Government Office and campuses with water harvesting structures?			
	% reduction of total water demand compared to the previous year.			

[32]Overexploited block of groundwater

Performance Indicators

Category	Indicator	Benchmark*(as applicable)*	District 1	District 2
Water Use Efficiency *(Annexure-7)*	Water consumed per employee/ day			
	Specific Water Consumption (SWC); (litres/capita/day of water consumed) *(refer Annexure-7(a),(b) & (c))*			
	Have specific water consumption norms/bench marks established?	Yes/No		
Waste Water *(Annexure-8)*	% reduction in wastewater generation as compared to previous year?			
Water Quality *(Annexure-9)*	% of Government Office and campuses with online water quality monitoring systems installed.			
Economics	Whether economic incentives are in place by state to encourage water efficiency & conservation?	Yes/No		
	Whether economic disincentive mechanisms like penalties etc. are in place by state to discourage water wastage & inefficient use?	Yes/No		
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?	Yes/No		

8.0Reforms undertaken/ being undertaken/ proposed if any

9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number of Government Office and Campuses in the State

Total no. of Government Office and Campuses in the State				
Category	Department name	No. of offices in the State	No. of employees	
State Government				
Semi-State Govt.				
Central Government				
Semi-Central Govt.				

2Growth Trend of Government Office and campuses over a period and Water Demand and Supply position

Government office & campuses		**Years**					
		1990	**1995**	**2000**	**2005**	**2010**	**2017**
No. of Government Office							
No. of associated Campuses							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Government Offices and Campuses: (MCM) Present Water Year: 1st June to 31st May next year									
INSTITUTIONS (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Government Offices and Campuses: (MCM)										
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**					**TOTAL**
Rain Water	Directly Harvested Rain Water									
Total										
Surface Water	Springs, Nallahs									
	Major Projects									
	Medium Projects									
	Minor Projects									
	Ponds, Tanks									
	Wetlands									
	Sea Water /Desalinated Water									
	Inter Basin Transfer									
Total										
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)									
	Dug cum Bore well (Total No. x Draft)									
	Bore/Tube wells (Total No. x Draft)									
	Others etc									
Total										
Treated Waste Water										
GRAND TOTAL										

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Government office & campuses

Government office & campuses (District-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All districts	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Government office & campuses against total industries in the State

Total Water Withdrawal by all the Government office & campuses (%)	Total water withdrawal by all the Industries in state	Total Water Consumption by all the Government office & campuses (%)	Total water Consumption by all the Industries in state

(Refer 4(a) below)		*(Refer 4(b) below)*	

4(a) Total Water Withdrawal/Abstraction by **Government office & campuses** in the State as percentage of total water withdrawal by all industries in the State

(Total water withdrawal by Government office & campuses in the State) x 100
Total water withdrawal (%) = --
(Total water withdrawal by all the industries in the state)

4(b) Total Actual Water Consumption by **Government office & campuses** in the State as percentage of total water consumption by all industries in the State

Total water consumption(%)=(Total actual water consumption by Government office & campuses in State) x100

(Total water consumption by all the industries in the state)

4(c) Total Freshwater Withdrawal and Total Actual Water Consumption by all Government office & campuses in the State

	CY -11	**CY -10**	**CY -9**	**CY -8**	**CY -7**	**CY -6**	**CY -5**	**CY -4**	**CY -3**	**CY -2**	**CY -1**	**CY / 2017**
Total Fresh Water Withdrawal by all Government office & campuses (MCM)												
Total Actual Water Consumption by all Government office & campuses (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Total Fresh Water Withdrawal by all Government office & campuses (%) *(Refer 5(a) below)*						
Total Actual Water Consumption by all Government office & campuses (%) *(Refer 5(b) below)*						

5(a) Total Water Withdrawal/Abstraction by **Government office and campuses** in the State as percentage of Total available freshwater resources of the State

(Total water withdrawal by all Government office & campuses in the State) x 100
Total water withdrawal (%) = --
(Total available freshwater resources of the state)

5(b) Total Actual Water Consumption by all **Government office & campuses** in the state as percentage of Total available freshwater resources of the State

(Total actual water consumption by all Government office & campuses in State) x 100
Total water consumption(%) = ---
(Total available freshwater resources of the state)

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Government office & campuses on water treatment and management (Lakhs)						
Total O&M Expenditure by Government office and campuses on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by Government office & campuses at district level for the Current Year- CY

Government office & campuses	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
District 1				
District 2				
District 3				
District 4				
District 5				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit person. In case of Government office & campuses it can be represented as the total volume of water used/consumed (in litres) per official.

Specific Water Consumption (SWC) of Government office and campuses:

$$\textbf{Specific Water Consumption} \text{ (litres/capita/day)} = \frac{\text{Volume of water consumed by the Government office \& campuses, (litres)}}{\text{(Total no. of officials)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Average Daily Vol. of Water Consumed (litres)	Total no. of Officials	**SWC** (litres per capita per day)
District 1			
District 2			
District 3			

7(b) Average SWC of Government office and campuses for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of Government office & campuses in State						

7(c) Specific Water Consumption (**SWC**)

SWC of Government office & campuses in the **State**; Decadal trends or 15 years trend to be provided.

Trend of average Specific Water Consumption (SWC) of Government office & campuses at district level.
Percentage of Government office & campuses having specific water consumption within the norms/bench marks/standards (**as applicable**)

8Waste Water

	Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
Total Waste Water Generated from Government office & campuses in the state (m^3/annum)				
% Total quantum of wastewater discharged after recycling				

9Water Quality

		Bench Mark*(as applicable)*	**District 1**	**District 2**	**District 3**
Water Quality	% of Government office & campuses with online water quality monitoring systems installed.				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

10Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for Government office & campuses in state.

10(a) Benchmark for Water Consumption, Waste Water Generation etc. – District-wise

Parameters	Unit	Indian Bench Mark	International Bench Mark
Specific Water Consumption	litres/capita/day		
Waste Water generation	litres/capita/day		
Waste Water discharged	litres/capita/day		

10(b) Existing benchmarks/norms in certain sectors for reference

*(As per **CPHEEO Norms** for Office Buildings)*

	SWC
Specific Water Consumption for Office building	45 litres/capita/day

4.2.4.5 Private Offices

1.0Subject Matter

(Present a brief historical background on the growth of offices – a bird's eye view picture and analysis of the sector using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Private Offices- District level
Type and total no. of Private Offices in the State. *(Refer Annexure: Table-1)*
Time trend of the number (growth) of Offices in the state and Water Demand & Supply position.*(Refer Annexure: Table-2)*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Offices

Water Supply & Demand for Offices in the State

Time trend of total water demand and actual current water supplied to the Offices along with growth of offices in the state. *Provide trend analysis (10-15 years) with breakup.(Refer Annexure: Table – 2, 3a, 3b*

Total Freshwater Withdrawal and Actual Water Consumption by Offices in the State

Comparative trend of Total Freshwater Withdrawal vs Actual Water Consumption by Offices in the State: State Water Budgeting: *Refer Annexure- Table 3(e)*

SECTOR (District-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
District 1				
District 2				
GRAND TOTAL	xxx	xxx	xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include

- Water demand and supply issues in the Private offices in the state, provide details
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions
5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Offices in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines for Offices in state, provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the water consumption and supply.

Governing body for sector	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Government of India	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by Private offices for the benefit of neighborhood/ local community/ Environment.

Private Offices	Any OE[33] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Private Offices	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics& Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost*(Refer Annexure: Table 6(a) & 6(b))*
- Expenditure on Water management*(Refer Annexure: Table 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**
- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.
- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring

7.0Performance Indicators:

a. Benchmarks on water use *(Refer Annexure: Table-13)*

b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Performance Indicators

Category	**Indicator**	**Bench Mark** *(as applicable)*	**District- 1**	**District- 2**
Water Quantity Measurement	**Water Quantity**			
	% of Private offices with installed water flow meters			
	% of Private offices undertaken internal water audit in the last year			
	% of Private offices undertaken external water audit in the last year			
	% of Private offices undertaken Third party Water Audit in the last Year			
Water Conservation	% of Private offices with water harvesting structures?			
	% reduction of total water demand compared to the previous year.			

Performance Indicators

Category	**Indicator**	**Benchmark***(as applicable)*	**District 1**	**District 2**
Water Use Efficiency *(Annexure-7)*	Water consumed per employee/ day			
	Specific Water Consumption (SWC); (litres/capita/day of water consumed) *(refer Annexure-7(a),(b) & (c))*			
	Have specific water consumption norms/bench marks established?	Yes/No		
Waste Water *(Annexure-8)*	% reduction in wastewater generation as compared to previous year?			

[33]Overexploited block of groundwater

Water Quality *(Annexure-9)*	% of Private offices with online water quality monitoring systems installed.			
Economics	Whether economic incentives are in place by state to encourage water efficiency & conservation?	Yes/No		
	Whether economic disincentive mechanisms like penalties etc. are in place by state to discourage water wastage & inefficient use?	Yes/No		
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?	Yes/No		

8.0Reforms undertaken/ being undertaken/ proposed if any

9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number of Private offices in the State

District-wise	No. of Private Offices	No. of employees
District 1		
District 2		
District 3		
Total		

2Growth Trend of Private offices over a period and Water Demand and Supply position

Private Offices		**Years**					
		1990	**1995**	**2000**	**2005**	**2010**	**2017**
No. of Private Offices							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Private Offices: (MCM) Present Water Year: 1st June to 31st May next year										
INSTITUTIONS (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			

Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Private Offices: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				

Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Private Offices

Private Offices(District-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All districts	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Private Offices against total industries in the State

Total Water Withdrawal by all the Private offices (%) *(Refer 4(a) below)*	Total water withdrawal by all the Industries in state	Total Water Consumption by all the Private offices (%) *(Refer 4(b) below)*	Total water Consumption by all the Industries in state

4(a) Total Water Withdrawal/Abstraction by **Private Offices** in the State as percentage of total water withdrawal by all industries in the State

$$\text{Total water withdrawal by Private offices (\%)} = \frac{\text{(Total water withdrawal by Private Offices in the State) x 100}}{\text{(Total water withdrawal by all the industries in the state)}}$$

4(b) Total Actual Water Consumption by **Private Offices** in the State as percentage of total water consumption by all industries in the State

$$\text{Total water consumption by Private offices (\%)} = \frac{\text{(Total actual water consumption by Private Offices in State) x100}}{\text{(Total water consumption by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal and Total Actual Water Consumption by all Private Offices in the State

	CY -11	CY -10	CY -9	CY -8	CY -7	CY -6	CY -5	CY -4	CY -3	CY -2	CY -1	CY / 2017
Total Fresh Water Withdrawal by all Private Offices(MCM)												
Total Actual Water Consumption by all Private Offices(MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Fresh Water Withdrawal by all Private Offices (%) *(Refer 5(a) below)*						
Total Actual Water Consumption by all Private Offices (%) *(Refer 5(b) below)*						

5(a) Total Water Withdrawal/Abstraction by **Private offices** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by Private offices (\%)} = \frac{\text{(Total water withdrawal by all Private Offices in the State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by all **Private Offices** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by Private offices (\%)} = \frac{\text{(Total actual water consumption by all Private Offices in State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	CY-4	CY-3	CY-2	CY-1

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Private Offices on water treatment and management (Lakhs)						
Total O&M Expenditure by Private offices on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by Private Offices at district level for the Current Year- CY

Private Offices	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
District 1				
District 2				
District 3				
District 4				
District 5				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit person. In case of Private Offices it can be represented as the total volume of water used/consumed (in litres) per official.

Specific Water Consumption (SWC) of Private offices:

Volume of water consumed by the Private Offices, (litres)

Specific Water Consumption (litres/capita/day) = --

(Total no. of officials)

7(a) Specific Water Consumption (SWC) for Current Year

	Average Daily Vol. of Water Consumed (litres)	Total no. of Officials	**SWC** (litres per capita per day)
District 1			
District 2			
District 3			

7(b) Average SWC of Private offices for the State – time trend (also represent through Graph)

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Average SWC of Private Offices in State						

7(c) Specific Water Consumption (**SWC**)

SWC of Private Offices in the **State**; Decadal trends or 15 years trend to be provided.

Trend of average Specific Water Consumption (SWC) of Private Offices at district level.
Percentage of Private Offices having specific water consumption within the norms/bench marks/standards (**as applicable**)

8Waste Water

	Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
Total Waste Water Generated from Private Offices in the state (m^3/annum)				
% Total quantum of wastewater discharged after recycling				

9Water Quality

		Bench Mark*(as applicable)*	**District 1**	**District 2**	**District 3**
Water Quality	% of Private Offices with online water quality monitoring systems installed.				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

10Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for Private Offices in state.

10(a) Benchmark for Water Consumption, Waste Water Generation etc. – District-wise

Parameters	Unit	Indian Bench Mark	International Bench Mark
Specific Water Consumption	litres/capita/day		
Waste Water generation	litres/capita/day		
Waste Water discharged	litres/capita/day		

10(b) Existing benchmarks/norms in certain sectors for reference

(As per CPHEEO Norms for Office Buildings)

	SWC
Specific Water Consumption for Office building	45 litres/capita/day

4.2.4.6 Hotels

1.0Subject Matter

(Present a brief historical background on the growth of sector – a bird's eye view picture and analysis of the Sector using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Hotels - District level
Type and total no. of Hotels in the State – (*Refer Annexure: Table-1)*
Time trend of the number (growth) of Hotels in the state and Water Demand & Supply *(Refer Annexure: Table-2)*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Hotels

Water Supply & Demand for all the Hotels in the State

Time trend of total water demand and actual current water supplied to the Hotels along with growth of Hotels in the state.
Provide trend analysis (10-15 years) with breakup. (Refer Annexure: Table 2, 3a, 3b)

Total Freshwater Withdrawal and Actual Water Consumption by Hotels in the State

Comparative trend of Total Freshwater Withdrawal Vs Actual Water Consumption by Hotels in the State

State Water Budgeting: *Refer Annexure: Table-3(e)*

Hotels (district-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
District 1				
District 2				
All Districts				
GRAND TOTAL	xxx	xxx	xxx	xxx

3.0Issues and Challenges

Illustrative issues and challenges may include

- Water demand and supply issues in the Hotel sector in the state, provide details
- Waste water disposal and associated surface and ground water contamination
- Capital investment related issues w.r.to wastewater treatment/recycle/reuse, water conservation interventions etc.
- Issues related to water pricing in Hotel sector
- Technology availability, affordability and efficiency related issues
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5.0Governance / Management:

Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Hotel sector in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines in state, provide details.

- Has the state notified any regulations including for zero liquid discharge for the Hotels in the state? Provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the hotel industry water consumption and supply.

Governing body for Hotels sector	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Ministry of Tourism	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Schemes, Economics & Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost *(Refer Annexure: Table 6(a) & 6(b))*
- Expenditure on Water management *(Refer Annexure: Table 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**

  Shall specify measurement methods and technologies at Raw water source and Waste Water (generation, recycle/reuse & discharge) and Water Quality as per CPCB / SPCB

- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.

- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters are within the prescribed norms etc.

- **Constraints** with respect to the measurement & monitoring: Example is provided below

  No Designated/ responsible Official / team for Water management
  Lack of measurement equipment & standard infrastructure
  Unskilled manpower for Measurement & Monitoring
  No centralized data base and analytical support etc

7.0Performance Indicators:

a. Benchmarks on water use *(Refer Annexure: Table-10)*

b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Category	Indicator	Bench Mark *(as applicable)*	District- 1	District- 2
Water Quantity Measurement	**Water Quantity**			
	% of hotels with water flow meters			
	% of hotels with water sources geotagged			
	% of hotels undertaken internal water audit in the last year			
	% of hotels undertaken external water audit in the last year			
	% of hotels undertaken Third party Water Audit in the last Year			
Water Conservation	% of hotels with water harvesting structures?			
	% reduction of total water demand compared to the previous year.			

Performance Indicators

Category	Indicator	Benchmark *(as applicable)*	District 1	District 2
Water Use Efficiency *(Annexure- Table 7)*	Specific Water Consumption (SWC); (**Litres/guest nights**) *(refer Annexure-7(a),(b) & (c))*			

	Have specific water consumption norms/benchmarks established	Yes/No		
	% of hotels with specific water consumption within the norms/bench marks/standards			
Waste Water *(Annexure-Table 8)*	% reduction in wastewater generation as compared to previous year			
Water Quality *(Annexure-Table 9)*	% of hotels with online water quality monitoring systems installed.			
	% of hotels having compliance with the wastewater quality discharge norms.			
	% of hotels discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?			
	% of hotels notified for violating effluent discharge norms for discharge in natural resources (surface/ground)			
Economics	Whether economic incentives are in place by state to encourage water efficiency & conservation?	Yes/No		
	Whether economic disincentive mechanisms like penalties etc. are in place by state to discourage water wastage & inefficient use?	Yes/No		
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?	Yes/No		

8.0Reforms undertaken/ being undertaken/ proposed if any
9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number of Hotels in the State

Total Number of Hotels in the State		
Type – Based on no. of rooms	**No. of Hotels**	**No. of total rooms**
Hotels with 0-100 rooms		
Hotels with 100 – 200 rooms		
Hotels with 200 above rooms		
Total		

2Growth Trend of Hotels over a period and Water Demand and Supply position

Hotels – Based on no. of rooms		Years					
		1990	1995	2000	2005	2010	2017
No. of Hotels							
Hotels with 0-100 rooms							
Hotels with 100 – 200 rooms							
Hotels with 200 above rooms							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						
Demand-Supply Gap							

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Hotels: (MCM) Present Water Year: 1st June to 31st May next year										
INSTITUTIONS (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Hotels: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											

Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Hotels

Hotels in state (district-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All Districts	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Hotels against total industries in the State

Hotels – Based on no. of rooms	Total Water Withdrawal by all Hotels (%) *(Refer 4(a) below)*	Total water withdrawal by all Industries in state	Total Water Consumption by all Hotels (%) *(Refer 4(b) below)*	Total water Consumption by all Industries in state
Hotels with 0-100 rooms				
Hotels with 100 – 200 rooms				
Hotels with 200 above rooms				
Total				

4(a) Total Water Withdrawal/Abstraction by **Hotels** in the State as percentage of Total water withdrawal by all the industries in the State

$$\text{Total water withdrawal by Hotel Sector (\%)} = \frac{\text{(Total water withdrawal by all Hotels in the State) x 100}}{\text{(Total water withdrawal by all industries in the state)}}$$

4(b) Total Actual Water Consumption by **Hotels** in the state as percentage of Total water consumption by all the industries in the State

$$\text{Total water consumption by Hotel Sector(\%)} = \frac{\text{(Total actual water consumption by all Hotels in State) x100}}{\text{(Total water consumption by all the industries in the state)}}$$

4(c) Total Freshwater Withdrawal and Total Actual Water Consumption by all Hotels in the State

	CY -11	**CY -10**	**CY -9**	**CY -8**	**CY -7**	**CY -6**	**CY -5**	**CY -4**	**CY -3**	**CY -2**	**CY -1**	**CY / 2017**
Total Fresh Water Withdrawal by all Hotels (MCM)												
Total Actual Water Consumption by all Hotels (MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Fresh Water Withdrawal by all Hotels (%) *(Refer 5(a) below)*						
Total Actual Water Consumption by Hotels (%) *(Refer 5(b) below)*						

5(a) Total Water Withdrawal/Abstraction by **Hotels** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by Hotel Sector (\%)} = \frac{\text{(Total water withdrawal by all the Hotels in the State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by **Hotels** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by Hotel Sector(\%)} = \frac{\text{(Total actual water consumption by all Hotels in State)} \times 100}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Hotels on water treatment and management (Lakhs)						
Total O&M Expenditure by Hotels on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by all the Hotels at district level for the Current Year- CY

District	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
District 1				
District 2				
District 3				

District 4				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit. In case of Hotels, it can be represented as the total volume of water used/consumed (litres) per guest nights.

Specific Water Consumption (SWC) of Hotels:

$$\text{Specific Water Consumption; (Litres/guest night)} = \frac{\text{Volume of water consumed by the Hotel, (litres)}}{\text{Total no. of guest nights}}$$

7(a) Specific Water Consumption (**Water consumption per guest night**) for Current Year

	Vol. of Water Consumed (litres)	**Total no. of guest nights**	SWC **(Litres/guest night)**
District 1			
District 2			
District 3			

7(b) Average Water consumption per guest night of Hotels for the State – time trend (also represent through Graph)

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Average Water consumption per guest night of Hotels in State						

7(c) Specific Water Consumption (**Water consumption per guest night**)

Trend of average Specific Water Consumption (Water consumption per guest night) of Hotels at district level

Percentage of Hotels having specific water consumption within the norms/bench marks/standards (**as applicable**)

8Waste Water

	Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
Total Waste Water Generated from Hotels (m^3/annum)				
% Total quantum of wastewater discharged after recycling				
% of hotels with zero liquid discharge in place				

9Water Quality

		Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
Water Quality	% of Hotels with online water quality monitoring systems installed.				

	% of Hotels with compliance of wastewater regulatory quality discharge norms.				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

10Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for each industrial sector in state.

10(a) Benchmark for Water Consumption, Waste Water Generation etc.

	Parameters	Unit	Indian Bench Mark	International Bench Mark
1	Specific Water Consumption	Liters/guest nights		
2	Waste Water generation	Litres/guest nights		
3	Waste Water discharged	Litres/guest nights		

10(b) Existing benchmarks/norms in Hotel sector for reference

Based on a joint report of IBLF & WWF-UK published in 2005, following benchmarks have been established for water consumption in hotels & resorts:

Benchmarks for water use in guest rooms in litres per guest night
(Based on IBLF & WWF-UK report)

	Unit	Good	Fair	Poor
Temperate	litres/guest night	250	250-300	>300
Mediterranean	litres/guest night	270	270-320	>320
Tropical	litres/guest night	300	300-350	>350

As per a report published by CIRIA, London in the year 2006 on **"Water Key Performance Indicators and Benchmarks for offices and hotels"**, benchmarks have been split into 2 distinct types: those with a swimming pool and those without pool. They have been further split into the respective category of resort. Benchmark of hotels with & without swimming pools is shown below in Table.

Benchmarks for hotels with swimming pools
(Based on CIRIA, London report)

Category	Hotel rating	Benchmarks (m3/bedspace/annum)		
		Best Practice	**Typical**	**Above average**
Cat 1	1 star	9	25	60
Cat 2	2 or 3 star	20	60	185
Cat 3	4 or 5 star	60	130	220
Other	No rating	40	90	170

Benchmarks for hotels without swimming pools
(Based on CIRIA, London report)

Category	Hotel rating	Benchmarks (m3/bedspace/annum)		
		Best Practice	**Typical**	**Above average**
Cat 1	1 star	5	10	15
Cat 2	2 or 3 star	10	20	50
Cat 3	4 or 5 star	15	30	65
Other	No rating	10	30	70

4.2.4.7 Restaurants

1.0Subject Matter

(Present a brief historical background on the growth of restaurants – a bird's eye view picture and analysis of the sector using the information/ tables) provided in the annexure.

GIS based map depicting location of all the Restaurants- District level
Total no. of Restaurants in the State. *(Refer Annexure: Table-1)*
Time trend of the number (growth) of Restaurants in the state and Water Demand & Supply position.*(Refer Annexure: Table-2)*

2.0Details of Water Availability, Supply, Demand, Withdrawal & Consumption for the Restaurants

Water Supply & Demand for Restaurants in the State

Time trend of total water demand and actual current water supplied to the Restaurants along with growth of restaurants in the state. *Provide trend analysis (10-15 years) with breakup.(Refer Annexure: Table – 2, 3a, 3b)*

Total Freshwater Withdrawal and Actual Water Consumption by Restaurants in the State

Comparative trend of Total Freshwater Withdrawal vs Actual Water Consumption by Restaurants in the State:
State Water Budgeting: *Refer Annexure- Table 3(e)*

SECTOR (District-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
District 1				
District 2				
GRAND TOTAL	xxx	xxx	xxx	xxx

3.0Issues and Challenges
Illustrative issues and challenges may include

- Water demand and supply issues in the Restaurants in the state, provide details
- Issues & challenges relevant to the water supply & consumption
- Issues related to monitoring and reporting of data

(Supporting data & analysis for above points may also be furnished)

4.0Problem Tree / Root cause Analysis: Cause, Effect and Interventions
5.0Governance / Management:
Statute / Law / Policy/ Regulations if any

- State level laws, policy and governance for the Restaurants in the state on water access, consumption and wastewater discharge.
- Any specific fresh and waste water regulation/ guidelines for Restaurants in state, provide details.

Institutions governing / managing / monitoring the resources and Institutional structure.

- Institutions governing / managing / monitoring the water consumption and supply.

Governing body for sector	Water allocation & Monitoring authority	Waste water discharge monitoring
E.g. Department of Food	*E.g. CGWA/ Water resource department/ Urban or Rural body*	*e.g. State pollution Control Board*

Areas of Peoples/Private Participation if any

- Water Projects set up by Restaurants for the benefit of neighborhood/ local community/ Environment.

Restaurants	Any OE[34] or critical block within the watershed	Water Conservation / Waste Water Treatment initiatives if any	Partnership			Sustainability of initiative
			Community Participation	PPP	Others	

Restaurants	Any OE or critical block within the watershed	Water Reuse/ Recycle initiatives under PPP	PPP Yes/No	Sustainability of initiative

Schemes, Economics& Financing-

Existing schemes and programs along with financial allocations, expenditure etc.

- Water Tariff and procurement cost*(Refer Annexure: Table 6(a) & 6(b))*
- Expenditure on Water management*(Refer Annexure: Table 6(c) & 6(d))*

6.0Measurement, Monitoring and Data Constraints/ Management

- **Water & Wastewater Measurement:**
- **Monitoring** at State Government: Institution/ Agency/ Official responsible for Sustainable Water Management comprehensively for this Sector.
- **Data Management**: Should specify - Frequency of measurement, Frequency of Reporting to centralized agency, Water Quality Parameters monitored, how data is being used to improve Water Use Efficiency and ensure water quality parameters within the prescribed norms etc.
- **Constraints** with respect to the measurement & monitoring

7.0Performance Indicators:

a. Benchmarks on water use *(Refer Annexure: Table-13)*

b. Status of various Performance Indicators– for comparison across Districts/ Plants/ Units/ Products etc.

Performance Indicators

Category	**Indicator**	**Bench Mark** *(as applicable)*	**District- 1**	**District- 2**
Water Quantity Measurement	**Water Quantity**			
	% of Restaurants with water flow meters			
	% of water sources of Restaurants geotagged			
	% of Restaurants undertaken internal water audit in the last year			
	% of Restaurants undertaken external water audit in the last year			
	% of Restaurants Undertaken Third party Water Audit in the last Year			
Water Conservation	% of Restaurants with water harvesting structures?			
	% reduction of total water demand compared to the previous year.			
Water Use Efficiency *(Annexure- Table 7)*	Specific Water Consumption in **Water consumption per guest (L/guest)** *(refer Annexure Table-7(a),(b) & (c))*			
	Have specific water consumption norms/benchmarks established	Yes/No		
	% of Restaurants with specific water consumption within the norms/bench marks/standards			

[34] Overexploited block of groundwater

Waste Water *(Annexure-Table 8)*	% reduction in wastewater generation as compared to previous year			
Water Quality *(Annexure-Table 9)*	% of Restaurants with online water quality monitoring systems installed.			
	% of Restaurants having compliance with the wastewater quality discharge norms.			
	% of Restaurants discharging wastewater into open area/ earthen nallah /open drain/ municipal sewer?			
	% of Restaurants notified for violating effluent discharge norms for discharge in natural resources (surface/ground)?			
Economics	Whether economic incentives are in place to encourage water efficiency & conservation?	Yes/No		
	Whether economic disincentive mechanisms like penalties etc. are in place to discourage water wastage & inefficient use?	Yes/No		
	Whether water use charges & tariff are revised regularly and are reflective of rational pricing mechanisms?	Yes/No		

8.0Reforms undertaken/ being undertaken/ proposed if any

9.0Road map of activities / tasks proposed for

Better governance
Better source / supply management
Better demand management /improved Water Use Efficiency
Water Quality
Water Economics and Financing
Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

ANNEXURE

1Total number of Restaurants in the State

District-wise	No. of Restaurants
District 1	
District 2	
District 3	
Total	

2Growth Trend of Restaurants over a period and Water Demand and Supply position

Restaurants		Years					
		1990	1995	2000	2005	2010	2017
No. of Restaurants							
Total							
Water Demand and Supply							
Total Water Demand (MCM)							
Total Water Supply (MCM)	***GW***						
	SW						
	Total						

Demand-Supply Gap						

3Water Budgeting

3(a) Demand, Supply (Withdrawals) & Consumptive Use:

Restaurants: (MCM) Present Water Year: 1st June to 31st May next year									
INSTITUTIONS (within the Basin/ Sub-basin A)	Previous Year/ Average Annual Demand	Demand for Present Water Year	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water*	**TOTAL SUPPLY**			
Unit 1									
Unit 2									
GRAND TOTAL									

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(b) Source Wise: Previous Year/ Average Annual Water Supply

Restaurants: (MCM)											
Source	Sub Source	**Unit 1**	**Unit 2**	**Unit 3**	**Unit 4**						**TOTAL**
Rain Water	Directly Harvested Rain Water										
Total											
Surface Water	Springs, Nallahs										
	Major Projects										
	Medium Projects										
	Minor Projects										
	Ponds, Tanks										
	Wetlands										
	Sea Water /Desalinated Water										
	Inter Basin Transfer										
Total											
Ground Water* (Dynamic / Static)	Dug wells (Total No. x Draft)										
	Dug cum Bore well (Total No. x Draft)										
	Bore/Tube wells (Total No. x Draft)										
	Others etc										
Total											
Treated Waste Water											
GRAND TOTAL											

*GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

3(c) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Basin/ Sub-basin A:

Source of Water	Demand of all Units in Basin/ Sub-basin A	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(d) Previous Year/ Average Annual Demand, Supply (Source wise) and Consumption for Whole State:

Source of Water	Demand of all Units in the State	Supply/ Withdrawal for all Units	Consumptive Use of all Units	Gap/Remarks
Rain Water (Directly Harvested)				
Springs, Nallahs				
Major Projects				
Medium Projects				
Minor Projects				
Ponds, Tanks				
Wetlands				
Desalinated Water/ Sea water				
Inter-Basin Transfer				
Ground Water (Dynamic)				
Treated Waste Water				
TOTAL (MCM)				

3(e) Summary State Water Budget for Restaurants

Restaurants(District-wise)	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the present Water Year (MCM)
		Supply	Consumptive Use	
All districts	xxx	xxx	xxx	xxx

4Proportion of Water withdrawal and consumption by Restaurants against total establishments in the State

Total Water Withdrawal by all the Restaurants (%) *(Refer 4(a) below)*	Total water withdrawal by all the establishments in state	Total Water Consumption by all the Restaurants (%) *(Refer 4(b) below)*	Total water Consumption by all the establishments in state

4(a) Total Water Withdrawal/Abstraction by **Restaurants** in the State as percentage of total water withdrawal by all establishments in the State

$$\text{Total water withdrawal by Restaurants (\%)} = \frac{\text{(Total water withdrawal by Restaurants in the State) x 100}}{\text{(Total water withdrawal by all the establishments in the state)}}$$

4(b) Total Actual Water Consumption by **Restaurants** in the State as percentage of total water consumption by all establishments in the State

$$\text{Total water consumption by Restaurants (\%)} = \frac{\text{(Total actual water consumption by Restaurants in State) x100}}{\text{(Total water consumption by all the establishments in the state)}}$$

4(c) Total Freshwater Withdrawal and Total Actual Water Consumption by all Restaurants in the State

	CY -11	**CY -10**	**CY -9**	**CY -8**	**CY -7**	**CY -6**	**CY -5**	**CY -4**	**CY -3**	**CY -2**	**CY -1**	**CY / 2017**
Total Fresh Water Withdrawal by all Restaurants(MCM)												
Total Actual Water Consumption by all Restaurants(MCM)												

5Total Water Withdrawal (Abstraction) and Actual Water Consumption as percentage of total renewable freshwater resources

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Total Fresh Water Withdrawal by all Restaurants (%) *(Refer 5(a) below)*						
Total Actual Water Consumption by all Restaurants (%) *(Refer 5(b) below)*						

5(a) Total Water Withdrawal/Abstraction by **Restaurants** in the State as percentage of Total available freshwater resources of the State

$$\text{Total water withdrawal by Restaurants (\%)} = \frac{\text{(Total water withdrawal by all Restaurants in the State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

5(b) Total Actual Water Consumption by all **Restaurants** in the state as percentage of Total available freshwater resources of the State

$$\text{Total water consumption by Restaurants (\%)} = \frac{\text{(Total actual water consumption by all Restaurants in State) x 100}}{\text{(Total available freshwater resources of the state)}}$$

6Water Economics & Financing:

6(a) Water Tariff *(Rs./m³)*

Source	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
GW						
Urban body						
Treated Waste Water for reuse						
Others						

6(b) Procurement Cost of Water (in Rs)

Year wise cost of procurement of Water				
CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**

6(c) Expenditure on Water including Treatment and Management-Time trend at State level

	CY-5	CY-4	CY-3	CY-2	CY-1	CY/ 2017
Total Capex by Restaurants on water treatment and management (Lakhs)						
Total O&M Expenditure by Restaurants on water treatment and management (Lakhs)						
Total						
O&M Expense (%)						

6(d) Expenditure by Restaurants at district level for the Current Year- CY

Restaurants	Capital Expenditure (Lakhs)	O&M Expenditure (Lakhs)	Total	O&M Expense (%)
District 1				
District 2				
District 3				
District 4				
District 5				
Total				

7Water Use Efficiency:

Water use efficiency in terms of Specific Water Consumption (SWC) viz. amount of water used/consumed per unit person. In case of Restaurants it can be represented as the total volume of water used/consumed (in litres) per guest.

Specific Water Consumption (SWC) of Restaurants:

$$\textbf{Specific Water Consumption}\text{ (litres/guest)} = \frac{\text{Volume of water consumed by the Restaurants, (litres)}}{\text{(Total no. of guests)}}$$

7(a) Specific Water Consumption (SWC) for Current Year

	Average Daily Vol. of Water Consumed (litres)	Total no. of guests	**SWC** (litres per guest)
District 1			
District 2			
District 3			

7(b) Average SWC of Restaurants for the State – time trend (also represent through Graph)

	CY-5	**CY-4**	**CY-3**	**CY-2**	**CY-1**	**CY/ 2017**
Average SWC of Restaurants in State						

7(c) Specific Water Consumption (**SWC**)

SWC of Restaurants in the **State**; Decadal trends or 15 years trend to be provided.

Trend of average Specific Water Consumption (SWC) of Restaurants at district level.

Percentage of Restaurants having specific water consumption within the norms/bench marks/standards (**as applicable**)

8Waste Water

	Bench Mark *(as applicable)*	**District 1**	**District 2**	**District 3**
Total Waste Water Generated from Restaurants in the state (m^3/annum)				
% Total quantum of wastewater discharged after recycling				

9Water Quality

		Bench Mark*(as applicable)*	**District 1**	**District 2**	**District 3**
Water Quality	% of Restaurants with online water quality monitoring systems installed.				

Water Quality Time trend- Graphs: Compliance to Waste water discharge Quality norms (E.g. BOD / PH /COD / TSS etc.)

10Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently for Restaurants in state.

10(a) Benchmark for Water Consumption, Waste Water Generation etc. – District-wise

Parameters	Unit	Indian Bench Mark	International Bench Mark
Specific Water Consumption	litres/guest		
Waste Water generation	litres/guest		
Waste Water discharged	litres/guest		

4.2.4.8 Sports Establishments /Golf Courses

[States/ UT are requested to develop this Template in similar lines on their own.]

4.2.4.9 Retail Shops/Malls

[States/ UT are requested to develop this Template in similar lines on their own.]

4.2.4.10 Convention Centres & Wedding Halls

[States/ UT are requested to develop this Template in similar lines on their own.]

4.2.5 Drinking Water and Domestic Use

4.2.5.1 Rural Water Supply and Domestic Use

1. Subject Matter

a. Drinking water supply points in the state - Rural area (Table 1).
b. Un-served and partially served/ Stress areas Households and population (Table 4).
c. Water consumption, management and quantity monitoring (Table 4a & 4b).
d. Status of access, coverage & slippages (if any) of DW supply provision for the Rural population (Table 6).
e. Water quality measurement at Supply end (Source) (Table 7)
f. Water treatment plants with capacity and treatment methods (Table8).
g. Sewage treatment and recycling (Table 9)
h. Water conservation program (Table 10)
i. Technologies for emerging pollutants (Annexure 11).
j. Drinking Water Vulnerability Table.14
Guiding data Available on format B 1 of IMIS of MDWS
Guiding data Available in format B6 of IMIS of MDWS
Guiding data Available in Format C 17of IMIS of MDWS
For Guiding data refer link www.indiawater.gov.in/MISC/Homebp.aspx
(www.indiawater.gov.in)

2. Availability, Utilizable, Supply (Sector wise and Source wise), Demand (Sector wise and Source wise), Consumption (Sector wise and Source wise). Temporal & Spatial basis is to be considered

a) Current drinking water demand, supply, gap and time trends. (Table 3a & 3b, 5).

3. Issues and Challenges

4. Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5. Governance / Management

a) Statute / Law / Policy/ Regulations if any
b) Institutions governing / managing / monitoring the resources and Institutional structure.
c) Areas of Peoples/Private Participation if any
d) Water Financing & Schemes (Table11)

6. Measurement, Monitoring and Data Constraints/ Management

7. Performance Indicators

a) Bench Marks/ Norms/ Standards and deviation from the norms/benchmarks/standards currently.
  i. Water Quality: Conformity to quality of water supplied for drinking purpose as per (BIS 10500:2012) (Table6c).
  ii. Guiding data Available in Format C17A priority contaminants of IMIS of MDWS (www.indiawater.gov.in)

b) Status of various Performance Indicators – for comparison across Districts/ Plants/ Units/ Products etc.

Category of Indicators (Illustrative)	Indicator	Bench Mark/ units	District.1/	District.2/
Water Measurement	No. of Rural bodies fully covered with piped water supply connections	100%		
	No. of Rural bodies partially covered with piped water supply connections			
	No. of Rural bodies not covered with any piped water supply connections			
	Total number of sources for Rural Water Supply			
	No. of Rural bodies that have installed water meters at all sources / withdrawal points	100%		
	% of Sources installed and operational water meters at source			
	% of households installed with water meters			
	% of establishments (other than households installed with water meters)			
	% population covered with W/S	100%		
Sources of DW	% Rural bodies served only from GW			
	% Rural bodies served only from Surface WR			
	% Rural bodies served only from RWH			
	% Rural bodies served only from Recycle Water			
	% Rural bodies served only from GW and SW			

	% Rural bodies served only from GW, SW and RWH			
	% water sources geo-tagged			
Access	% bodies covered by single piped Water Supply			
	% bodies covered by multi-habitations piped Water Supply			
	% households accessing drinking water through PWS with household connections			
	• Metered			
	• Un-meterd			
	% of households accessing DW through public taps			
	% of households accessing DW through hand pumps throughout the year			
	% of households accessing DW through other means throughout the year			
	% of Govt. Schools / Universities covered Water Supply			
	% of Govt. Health Institutions covered Water Supply			
	% of Private Schools / Universities covered Water Supply			
	% of Private Health Institutions covered Water Supply			
	% of Anganwadies, crèches having safe WS			
Water Conservation	% of Rural bodies not having Water management / security plans	20%		
	Number of Rural bodies not taken up RWH			
	Number of Rural bodies taken up behavioral change awareness campaign on responsible & safe use of water	90%		
	No. of Rural bodies undertaking GW recharge			
	No. of Rural bodies ensured the institutions to use micro irrigation for landscaping	80%		
Water Demand Management	% of Rural bodies having mechanism to accommodate seasonal water demand variations	Available		
	Gap between Demand and Supply	0		
	Gap between Supply and consumption	0		
	Gap between Demand and Consumption	0		
	No. of unserved (with respect to piped W/S) Households	0		
	No. of partially served Households			
	% of population in unserved Households	0%		
	% of population in partially served Households	20%		
	WMI: Proportion of total Rural Households fully covered with drinking water supply as on 31.03.2016			
	WMI: Proportion of total rural Households fully covered with drinking water supply as on 31.03.2017			
	% of cities/ towns covered with SCADA System	100%		
	% of household covered with leakage detecting devices	100%		
	% of households covered with metered water supply	100%		
	% of population served with other sources (other than piped)	100%		
	Water supply consistency- hours of Water Supply	24 hours a day		
	Water Stress Index			
	Volume of water supplied at Source vis-a-vis volume of water received by the end users			
	Days of operation at required standards			

Water Efficiency	% Non-revenue water (leakages)	0		
	Average time for correcting water leakage points	4 Hours		
	Rural bodies (in numbers)that have installed water meters at all sources / withdrawal points	100%		
	% of Sources installed and operational water meters at source	100%		
	% of households installed with water meters	100%		
	% of establishments (other than households installed with water meters)	100%		
	Repair times for high priority inoperative lines			
Equity	Number and % of SC and ST households not provided with PWS			
	Number and % of Minority households not provided with PWS			
	Number and %of Women Head households not provided with PWS			
	% of slums not covered with PWS			
Water Service levels	% of population with 135-150 lpcd water supply			
	% of population with 70-135 lpcd water supply			
	% of population with less than 70 lpcd water supply			
	% of population in unserved areas			
	% of population in partially served areas			
	% of population served with other sources (other than piped)			
	Water supply consistency- hours of Water Supply			
Water Stress Index	Volume of water supplied at Source vis-a-vis volume of water received by the end users			
SDG	Proportion of population using safely managed drinking water services (SDG)	100%		
	Volume of Utilization of fresh water vis-a-vis volume of Treated Water uses in domestic purpose other than drinking			
Sewage treatment and recycling	No. of sewage releasing points			
	% of sewage release points geo tagged			
	Total sewage generated	100%		
	% of Sewage treated	20%		
	% of treated sewage recycled in the Industry	20%		
	% of treated sewage is used for other purposes	0%		
	% of un treated sewage is discharged	0%		
	No. of points where sewage is mixed with drinking water			
Water treatment plants with capacity and treatment methods	Gap between the Water Treatment Design capacity and actual capacity	0 mcm		
	Volume of Utilization of fresh water vis-a-vis volume of Treated Water uses in domestic purpose other than drinking			
Water Quality Monitoring	Districts having Water Quality testing lab			
	No. of Sub-divisions without Water Quality testing labs			
	% of Rural bodies not undertaking Quality surveillance (in terms no. of samples) as prescribed.	%		
	Number of Rural bodies not undertaking Quality surveillance (in terms no. of samples) as prescribed.	Number		
	Total number of samples taken during the last year			
	Households	% of coverage		
	Schools			

	Universities	%		
	Industry	%		
	Establishments	%		
	Bus Stops	%		
	Railway stations			
	Number of samples per 1000 population			
	No. of Rural bodies that have not undertaken quality sampling as per prescribed norm			
	% of samples not qualified for BIS Norms- physio-chemical properties	10%		
	% of samples not qualified for BIS Norms-Bacteriological	0%		
	% of Households whose water sources at availability is not as per set norms/ standards	0%		
	% of Households whose water sources at supply end are not as per set norms/ standards	10%		
	% of public DW sources with chemical contamination			
	% of private DW sources with chemical contamination			
	% of public DW sources with bacteriological contamination			
	WMI: % reduction in rural Households affected by Water Quality problems during the Financial Year 2015			
	WMI: % reduction in rural Households affected by Water Quality problems during the Financial Year 2016			
Water Productivity	Per capita water supply			
	No. of Rural bodies failing to supply standard per capital water supply			
	Volume of water supplied at Source vis-a-vis volume of water received by the end users			
	Total volume of Fresh water supply and volume of Tertiary treated water Supply			
Waste Water	Total estimated generation of waste water in the Rural areas as on 1st June WMI			
	Capacity installed in the state to treat the Rural waste-water as a proportion of the total estimated waste water generated in the Rural areas of the state as on 31st June WMI			
	% Waste water treated in CY WMI			
	% Waste Water treated in previous Year WMI			
Environmental sustainability and Water Quality	Quality of water supplied as per BIS 10500:2012	100%		
Participatory Water Management	No. of public grievances pending	80%		
Financing	% Cost recovery through water supply systems	90%		
	Total cost of operations per MCM			
	No. of PPP contracts if any			
Impact	% reduction in prevalence of Diarrhea in children under 5 from base year.			
	% reduction in IMR from base year			
Monitoring	Operationalization of online Water Quality test results information and feedback	Yes/No		
	No. of studies undertaken and shared with local bodies			

Core water supply performance indicators **%**

Sr. No.	**Water Supply Services**	**Bench Mark**	**Existing status**		
			District 1		**Nth district**
1	Coverage of water supply connections	100%			
2	Per capita water supply	40 lpcd			
3	Extent of metered water supply	100%			
4	Water supply consistency	24 hours a day			
5	Quality of water supplied as per BIS 10500:2012	100%			
6	Efficiency of redressal of customer complaints	100%			
7	Cost recovery through water supply systems	100%			

% Water supply performance TARGET can be alleged to those of SDG-2030 which is "Achieve UNIVERSAL & EQUITABLE access to SAFE & AFFORDABLE DRINKING WATER FOR ALL BY 2030" This target is monitored through following indicators – "% of population using safely managed drinking water services" i.e. : (a) located on premises (b) available when needed & (c) free from faecal & priority chemical contamination.

8. Reforms undertaken/ being undertaken/ proposed if any
9. Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity.

ANNEXURE

1. Rural population covered with w/s

District/basin	Rural Population	Point Sources		Piped water supply	
		No	Qty	No	Qty
Total					

Annexure 2: Drinking water sources in the state - rural area.

Sr. No.	Name of district/basin	Number of habitations	Source of water (Annual)								Total availability (MCM)
			River		Canal		Lake		Ground water#		
			Number	Quantity (MCM)	Number	Quantity (MCM)	Number	Quantity (MCM)	Number	Quantity (MCM)	

We can explain that groundwater consist of all water sources such as dug well with primary treatment, hand pumps (both country made and IM type or Tara hand pumps tube well/DTW)

Annexure 3a: Current drinking water demand, supply and gap.

Sr. No.	Name of district/basin	Number of habitations (2017)		Population (2017)		Annual demand (MCM)	Annual supply (MCM)	Annual gap, if any (MCM)
		Total	Covered with w/s	Total	Covered with w/s			

Annexure 3b: Drinking water demand trends for last 3 decades.

Sr. No.	Name of district/basin	No. of habitations	Population			Water Demand (BCM)			Water Supply based on actual (BCM)		
			2001	2011	2017	2001	2011	2017	2001	2011	2017

Annexure 4: Un-served and stress areas.

Sr. No.	Name of district/basin	Total no. of habitations	Total population	Stress areas (service level <30 lpcd)					
				0 – 10 lpcd		10 – 20 lpcd		20 – 30 lpcd	
				No. of habitations	Population	No. of habitations	Population	No. of habitations	Population

Annexure 5: Water consumption and management.

Sr. No.	Name of district/basin	No. of habitations	Population Coverage (%)	Per capita water supply (lpcd)	Unaccounted water (%)	Leakages/ losses (%)	Non-Revenue Water (%) (8 + 9)	Total Actual Water Supplied (KLD)	Total Actual Water Consumption (KLD)
(1)	(2)	(3)	(4)	(5)	(8)	(9)	(10)	(11)	(12)

Annexure 6: Status of access, coverage & slippages (if any) of drinking water supply provision for the rural population.

1. As such in number of replies to Parliament, it has been stated that no parts of country are categorized as unserved and at least some minimum service level exist. Therefore, it is proposed to club unserved areas under Supply level of 0-10 lpcd.
2. In rural aspect, the percentage of population with metering at house level and at village level is minuscule and therefore can be deleted/modified

Sr. No.	Name of district/basin	No. of habitations	Total Current Population	Total Houses	Total House Connection	Total public stand post	Total hand pumps	Total population Coverage (%)	Total slippage (%)

Annexure 7a: Conformity to quality of water supplied for drinking purpose as per (BIS 10500:2012). : The relevant information is also available on format C-17 A of IMIS at www.indiawater.gov.in

Sr. No.	Name of district / basin	No of w/s schemes		Water sources for w/s schemes (number)		Number of villages with Fluoride problem	Number of villages with Arsenic problem	Number of villages with TDS problem	Number of villages with Nitrate problem	Number of villages with Iron problem	Number of villages with Heavy Metals problem
		Non PWS	PWS	Surface	Ground						

Annexure 7b: Water quality monitoring for the last 3 years (*).

Sr. No.	Name of district/basin	Type of tests	No of samples					
			2015		2016		2017	
			Tested	Failed	Tested	Failed	Tested	Failed
		Physical & Chemical						
		Bacteriological						

(*) All the failed samples results should be analyzed and suitable remedial measures adopted must be given in brief.

Table8: Availability of water treatment plants.

Name of district/basin	No of towns/cities	Total Demand	Design capacity of WTP MCM	Actual Treatment capacity, MCM	Gap, MCM

Annexure 9: Availability of sewage treatment plants.

Sr. No.	Name of district/basin	No of habitations	Availability of sewage treatment plant	Capacity (MLD)	Type of treatment (primary/secondary & tertiary)

Table10: Water conservation programs.

Sr. No.	Name of district/basin	No. of Rural bodies not taken water conservation	No. of Rural bodies taken up water Conservation Measures		
			Rain Water Harvesting	Use of all Institutions -Micro- Drip/ Sprinkler in Institutions	Behavioral change programmes for Responsible and safe use of Water

Annexure 11: Technologies available for the emerging pollutants (**).

Sr. No.	Name of district/basin	No. of habitations	Treatment technology for removal of		
			Pesticide	Trihalomethanes	Phenols

(**) If any other emerging pollutant is found, same should also be included.

Annexure 12: Status of water pricing and financial performance of the agencies supplying water in the rural area.

Sr. No.	Name of the District/ Basin	No of w/s schemes	Number of habitations covered	Total water Supplied (KLD)	Total Cost/Expenditure of water supply (annual)		Water Tariff collected	Total billed amount (annual)	Total Revenue Generated (annual)	Management Agency/Department
					Flat monthly charges	Volumetric charges based on metering				

WATER Financing, PRICING AND COST ACCOUNTING

Table.13.1 Investment on Water Schemes

District/ Basin	Scheme Name	Total No. of Rural bodies	No. of Rural bodies received money	Budget for the previous Year			Budget for CY
				Allocation	Expenditure	% Expenditure	BE

Table13.2: Status of water pricing and financial performance of the agencies supplying water in the Rural area.

Sr. No.	Name of the City	No of w/s schemes	Total water Supplied (KLD)	Water Tariff (Rs./KL)	Total Billed Amount (annual)	Total Cost/Expenditure of water supply (annual)	Total Revenue Generated (annual)	Gap of O & M expenditure and revenue generated	Management Agency/ Department

Annexure 14. Drinking water Vulnerability

District	Number of Habitations	Number of Habitations in Quality affected	Number of Habitations located in coastal zones or flood prone	Number of Habitations located in areas vulnerable to drought	Is the Habitation in areas where ground water is over exploited	Number of habitations where any resilient drinking water supply measures promoted

4.2.5.2 Urban Water Supply and Domestic Use

1.0Subject Matter

Drinking water sources in the state - urban area (Table 1).
Un-served and partially served/ Stress areas Households and population (Table 3).
Water consumption, management and quantity monitoring (Table 4a & 4b).
Status of access, coverage & slippages (if any) of DW supply provision for the urban population (Table 5).
Water quality measurement at Supply end (Source) (Table 6a & 6b)
Sewage treatment and recycling (Table 7)
Water treatment plants with capacity and treatment methods (Table8).
Water conservation program (Table9)

2. Availability, Utilizable, Supply (Sector wise and Source wise), Demand (Sector wise and Source wise), Consumption (Sector wise and Source wise).Temporal & Spatial basis is to be considered

Current drinking water demand, supply, gap and time trends. (Table 2a & 2b).

3. Issues and Challenges

4. Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5. Governance / Management

Statute / Law / Policy/ Regulations if any
Institutions governing / managing / monitoring the resources and Institutional structure.
Areas of Peoples/Private Participation if any
Water Financing& Schemes (Table10)

6. Measurement, Monitoring and Data Constraints/ Management

7. Performance Indicators

Bench Marks/ Norms/ Standards and deviation from the norms/benchmarks/standards currently.
Conformity to quality of water supplied for drinking purpose as per (BIS 10500:2012) (Table6c).
Status of various Performance Indicators – for comparison across Districts/ Plants/ Units/ Products etc.

Category of Indicators (Illustrative)	**Indicator**	**Bench Mark/ units**	**District.1/**	**District.2/**
Water Measurement	No. of urban bodies fully covered with piped water supply connections	100%		
	No. of urban bodies partially covered with piped water supply connections			
	No. of urban bodies not covered with any piped water supply connections			
	Total number of sources for Urban Water Supply			
	No. of Urban bodies that have installed water meters at all sources / withdrawal points	100%		
	% of Sources installed and operational water meters at source			
	% of households installed with water meters			
	% of establishments (other than households installed with water meters)			
	% population covered with W/S	100%		
Sources of DW	% urban bodies served only from GW			
	% urban bodies served only from Surface WR			
	% urban bodies served only from RWH			
	% urban bodies served only from Recycle Water			
	% urban bodies served only from GW and SW			
	% urban bodies served only from GW, SW and RWH			
Access	% bodies covered by single piped Water Supply			
	% bodies covered by multi-habitations piped Water Supply			
	% households accessing drinking water through PWS with household connections			
	• Metered			
	• Un metred			

	% of households accessing DW through public taps			
	% of households accessing DW through hand pumps throughout the year			
	% of households accessing DW through other means throughout the year			
	% of Govt. Schools / Universities covered Water Supply			
	% of Govt. Health Institutions covered Water Supply			
	% of Private Schools / Universities covered Water Supply			
	% of Private Health Institutions covered Water Supply			
	% of Anganwadies, crèches having safe WS			
Water Conservation	% of Urban bodies not having Water management / security plans	20%		
	Number of urban bodies not taken up RWH			
	Number of urban bodies taken up behavioral change awareness campaign on responsible & safe use of water	90%		
	No. of urban bodies undertaking GW recharge			
	No. of urban bodies ensured the institutions to use micro irrigation for landscaping	80%		
Water Demand Management	% of Urban bodies having mechanism to accommodate seasonal water demand variations	Available		
	Gap between Demand and Supply	0		
	Gap between Supply and consumption	0		
	Gap between Demand and Consumption	0		
	No. of unserved(with respect to piped W/S) Households	0		
	No. of partially served Households			
	% of population in unserved Households	0%		
	% of population in partially served Households	20%		
	WMI: Proportion of total urban Households fully covered with drinking water supply as on 31.03.2016			
	WMI: Proportion of total rural Households fully covered with drinking water supply as on 31.03.2017			
	% of cities/ towns covered with SCADA System	100%		
	% of household covered with leakage detecting devices	100%		
	% of households covered with metered water supply	100%		
	% of population served with other sources (other than piped)	100%		
	Water supply consistency- hours of Water Supply	24 hours a day		
	Water Stress Index			
	Volume of water supplied at Source vis-a-vis volume of water received by the end users			
	Days of operation at required standards			
Water Efficiency	% Non-revenue water (leakages)	0		
	Average time for correcting water leakage points	4 Hours		
	Cities/ Towns (in numbers)that have installed water meters at all sources / withdrawal points **Table 4**	100%		
	% of Sources installed and operational water meters at source **Table 4**	100%		
	% of households installed with water meters **Table 4**	100%		
	% of establishments (other than households installed with water meters)**Table 4**	100%		
	Repair times for high priority inoperative lines			
Equity	Number and % of SC and ST households not provided with PWS			
	Number and % of Minority households not provided with PWS			
	Number and %of Women Head households not provided with PWS			
	% of slums not covered with PWS			

Water Service levels	% of population with 135-150 lpcd water supply **Table 3**			
	% of population with 70-135 lpcd water supply **Table 3**			
	% of population with less than 70 lpcd water supply **Table 3**			
	% of population in unserved areas **Table 5**			
	% of population in partially served areas **Table 3**			
	% of population served with other sources (other than piped)**Table 5**			
	Water supply consistency- hours of Water Supply			
Water Stress Index	Volume of water supplied at Source vis-a-vis volume of water received by the end users			
SDG	Proportion of population using safely managed drinking water services (SDG)	100%		
	Volume of Utilization of fresh water vis-a-vis volume of Treated Water uses in domestic purpose other than drinking			
Sewage treatment and recycling	No. of sewage releasing points			
	% of sewage release points geo tagged			
	Total sewage generated			
	% of Sewage treated	100%		
	% of treated sewage recycled in the Industry	20%		
	% of treated sewage is used for other purposes	20%		
	% of un treated sewage is discharged	0%		
	No. of points where sewage is mixed with drinking water	0%		
Water treatment plants with capacity and treatment methods	Gap between the Water Treatment Design capacity and actual capacity	0 mcm		
	Volume of Utilization of fresh water vis-a-vis volume of Treated Water uses in domestic purpose other than drinking			
Water Quality Monitoring	Districts having Water Quality testing lab			
	No. of Sub-divisions without Water Quality testing labs			
	% of urban bodies not undertaking Quality surveillance (in terms no. of samples) as prescribed.	%		
	Number of urban bodies not undertaking Quality surveillance (in terms no. of samples) as prescribed.	Number		
	Total number of samples taken during the last year			
	Households	% of coverage		
	Schools	%		
	Universities	%		
	Industry	%		
	Establishments	%		
	Number of samples per 1000 population			
	No. of urban bodies that have not undertaken quality sampling as per prescribed norm			
	% of samples not qualified for BIS Norms- physio-chemical properties	10%		
	% of samples not qualified for BIS Norms-Bacteriological	0%		
	% of Households whose water sources at availability is not as per set norms/ standards	0%		
	% of Households whose water sources at supply end are not as per set norms/ standards	10%		

	% of public DW sources with chemical contamination			
	% of private DW sources with chemical contamination			
	% of public DW sources with bacteriological contamination			
	WMI: % reduction in rural Households affected by Water Quality problems during the Financial Year 2015			
	WMI: % reduction in rural Households affected by Water Quality problems during the Financial Year 2016			
Water Productivity	Per capita water supply	135 lpcd/ 150 lpcd		
	No. of urban bodies failing to supply standard per capital water supply			
	Volume of water supplied at Source vis-a-vis volume of water received by the end users			
	Total volume of Fresh water supply and volume of Tertiary treated water Supply			
Waste Water	Total estimated generation of waste water in the urban areas as on 1st June WMI			
	Capacity installed in the state to treat the urban waste-water as a proportion of the total estimated waste water generated in the urban areas of the state as on 31st June WMI			
	% Waste water treated in CY WMI			
	% Waste Water treated in previous Year WMI			
Environmental sustainability and Water Quality	Quality of water supplied as per BIS 10500:2012	100%		
Participatory Water Management	No. of public grievances pending	80%		
Financing	% Cost recovery through water supply systems	90%		
	Total cost of operations per MCM			
	No. of PPP contracts if any			
Impact	% reduction in prevalence of Diarrhea in children under 5 from base year.			
	% reduction in IMR from base year			
Monitoring	Operationalization of online Water Quality test results information and feedback	Yes/No		
	No. of studies undertaken and shared with local bodies			

Core water supply performance indicators.**%**

Sr. No.	**Water Supply Services**	**Bench Mark**	**Existing status**		
			District 1		**Nth district**
1	Coverage of water supply connections	100%			
2	Per capita water supply	40 lpcd			
3	Extent of metered water supply	100%			
4	Water supply consistency	24 hours a day			
5	Quality of water supplied as per BIS 10500:2012	100%			
6	Efficiency of redressal of customer complaints	100%			

7	Cost recovery through water supply systems	100%			

8. Reforms undertaken/ being undertaken/ proposed if any
9. Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity.

ANNEXURE

A. WATER AVAILABILITY- source wise

Table-1

District/Basin Name	No. of Households		Source of Water supply: River		
	Urban		No.	Quantity (MCM)	Name of Water quality monitoring agency

District/Basin Name	No. of Households		Source of Water supply: Dam/ Reservoirs		
	Urban		No.	Quantity (MCM)	Name of Water quality monitoring agency

District/Basin Name	No. of Households		Source of Water supply: Ponds / Tanks		
	Urban		No.	Quantity (MCM)	Name of Water quality monitoring agency

District / Basin Name	No. of Households		Source of Water supply: Wetlands includes Lakes		
	Urban		No.	Quantity (MCM)	Name of Water quality monitoring agency

District/Basin Name	No. of Households			Source of Water supply: Desalination		
	Urban			No.	Quantity (MCM)	Name of Water quality monitoring agency

District/Basin Name	No. of Households		Source of Water supply: GW: Dug wells		
	Urban		No.	Quantity (MCM)	Name of Water quality monitoring agency

District/Basin Name	No. of Households		Source of Water supply: GW Dug cum bore wells		
	Urban		No.	Quantity (MCM)	Name of Water quality monitoring agency

District / Basin Name	No. of Households		Source of Water supply: Springs		
	Urban		No.	Quantity (MCM)	Name of Water quality monitoring agency

Table-2aDrinking water annual demand, supply, gap and time trend

District/ Basin	No of Urban Local Body	CY Total population	Demand in CY	Supply in CY

Name of district / Basin	No. of towns/cities / Urban local bodies			Population (2017)		Annual demand (MCM)	Annual supply (MCM)	Consumption	Gap	
	Total	Fully Covered with w/s	Partly covered with w/s	Total	% Covered with w/s				Demand - Supply	Supply-Consumption

Table 2bDrinking water Demand, Supply and Gap- Time trend

Name of district/ Basin	No. of towns/cities	Population			Water Demand (BCM) @135 lpcd			Water Supply based on actual (BCM)			Water consumption		
		2001	2011	CY	2001	2011	CY	2001	2011	CY	2001	2011	CY

CY: Current Year
Note: Service level benchmark is 150 lpcd for Metro cities, 135 lpcd for other cities/towns with sewerage system and 70 lpcd without sewerage system city.

Table 3 Un-served and partially served/ Stress areas.

Name of district	Total no. of towns/ cities	Total population	Unserved Households& Population			Partially served/ supplied: Stress areas population							
						0 – 70 lpcd		70-135 lpcd		135-150 lpcd		Total	
			No. of House holds	Pers ons	**% of Popul ation**	No. of House holds	Pers ons	No. of House holds	Pers ons	No. of House holds	Pers ons	No. of House holds	**% of popul ation**

Table4 Water consumption, management and quantity monitoring

Table 4 (a) Quantity Monitoring

District/ Basin	Water source quantity not monitored by Any agency at available Water source							
	Rivers	Dams/ reservoirs	Ponds/Tanks	Wetlands/ Lakes	Desalination plants	Dug wells	Dug/ Bore wells	Springs

District/ Basin	No. of Urban Households whose water source is not being monitored							
	Rivers	Dams/ reservoirs	Ponds/Lakes	Wetlands	Desalination plants	Dug wells	Dug/ Bore wells	Springs

Table 4 (b) Water consumption& management

Sr. No.	Name of district / Basin	No. of towns / cities	Total no of House holds	No. of House holds covered	% of House holds covered	Population Coverage (%)	Total water consumption from other than Piped WS, MCM	Total Piped Water Supply MCM	Total Actual Metered Consumption (MCM)	Total Actual Un-metered Consumption (MCM)	Non-Revenue Water (MCM)	Coverage of HHs with leakage detection unit	No of towns / cities with SCADA System

Table5 Access to Drinking Water and Domestic usage: Coverage & slippages (if any) of Drinking water supply provision for the urban population.

Name of district/ Basin	No. of towns/cities	Total Current Population	Total Households	Total Households Connection Metered + Non-Metered	Total public stand post	Total hand pumps	Total population coverage (%)	Total slippage = Not covered (%)

B. URBAN WATER QUALITY MONITORING: AT SUPPLY END

Table 6a Data on Water Quality at Water Supply end

District/Basin Name	No. of Households			Source of Water supply: River		
	Urban			No.	Quantity (MCM)	Name of National accredited Water quality monitoring agency

District/ Basin Name	No. of Households			Source of Water supply: Irrigation Projects		
	Urban			No.	Quantity (MCM)	Name of National accredited Water quality monitoring agency

District/ Basin Name	No. of Households	Source of Water supply: Ponds / Tanks		
	Urban	No.	Quantity (MCM)	Name of National accredited Water quality monitoring agency

District/ Basin Name	No. of Households	Source of Water supply: Wetlands includes Lakes		
	Urban	No.	Quantity (MCM)	Name of National accredited Water quality monitoring agency

District / Basin Name	No. of Households	Source of Water supply: Desalination		
	Urban	No.	Quantity (MCM)	Name of National accredited Water quality monitoring agency

District / Basin Name	No. of Households	Source of Water supply: GW: Dug wells		
	Urban	No.	Quantity (MCM)	Name of National accredited Water quality monitoring agency

District / Basin Name	No. of Households	Source of Water supply: GW Dug cum bore wells		
	Urban	No.	Quantity (MCM)	Name of National accredited Water quality monitoring agency

District/ Basin Name	No. of Households	Source of Water supply: Springs		
	Urban	No.	Quantity (MCM)	Name of National accredited Water quality monitoring agency

Table 6b Monitoring of Water Quality at Supply end

District/ Basin	Not monitored by Any agency at available Water source							
	Rivers	Irrigation Projects	Ponds/Tanks	Wetlands/ Lakes	Desalination plants	Dug wells	Dug/ Bore wells	Springs

District/ Basin	No. of Urban Households whose water source is not being monitored							
	Rivers	Irrigation Projects	Ponds/Tanks	Wetlands/ Lakes	Desalination plants	Dug wells	Dug/ Bore wells	Springs

Water Quality Status: Physio-Chemical and Bacteriological Parameters

District/ Basin	Source	No. of Households			Physio-Chemical (Annual Range) in mg/l					Bacteriological (Annual Range in MPN/100 ml)	
			Urban		Fluoride	TDS	SS	Odour	Taste	T.C	F.C

Water Quality Status: Heavy Metals and Pesticides: Annual Range

District/ Basin		No. of Households			Heavy Metals (mg/l) Annual Range										Pesticides (mg/l)	
			Urban		As	Cd	Cu	Pb	Cr	Ni	Zn	Hg	Fe	CN	OCP	OPP

C. WATER QUALITY CRITERION & BIS DRINKING WATER QUALITY STANDARDS

Table6c Water quality monitoring as per BIS 10500

District	No. of Households			Water source	Name of Water source	standards					
		Urban				pH	DO	BOD	T.C	F.C	Compliance

BIS conformity with Physico-Chemical

District	No. of urban bodies	No.of Samples collected sources wise						No.of Samples failed to conform BIS 10500					
		River	Dam/Reservoir	Lakes	Desalination	Borewells	Springs	River	Dam/Reservoir	Lakes	Desalination	Borewells	Springs

BIS conformity with Bacteriological

District	No. of urban bodies	No.of Samples collected sources wise						No.of Samples failed to conform BIS 10500					
		River	Dam/Reservoir	Lakes	Desalination	Borewells	Springs	River	Dam/Reservoir	Lakes	Desalination	Borewells	Springs

Table 7: Sewage treatment and recycling

Name of district	**No of towns/cities**	**Total Generation of Sewage**	**Design capacity of STP**	**Actual Treatment capacity,**	**Gap**	**Amount of sewage recycled for industrial Purposes**	**Amount of sewage recycled for other Purposes**	**Amount of un treated sewage is discharged**

Table8: Availability of water treatment plants.

Name of district	**No of towns/cities**	**Total Demand**	**Design capacity of WTP MCM**	**Actual Treatment capacity, MCM**	**Gap, MCM**

Table9: Water conservation programs.

Sr. No.	Name of district	No. of urban bodies not taken water conservation	No. of urban bodies taken up water Conservation Measures		
			Rain Water Harvesting	Use of all Institutions -Micro- Drip/ Sprinkler in Institutions	Behavioral change Responsible and safe use of Water

D. WATER Financing, PRICING AND COST ACCOUNTING

Table.10 Investment on Water Schemes

District	Scheme Name	Total No. of Urban bodies	No. of Urban bodies received money	Budget for the previous Year			Budget for CY
				Allocation	**Expenditure**	**% Expenditure**	**BE**

Table10: Status of water pricing and financial performance of the agencies supplying water in the urban area.

Sr. No.	Name of the City	No of w/s schemes	Total water Supplied (KLD)	Water Tariff (Rs./KL)	Total Billed Amount (annual)	Total Cost/Expenditure of water supply (annual)	Total Revenue Generated (annual)	Gap of O & M expenditure and revenue generated	Management Agency/ Department

4.3. WATER QUALITY

1. Subject Matter

Water sources, its quality and quality monitoring (Table1 and Table-2)

a) At available water sources-

i. Monitoring status -source & habitation wise (Table A-1 to A-11)
ii. Water Quality Status – Physio-chemical, Bacteriological and (Table A-12)
iii. Water Quality Status - Heavy metals and Pesticides (Table A-13)

b) At supply end

i. Monitoring status -source & habitation wise (Table B-1 to B-3)
ii. Water Quality Status – Physio-chemical, Bacteriological and; (Table B-4)
iii. Water Quality Status - Heavy metals and Pesticides, (Table B-5)

2. Availability, Utilizable, Demand, Supply and Consumption (Table.G.1)

3. Issues and Challenges

4. Problem Tree / Root cause Analysis: Cause, Effect and Interventions

5. Governance / Management:

a) Institutions governing / managing / monitoring the resources and Institutional structure.
b) Areas of Peoples/Private Participation if any
c) Water Financing& Economics (Table C)

6. Measurement, Monitoring and Data Constraints/ Management

7. Performance Indicators: for comparison across Districts/ Plants/ Units/ Products etc

c) Bench Marks/ Norms/ Standards and deviation from the norms/bench marks/standards currently.

i. Designated Use based standards for each Water Body w.r.to standards at Table 1 and 2 of Bench Marking (Table D).
ii. Number of surface water quality monitoring Stations meeting the prescribed norms (Table E).
iii. Number of Groundwater quality monitoring Stations meeting the prescribed norms (Table F).
iv. Primary Water Quality Criteria, BIS Drinking Water Quality standards and Site selection criteria for water quality Monitoring stations (Table G)

d) Status of various Performance Indicators – for comparison across Districts/ Plants/ Units/ Products etc.

Category of Indicators (Illustrative)	**Indicator**	**Bench Mark/ units**	**District.1/**	**District.2/**	**District.3/**
Monitoring	**Manual Monitoring Stations**				
	% of Water Quality Monitoring Stations as per Criteria for Selection of Monitoring Stations **for Rivers** at Table 3 of benchmarking (Table G).				
	% of Water Quality Monitoring Stations as per Criteria for Selection of Monitoring Stations **for Lake/Reservoir/Pond/Tank** at Table 3 of benchmarking (Table G)				
	% of Water Quality Monitoring Stations as per Criteria for Selection of Monitoring Stations for **Canal** at Table 3 of benchmarking (Table G)				
	% of Water Quality Monitoring Stations as per Criteria for Selection of Monitoring Stations for **Ground Water** at Table 3 of benchmarking(Table G)				
	Real Time Continuous Water Quality Network				
	% of Water Quality Monitoring Stations as per Criteria for Selection				

Category of Indicators (Illustrative)	Indicator	Bench Mark/ units	District.1/	District.2/	District.3/
	of Monitoring Stations **for Rivers** at Table 3 of benchmarking (Table G)				
	% of Water Quality Monitoring Stations as per Criteria for Selection of Monitoring Stations **for Lake/Reservoir/Pond/Tank** at Table 3 of benchmarking (Table G)				
	% of Water Quality Monitoring Stations as per Criteria for Selection of Monitoring Stations **for Canal** at Table 3 of benchmarking (Table G)				
	% of Water Quality Monitoring Stations as per Criteria for Selection of Monitoring Stations **for Ground Water** at Table 3 of benchmarking (Table G)				
Quality	**At source**				
	% of Water Quality Monitoring Stations meeting the prescribed standards for **River**				
	% of Water Quality Monitoring Stations meeting the prescribed standards **for Lake/Reservoir/Pond/Tank**				
	% of Water Quality Monitoring Stations meeting the prescribed standards **for Canal**				
	% of Water Quality Monitoring Stations meeting the prescribed standards **for Groundwater**				
	AT Consumption points				
	No. of samples taken				
	• Residential				
	• Schools				
	• Hospitals				
	• Hostels				
	• Restaurants				
	• Govt. Offices				
	• Pvt. Offices				
	• Industry				
	% samples taken				
	• Residential				

Category of Indicators (Illustrative)	Indicator	Bench Mark/ units	District.1/	District.2/	District.3/
	• Schools				
	• Hospitals				
	• Hostels				
	• Restaurants				
	• Govt. offices				
	• Pvt. Offices				
	• Industry				
Laboratories Accreditation	% of Water Quality Analytical Laboratory accredited NABL certification or any other international certification				
Non-attainment stations	% of stations shows persistent violation of norms for **rivers** for 05 years				
	% of stations shows persistent violation of norms **for Lake/Reservoir/Pond/Tank** for 05 years				
	% of stations shows persistent violation of norms for **canal** for 05 years				
	% of stations shows persistent violation of norms for **Groundwater** for 05 years				
Participatory Water Management	Number of Campaigns for Water Quality Monitoring	(Number)			
	Number of Initiative taken by Industrial sector for improvement of Water Quality under CREP scheme	(Number)			
	Number of Initiative taken by NGOs supported by State Government for improvement of Water Quality	(Number)			
	Online portal for dissemination and feedback of water quality data for data	(Number)			
	Number of grievance received	(Number)			

8. Reforms undertaken/ being undertaken/ proposed if any

9. Road map of activities / tasks proposed for better governance with timelines and agencies responsible for each task/activity.

TABLE

Table.1: Mapping of Water Resources at State level at source end

Water resource of State	**Number of Water Resources**	**Qty**	**Number of Water resources at Availability**						Heavy metals and pesticides observed/detected
			Meeting desired Primary Water Quality Criteria Class					Below E	
			A	B	C	D	E		
River	6		**1**	2	1	1	1		
Irrigation									
Tank									
Wetlands									
Desalination									
GW									

Table.2: Mapping of Water Resources and Quality- District wise at source level (Summary of A)

District	Sources	Source of Water Supply											
		Total No	Monitored	Not Monitored	Total Qty	Designated Best use among the monitored						Heavy metals and pesticides observed/detected	Water quality monitoring agency
						A	B	C	D	E	<E		
	River												
	Irrigation												
	Tank												
	Wetlands												
	Desalination												
	GW												
	Total												

Table.3: Mapping of Water Quality monitoring source wise at supply end (summary of B)

District	Number of Schemes based on the Surface water sources	Number of Schemes based on the Ground water sources	Number Bore wells Hand pumps	Number of Schemes based on the surface water sources tested as per protocol and meeting BIS Standards		Number of Schemes based on the Ground water sources tested as per protocol and meeting BIS Standards		Number Bore wells Hand pumps tested as per protocol and meeting BIS Standards	
				Number	%	Number	%	Number	%

Table A: WATER QUALITY MONITORING: AT AVAILABILITY (should be done pre- & post-monsoon) of Preferably of Current Year else Previous Year

Table AS 1State wise water sources and Water Quality Monitoring at source level

District	Total Sources	Source of Water Supply											
		Total No	Monitored	Not Monitored	Total Qty	Designated Best use among the monitored						Heavy metals and pesticides observed/detected	Water quality monitoring agency
						A	B	C	D	E	<E		

Table AD District wise Water Quality Monitoring (Summary of A1 to A8)

Source wise

Table A-1: Data on Water Quality at Water Source – River: Availability

District	No. of Habitation			Source of Water Supply											
				Total No	Monitored	Not Monitored	Total Qty	Designated Best use among the monitored						Heavy metals and pesticides observed/detected	Water quality monitoring agency
	Rural	Urban	Total					A	B	C	D	E	<E		
				6											

Table A-2: Data on Water Quality at Water Source – Irrigation Projects: Availability

District	No. of Habitation			Source of Water Supply											
				Total No	Monitored	Not Monitored	Total Qty	Designated Best use among the monitored						Heavy metals and pesticides observed/detected	Water quality monitoring agency
	Rural	Urban	Total					A	B	C	D	E	<E		

Table A-3: Data on Water Quality at Water Source – Ponds /Tanks: Availability

District	No. of Habitation			Source of Water Supply											
				Total No	Monitored	Not Monitored	Total Qty	Designated Best use among the monitored						Heavy metals and pesticides observed/detected	Water quality monitoring agency
	Rural	Urban	Total					A	B	C	D	E	< E		

Table A-4: Data on Water Quality at Water Source – Wetlands: Availability

District	No. of Habitation			Source of Water Supply											
				Total No	Monitored	Not Monitored	Total Qty	Designated Best use among the monitored						Heavy metals and pesticides observed/detected	Water quality monitoring agency
	Rural	Urban	Total					A	B	C	D	E	< E		

Table A-5: Data on Water Quality at Water Source – Desalination: Availability

District	No. of Habitation			Source of Water Supply											
				Total No	Monitored	Not Monitored	Total Qty	Designated Best use among the monitored						Heavy metals and pesticides observed/detected	Water quality monitoring agency
	Rural	Urban	Total					A	B	C	D	E	< E		

Table A-6: Data on Water Quality at Water Source – Ground Water- Dug Wells: Availability

District	No. of Habitation			Source of Water Supply											
				Total No	Monitored	Not Monitored	Total Qty	Designated Best use among the monitored						Heavy metals and pesticides observed/detected	Water quality monitoring agency
	Rural	Urban	Total					A	B	C	D	E	< E		

Table A-7: Data on Water Quality at Water Source – Groundwater Dug cum bore wells Availability

District	No. of Habitation			Source of Water Supply											
				Total No	Monitored	Not Monitored	Total Qty	Designated Best use among the monitored						Heavy metals and pesticides observed/detected	Water quality monitoring agency
	Rural	Urban	Total					A	B	C	D	E	< E		

Table A-8: Data on Water Quality at Water Source – Springs: Availability

District	No. of Habitation			Source of Water Supply											
				Total No	Monitored	Not Monitored	Total Qty	Designated Best use among the monitored						Heavy metals and pesticides observed/detected	Water quality monitoring agency
	Rural	Urban	Total					A	B	C	D	E	< E		

Table A-9: Summary: Enumeration of Water Quality Monitoring

District	No. of Water Resources not monitored by any agency							
	Rivers	Irrigation Projects	Ponds/Lakes	Wetlands	Desalination plants	Dug wells	Dug/ Bore wells	Springs

Table A-10: Summary: Enumeration of Water Quality Monitoring for Rural Habitations

District	No. of Rural habitations whose water source is not being monitored							
	Rivers	Irrigation Projects	Ponds/Lakes	Wetlands	Desalination plants	Dug wells	Dug/ Bore wells	Springs

Table A-11: Summary: Enumeration of Water Quality Monitoring for Urban Habitations

District	No. of Urban habitations whose water source is not being monitored							
	Rivers	Irrigation Projects	Ponds/Lakes	Wetlands	Desalination plants	Dug wells	Dug/ Bore wells	Springs

Table A-12: Water Quality Status: Physio-Chemical and Bacteriological Parameters

District	Source	No. of samples not complying with prescribed standards								Bacteriological (Annual Range in MPN/100 ml)	
		Fluoride	Arsenic	TDS	Nitrate	COD	pH	DO	BOD	T.C	F.C

Table A-13 Water Quality Status: Heavy Metals and Pesticides: Annual Range

District	Source	No. of samples not complying with prescribed standards										Pesticides (mg/l)	
		As	Cd	Cu	Pb	Cr	Ni	Zn	Hg	Fe	CN	OCP	OPP

Table B: WATER QUALITY MONITORING: AT CONSUMPTION END

Table B-1: Water Quality Monitoring– through samples

District	sampling in the CY/ Previous Year							
	Residential	Educational	Hospital	Hostels	Restaurants/ Hospitality	Offices	Pvt. Office	Industry
Numbers								
No. of samples								
% of Sampling								

Table B-2: Water Quality Monitoring of surface water sources

District	Number of Schemes based on the Surface water sources	Raw water, source and intake point testing – Number of Schemes Tested as per CPHEEO	Filtered water - Number of Schemes Tested as per	Clear water storage reservoirs - Schemes Tested as per CPHEEO	Distribution system - Schemes Tested as per	Total number of sources tested as per all parameters and meeting BIS

				CPHEEO				CPHEEO		standards	
		Number	%	Number	%	Number	%	Number	%	Number	%

Table B-2: Water Quality Monitoring of Ground water sources

District	Number of Schemes based on the Ground water sources	Number Bore wells Hand pumps	Number of Schemes based on the Ground water sources tested as per protocol		Number Bore wells Hand pumps	
			Number	%	Number	%

Table B-3: Water Quality Monitoring of all water sources at supply end

District	Number of Schemes based on the Surface water sources	Number of Schemes based on the Ground water sources	Number Bore wells Hand pumps	Number of Schemes based on the surface water sources tested as per protocol and meeting BIS Standards		Number of Schemes based on the Ground water sources tested as per protocol and meeting BIS Standards		Number Bore wells Hand pumps tested as per protocol and meeting BIS Standards	
				Number	%	Number	%	Number	%

Table B-4: Water Quality Status: Physio-Chemical and Bacteriological Parameters

State/ District	Source	No. of Habitations			No. of samples not complying with prescribed standards								Bacteriological (Annual Range in MPN/100 ml)	
		Rural	Urban	Total	Fluoride		TDS	Nitrate	COD	pH	DO	BOD	T.C	F.C

Table B-5: Water Quality Status: Heavy Metals and Pesticides: Annual Range

District	No. of habitations			No. of samples not complying with prescribed standards										Pesticides (mg/l)	
	Rural	Urban	Total	As	Cd	Cu	Pb	Cr	Ni	Zn	Hg	Fe	CN	OCP	OPP

Table C: Budget for Water Quality Monitoring

District	No. of Habitations			Budget for Monitoring of River	Budget for Monitoring of Wetland	Budget for Monitoring of Canals	Budget for Monitoring of Groundwater
	Rural	Urban	Total				

Table D: Water Quality Criterion & BIS Drinking Water Quality Standards

District	No. of habitations			Water source	Name of Water source	Standards						
	Rural	Urban	Total			pH	DO	BOD	T.C	F.C	Heavy metals and pesticides observed/detected	Compliance

Table E: Number of surface water quality monitoring Stations meeting the prescribed norms.

District	Surface Water Source	Number of Stations required as per norm	Number of Stations in operation	Number of working Stations meeting the prescribed norms	Percentage of Stations meeting the norms (Number of Stations meeting the prescribed norms/ Number of Stations) ×100

Table F: Number of Groundwater quality monitoring Stations meeting the prescribed norms.

District	GW	Number of Stations required as per norm	Number of Stations in operation	Number of working Stations meeting the prescribed norms	Percentage of Stations meeting the norms (Number of Stations meeting the prescribed norms/ Number of Stations) ×100

Table G: BENCH MARKING

Table 1: Water Quality criterion for RIVERS / SURFACE WATER SOURCES for Designated Best use:

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	**A**	Total Coliforms Organism MPN/100ml shall be 50 or less pH between 6.5 and 8.5 Dissolved Oxygen 6mg/l or more Biochemical Oxygen Demand 5 days 20°C 2mg/l or less
Outdoor bathing (Organised)	**B**	Total Coliforms Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Drinking water source after conventional treatment and disinfection	**C**	Total Coliforms Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/l or more Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Propagation of Wild life and Fisheries	**D**	pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	**E**	pH between 6.0 to 8.5 Electrical Conductivity at 25°C micro mhos/cm Max.2250 Sodium absorption Ratio Max. 26 Boron Max. 2mg/l
	Below-E	**Not Meeting A, B, C, D & E Criteria**

Table 2: DRINKING WATER quality standards BIS:

Indian Standard Drinking Water Specification (Second revision) IS 10500:2012

Table 2.1 Organoleptic and Physical Parameters (Foreword and Clause 4)

Sl. No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to Part of IS 3025	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Colour, Hazen units, Max	5	15	Part 4	Extended to 15 only, if toxic substances are not suspected in absence of alternate sources
ii)	Odour	Agreeable	Agreeable	Part 5	a) Test cold and when heated b) Test at several dilutions
iii)	pH Value	6.5-8.5	No relaxation Agreeable	Part 11	-
iv)	Taste	Agreeable	Agreeable	Parts 7 and 8	Test to be conducted only after safety has been established
v)	Turbidity, NTU, Max	1	5	Part 10	-
vi)	Total Dissolved Solids, mg/l/ Max	500	2000	Part 16	-

NOTE – It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in absence of an alternate source but up to the limits indicated under permissible limit in the absence of alternate source in Col. 4 above which the sources will be liable to be rejected.

IS 10500: 2012

Table 2.2 General Parameters Concerning Substances undesirable in Excessive Amounts (Foreword and Clause 4)					
Sl. No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to Part of IS 3025	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Aluminium (as Al), mg/l, Max	0.03	0.2	IS 3025 (Part 55)	-
ii)	Ammonia (as Total ammonia-N), mg/l, Max	0.5	No relaxation	IS 3025 (Part 34)	-
Iii)	Anionic detergents (as MBAS), mg/l, Max	0.2	1.0	Annex K of IS 13428	-
iv)	Barium (as Ba), mg/l, Max	0.7	No relaxation	Annex F of IS 13428* or IS 15302	-
v)	Boron (as B), mg/l, Max	0.5	1.0	IS 3025 (Part 57)	-
vi)	Calcium (as Ca) mg/l, Max	75	200	IS 3025 (Part 40)	-
vii)	Chloramines (as Cl_2), mg/l, Max	4.0	No relaxation	IS 3025 (Part 26)* or APHA 4500-Cl G	-
viii)	Chloride (as Cl), mg/l, Max	250	1000	IS 3025 (Part 32)	-
ix)	Copper (as Cu), mg/l, Max	0.05	1.5	IS 3025 (Part 42)	-
x)	Fluoride (as F), mg/l, Max	1.0	1.5	IS 3025 (Part 60)	-
xi)	Free Residual Chlorine, mg/l, Min	0.2	1	IS 3025 (Part 26)	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be minimum 0.5 mg/l
xii)	Iron (as Fe), mg/l, Max	0.3	No relaxation	IS 3025 (Part 53)	Total concentration of Manganese (as Mn)and iron (as Fe) shall not exceed 0.3 mg/l
xiii)	Magnesium (as Mg), mg/l, Max	30	100	IS 3025 (Part 46)	-
xiv)	Manganese (as Mn), mg/l, Max	0.1	0.3	IS 3025 (Part 59)	Total concentration of Manganese (as Mn)and iron (as Fe) shall not exceed 0.3 mg/l
xv)	Mineral oil, mg/l, Max	0.5	No relaxation	Clause 6 of IS 3025 (Part 39)Infrared	-
xvi)	Nitrate (as NO_3), mg/l, Max	45	No relaxation	IS 3025 (Part 34)	-
xvii)	Phenolic compounds (as C_6H_5OH), mg/l, Max	0.001	0.002	IS 3025 (Part 43)	-
xviii)	Selenium (as Se), mg/l, Max	0.01	No relaxation	IS 3025 (Part 56)or IS 15303*	-

xix)	Silver (as Ag), mg/l, Max	0.1	No relaxation	Annex J of IS 13428	-
xx)	Sulphate (as SO_4), mg/l, Max	200	400	IS 3025 (Part 24)	May be extended to 400 provided that Magnesium does not exceed 30
xxi)	Sulphide (as H_2S), mg/l, Max	0.05	No relaxation	IS 3025 (Part 29)	-
xxii)	Total Alkalinity as calcium carbonate, mg/l, Max	200	600	IS 3025 (Part 23)	-
xxiii)	Total Hardness as $CaCO_3$, mg/l, Max	200	600	IS 3025 (Part 21)	-
xxiv)	Zinc (as Zn), mg/l, Max	5	15	IS 3025 (Part 49)	-

NOTES

1 In case of dispute, the method indicated '*' shall be referee method

2 It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in Col 4. above which the source will have to be rejected.

IS 10500: 2012

Table 2.3 General Parameters Concerning Toxic Substances (Foreword and Clause 4)

Sl. No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to Part of IS 3025	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Cadmium (as Cd), mg/l, Max	0.003	No relaxation	IS 3025 (Part 41)	-
ii)	Cyanide (as CN), mg/l, Max	0.05	No relaxation	IS 3025 (Part 27)	-
iii)	Lead (as Pb), mg/l, Max	0.01	No relaxation	IS 3025 (Part 47)	-
iv)	Mercury (as Hg), mg/l, Max	0.001	No relaxation	IS 3025 (Part 48)/ Mercury analyser	-
v)	Molybdenum(as Mo), mg/l, Max	0.07	No relaxation	IS 3025 (Part 2)	-
vi)	Nickel (as Ni), mg/l, Max	0.02	No relaxation	IS 3025 (Part 54)	-
vii)	Pesticides, µg/l, Max	See Table 5	No relaxation	See Table 5	-
viii)	Polychlorinated biphenyls, mg/l, Max	0.0005	No relaxation	ASTM 5175*	Or APHA 6630
ix)	Polynuclear aromatic hydrocarbons (as PAH), mg/l, Max	0.0001	No relaxation	Or APHA 6440	-
x)	Total arsenic (as As), mg/l, Max	0.01	0.05	IS 3025 (Part 37)	-
xi)	Total Chromium (as Cr), mg/l, Max	0.05	No relaxation	IS 3025 (Part 52)	-
xii)	Trihalomethanes: a) Bromoform, mg/l, Max	0.1	No relaxation	ASTM D 3973-85* or APHA 6232	-

	b) Dibromocholormethane, mg/l, Max	0.1	No relaxation	ASTM D 3973-85* or APHA 6232	-
	c) Bromodichloromethane, mg/l, Max	0.06	No relaxation	ASTM D 3973-85* or APHA 6232	-
	d)Chloroform, mg/l, Max	0.2	No relaxation	ASTM D 3973-85* or APHA 6232	-

NOTES

1 In case of dispute, the method indicated '*' shall be referee method

2 It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in Col 4. above which the source will have to be rejected.

Table 3: Criteria for selection of Monitoring Stations

A. Rivers

- Water intake point for community water supply in city/town.
- Presence of large/medium or cluster of small water polluting industries.
- Upstream and Downstream of an industrial park
- Places of religious bathing (organized).
- Source of river to get indication of its pristine quality.
- Filling up long unrepresented gaps between existing monitoring stations.
- Large section of irrigated area upstream.
- Flow rate / discharge being critical in lean period.
- Downstream of big cities.
- Confluence of tributaries and Main River.
- Inter State boundaries

B. Lake / Reservoir / Pond / Tank

- Water abstraction point
- Organized bathing
- In the vicinity of significant out fall
- Recreational spots

C. Canal

- Irrigation off-take
- Upstream and Downstream of pollution outfall
- Drinking water intake point

D. Ground Water

- Drinking water sources located in sanitary conditions and prone to sewage contamination, preferably in shallow aquifer, deep aquifer in hard rock geology, the vicinity of soak pits, septic tanks, sewage treatment plant, oxidation pond, cess pools, garbage dump site etc.
- Tube-wells, hand pumps or dug-wells located in industrial areas and prone to contamination and are in use.

Chapter 5
Water Sustainable & Efficient technologies and Best Practices

1. Technologies:
    a. Agriculture:
    b. Water Resource Management, Industry and Drinking Water
        i. Department of Science and Technology and Department of Scientific and Industrial Research Nodal officers shall share the required details to all State / UT Nodal officers directly.

2. Best practices: All the States/ UTs are requested to provide a brief of best practices related to each of chapter/sub-chapter in 200 words with provide we blink for more details.

Annexure

Sector: Farming: Agriculture/ Horticulture/Plantations/ Livestock/ Fisheries/ Others

Salient water management interventions for enhancing crop and water productivity:

- Micro level water resource development through tank cum well system.
- Rainwater conservation through increased dyke height
- Sub-surface water harvesting structure for coastal areas
- Use of rubber dams for rainwater harvesting in watersheds
- Residual soil moisture utilization during rabi season
- Lining of runoff recycling tanks for seepage control
- Rainwater conservation for rice-fish integrated system
- Crop diversification in drought prone areas in rainfed upland
- Residual soil moisture utilization with conservation tillage in rice fallow in rabi season under shallow water table
- Residual soil moisture utilization in rabi season with utera/paira cropping
- Mulching for better water management
- Low cost management of acid soils for higher productivity and water use efficiency
- Water and energy efficient integrated farming system for rainfed farmers
- Rainwater harvesting through check dam and its multiple use
- Spring water collection and its utilization to grow high value crops
- CAM plants for enhancing water use efficiencies in the rainfed ecosystem
- Simulation model for integrating water balance of cropped area and tank as runoff recycling management of rain water
- Multi-criteria analysis for sustainable land use planning of watershed using remote sensing and GIS
- Raised and sunken bed technology for improved productivity in canal command
- Pressurized irrigation system in surface flow based minor irrigation system commands
- Wet seeded rice in spot sowing: a water saving rice cultivation technology
- Integrated system of rice intensification (SRI)
- Improved planting technique for saving of irrigation water in post-rainy season crops
- Micro tube wells in coastal areas having saline groundwater below 10 m
- Water quality index: tool to assess water quality for irrigation
- Drainage water management in medium and lowlands.
- Optimum crop growth stage for drainage in rice
- Biological drainage for reclamation of waterlogged lands in high rainfall areas
- Over aged rice seedlings cultivation for waterlogged areas.
- Fitting medicinal plants in rice based cropping system in post rainy season in waterlogged areas
- Pond based farming system for deep waterlogged areas
- Enhancing productivity of seasonal deep waterlogged areas
- Integrated water chestnut cultivation and aquaculture technology
- Cat tail (Typha) production technology for waterlogged areas
- Crop management interventions in post flood scenario
- Swamp taro: a promising vegetable crop in waterlogged condition

References:

Roy Chowdhury S., Rautaray, S.K., Panda, R.K., Das, M., Srivastava, R.C. and Ambast, S.K. 2016. Technological Options for Agricultural Water Management in Eastern Region of India. ICAR-Indian Institute of Water Management, Bhubaneswar. P. 39

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Chapter 6

Water Resources: Governance and Management

Objective: To critically review the existing statute and governance structures and to come up with the best possible - effective and efficient governance structures with convergence and synergy at State, District and Sub-District across the all Government institutions for ensuring water security, safety and sustainability.

Outcomes:

1. Designating one State Department as responsible for enabling, coordinating and supervising all aspects- supply side, demand side and quality dimension / components of Water / Water Cycle in the State and responsibility to formulate annual State/ UT Water Budgets.
2. To create common understanding both on various dimensions of Water and the growing alarming concerns; and to give a direction for collective leadership.
3. To fix responsibility and accountability to each of the stakeholder department and institutions/ organizations and evolve Performance Indicators for regular monitoring.
4. Suggest institutional structures at State and District level for convergence and synergy across the Departments.
5. To build expertise across all aspects- supply side, demand side and quality dimension / components of Water / Water Cycle in the State and on annual State/ UT Water Budgets.
6. To in built knowledge management in collaboration with Scientific/academic/research and peoples knowledge institutions.
7. Mass communication on Water Budget to elicit responsible and behavioral change.
8. To build online Water resources information management and provide services for the benefit of all departments, public and stakeholders and its convergence with India WRIS

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1. STATUTE
    a. Constitutional provisions, Water related Acts & Laws
    b. State Water Policy and Regulations etc.
    c. Water regulation
    d. Water tariff structures/ Water pricing in domestic, industrial and irrigation sector.
    e. Institutions on Water Governance- Departments, HODs, Authorities, Boards etc.
    f. Interstate/trans-boundary/Basin agreements
    g. Statute on partnership with stakeholders- WUA, and Private Sector
    h. MOUs and Inter-State Agreements if any

2. WATER RESOURCES MANAGEMENT INSTITUTIONS

    a. Role & Responsibilities of various Government Departments responsible for the development water resources, allocation of water among various sectors, responsible for efficient utilization of water in different sectors.
    b. Existing Institutional / Manpower Structure of various Departments related to Water in Government sector
        1. At State Level
        2. At Division Level
        3. At District Level
        4. At Municipal Corporation level
        5. At Sub-division level
        6. At Block level
        7. At GP/ Urban body level
    c. Existing resources in Non-Government sector
    d. Existing and potential opportunities for peoples participation
    e. Existing and potential opportunities for private sector participation
    f. Convergence and Synergetic management
    g. Disaster Management and Water

3. MONITORING AND EVALUATION
    1. Review the existing monitoring and evaluation systems for each of Water Cycle components and responsible agencies.
    2. To suggest the best possible -effective and efficient governance structures with convergence and synergy at State, District and Sub-District level cutting across all Government institutions for ensuring water security, safety and sustainability

4. ROAD MAP OF ACTIVITIES / tasks proposed for Water Security, Safety and Sustainability

4.3 better governance
4.4 better source / supply management
4.5 better demand management /improved Water Use Efficiency
4.6 Water Quality
4.7 Water Economics and Financing
4.8 Sustainable Water budgeting with timelines and agencies responsible for each task/activity.

Chapter 7
Water Financing and Economics

1 Objectives and Expected Outcomes

The objective of the Chapter in the context of SSAP & State Water Budget are: 1] to help governments -ensure adequate financing is available to effectively manage water resources and water related services, covering all components of the water cycle; 2] to ensure coherence and consistency amongst various policies that affects water resources, so that the outcomes of those policies do not work against each other; and, 3] to maximize value generated from water sector investment.

Following are the expected outcomes of the Chapter:

1. To calculate the scale of investment for managing water resources on annual basis and cumulative basis, and to link it with it with results to build accountability.
2. To derive unit cost of supply of water in various sectors and evaluate the benefit and costs for major water sector investments.
3. To assess the economic value of water in major sectors.

2 Background/ Rationale

Since Independence, India had made several billions of rupees worth of investments in the water sector to achieve the goal of social advancement, economic growth and environmental management. We need to understand the scale of investments for managing water resources and water related services in various sectors, for both capital expenditure and operation and maintenance, and analyse the historical trends to see the magnitude of future investments required and to ascertain the need for financial prudence in the sector. We also need to assess the value of the socio-economic outputs generated from the use of water against the investments to see how far these investments were viable. Large scale investments are made for public (canal) irrigation and heavy subsidies are provided for electricity supplied to the farm sector. There is a need to give attention to assess the cost and economic value of water being used in various sectors both for awareness for responsible use, accountability and cost recovery for ensuring water security, safety and sustainability.

3 Financing of Water

Here we will have to consider the public financing of water infrastructure and private financing of the same. Here also, we can have 5-6 broad categories, viz., irrigation and flood control, water supply infrastructure; hydropower; urban drainage infrastructure; sewerage systems, and wastewater treatment system; infrastructure for water harvesting and artificial recharge; and watershed development. In irrigation, we can have two categories, public investments in surface irrigation (canal, lift and tanks); and both public and private investments in well irrigation. In the case of failed wells (there are millions of them), all the money invested for drilling wells can be considered including the sunk costs. In addition, investments are also being made for resource survey, investigation, monitoring and resource evaluation and planning. We need to get a clear picture of these investments.

4 Cost of Production and Supply of Water

In the wake of the fact that with growing scarcity of water, investments in irrigation and water supply are becoming prohibitively high, we need to look at the cost of production and supply of water in various sectors and water resource management works to see whether these investments are cost effective, given the range of options available for meeting the water needs. Unlike in the case of financing, this will include all costs, capital expenditure, and operation and maintenance costs (including private investment in cash and kind), and should consider the life of the system or the treatment work. Here the categorization can be: 1] cost per ha of irrigation; 2] per kl of water supply (municipal and rural); 3] per capita cost of storm water drainage; 4] cost per Kl of wastewater treated; and, 5] cost per ha of watershed treated, depending on the type of sector being serviced.

In the case of private well irrigation, along with private capital expenditure (fixed cost) and O & M expenditure (variable cost), the government subsidy towards energy/fuels used for groundwater pumping (electricity and diesel) should be accounted for. Since the life of groundwater wells vary significantly across geological settings, it is important that we consider wells in different geological settings (hard rock areas, with high incidence of well failures; shallow alluvial areas; and deep alluvial areas).

In any case, the most advanced concept it to look at the life cycle cost of the system, whether it is irrigation or water supply. It is important to consider all the costs incurred (capital and O & M) during the life of the system, and discount it for the zeroth year.

Informal water markets have come up in both water scarce and surplus areas even in canal command areas at fast rate in the recent decades. Hence, there are millions of farmers in both water-scarce and water rich regions of India who purchase water from well owners. For them, the price at which water is purchased from the well owners is what matters when it comes to cost of irrigation and NOT the cost of production of water per se.

In the case of public systems, we can consider administrative costs (staff salaries and travel) and costs of repair and maintenance (annual), over and above the capital cost of the infrastructure and equipment.

It has been noticed that the cost of irrigation water (per ha or per cubic metre) in the case of large public systems varies widely across agro-ecologies. In the water scarce regions, the cost per unit volume or area is much higher than that in water-rich areas. Also, the unit costs are very high for some of the new irrigation projects. These factors need to be kept in mind. We also need to know how the economics of irrigation changes with size of the scheme from major to medium to minor.

5 Economics of Water

Determining the value of the resource in its various uses is important in investment decision making. In the case of uses that produce marketable surplus, the valuation can be rather straight forward. Say for instance, in irrigated production, irrigation water is used to increase the amount of crop yield. In such cases, the surplus value product from the use of irrigation water (per cubic metre) can be treated as the value of the water used. This is the difference between the incremental net benefit from irrigated production minus the full cost of water divided by the volume of water consumed for production (Rs./m^3 of water). Hence there can be economic value of water in crop production, and this can vary across crops. In the case of water used in industries, the procedure is somewhat easy, as there cannot be production without water.

An alternative in the case of agriculture is to look at the incremental net benefit from the use of irrigation water per ha of crop production and compare it against the cost of irrigation water per ha to arrive at the benefit cost ratio, using the life of the system and the discount rate. It is understood that while estimating the incremental net benefit, the cost of water is NOT to be considered.

In both the cases, it is important that we consider the entire farming system, rather than individual crops, as farmers grow multiple crops (even in the same season), and the net return from crop production as well as the incremental return from irrigated crop production would keep changing from crop to crop. For certain crops, grown in certain seasons, irrigation might be critical to realize the potential yield, whereas for some other crops, the marginal return from irrigation may not be very significant. In the former case, the value of irrigation water would turn out to be much higher than that of the latter.

In the case of use of water for domestic supply as a social good (like in municipal water supply and rural drinking), since the value of the water for supporting life systems cannot be monetized, the method of valuation involves looking at the cost of producing and supplying the same amount of water with the same quality through alternative means. Hence, we compare the cost of alternatives with the actual cost of production and supply of water and decide whether a certain scheme is cost effective/beneficial or not. It is quite possible that in certain situations, the cost of production is negligible (like taking water from a lake for meeting domestic water needs).

Similarly, the value of water as an environmental good (say for instance wetlands/lakes used for recreational purpose) can also be determined by various tools in ecological economics (travel cost method, hedonic pricing, contingent valuation, etc).

1. **Financing of Water** (Annexure) including the historical trend of financing of various water projects in the resource sectors and water related service sectors.

   2.1 Water Resources
   2.1.1 Precipitation
   2.1.2 Glaciers
   2.1.3 Springs
   2.1.4 River Basins
   2.1.5 Irrigation and Multi-Purpose Projects
   2.1.6 Wetlands
   2.1.7 Ponds/Tanks
   2.1.8 Coastal areas
   2.1.9 Groundwater
   2.1.10 Wastewater
   2.2 Water Demand Sectors
   2.2.1 Environment
   2.2.2 Farm Sector: crops and livestock production
   2.2.3 Industrial Supply
   2.2.4 Urban and Rural Water Supply
   2.2.5 Sustainable and Efficient Technologies

2. **Economics of Water**
   3.1 <u>Cost and Production and Supply of Water</u>: includes all costs, capital expenditure, and operation and maintenance costs (including private investment in cash and kind), and should consider the life of the system or the treatment works
   3.1.1 Cost and performance of Well Irrigation Systems
   3.1.2 Cost and Performance of Surface Water Projects
   3.1.3 Cost and Performance of Rural Water Supply Project (based on reservoirs)
   3.1.4 Cost and Performance of Rural Water Supply Project (based on river lift)'
   3.1.5 Cost and Performance of Rural Water Supply Project (based on wells/bore wells/tube wells)
   3.1.6 Cost and Performance of Urban Water Supply Projects
   3.1.7 Cost and Performance of Wastewater Treatment Systems
   3.1.8 Cost and Performance of Watershed Management Projects
   3.2 <u>Economic Evaluation of Water Projects</u>: Determining the value of the direct economic and social benefits generated from the use of water in different sectors, viz., irrigated agriculture including dairy farming, industrial production, and domestic water supply.
   3.2.1 Economic evaluation of irrigation projects (major, medium, minor and multi-purpose projects)
   3.2.2 Economics of Industrial Water Supply
   3.2.3 Economics of Water Supply Schemes
   3.2.4 Economics of Micro Irrigation Systems

4. **Economic Valuation of Water Use in Farming**: to determine the use value of irrigation water in the major water use sector i.e., agriculture (crops and dairy farming), by assessing the surplus value product from the use of water in crop production and dairy farming, per unit volume of water

I Water Financing: Summary Tables

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of the Water Resource/Demand Sector	Name of Scheme	Nature of Scheme (Central/ State)	Project Authority	Category of Financing $	Funding Scheme	Previous Financial Year (April 01 to March 31)								
							Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
							Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Precipitation														
2	Glaciers														
3	Spring														
4	Basin														
5	Irrigation/ Multi-Purpose														
6	Wetlands														
7	Ponds/Tanks														
8	Coastal Area														
9	Groundwater														
10	Wastewater														
11	Others														
12	Environment														
13	Farm Sector														
14	Industrial Supply														
15	Urban and Rural Water Supply														

16	Sustainable and Efficient Technologies														
17															

Current Financial Year (June 01 to May 31)								
Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
17	18	19	20	21	22	23	24	25

$ Capital/O & M/Infrastructure/ R & D/Capacity Building. In the case of more than one category of financing, new rows may be created

Table 2: Historical Trends in Investment/Financing

Plan Period	Names of Schemes	Total Financial Allocation** (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement	Share in Finance		
		Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D			State	Central	Other
1	3	5	6	7	8	9	10	11	12	13	13			
I Five Year Plan														
II Five year plan														
III Plan														
IV Plan														
V Five Year Plan														
VI Five Year Plan														
VII Plan														
VIII Plan														
IX Plan														
X Plan														
XI Plan														
XII Plan														

- Put tick mark whichever category is applicable

**** <u>The total financial allocation should consider allocation to all the water resource and demand sectors</u>**

I Water Financing (Chapter-wise templates)

1 Precipitation Concerned Department: IMD and the state government agencies

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year								
						Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
						Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1														
2														

Current Financial Year								
Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
16	17	18	19	20	21	22	23	24

The financial allocation can be for procuring and setting up rain gauges, hiring staff for taking readings from rain-gauges, etc.

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement
				Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3		4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan													
II Five year plan													
III Plan													
IV Plan													
V Five Year Plan													
VI Five Year Plan													
VII Plan													
VIII Plan													
IX Plan													

2 **Glaciers** Concerned Department: IMD and the state government depts.

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year								
						Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
						Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1														
2														

Current Financial Year								
Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
16	17	18	19	20	21	22	23	24

Note: The financial allocation can be for procuring and setting up instruments for glacier monitoring, hiring staff for taking readings of glaciers

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement
				Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3		4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan													
II Five year plan													
III Plan													
IV Plan													
V Five Year Plan													
VI Five Year Plan													
VII Plan													
VIII Plan													
IX Plan													

3 Springs

Concerned Department: Central Water Commission

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year								
						Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
						Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	
1														
2														

Current Financial Year								
Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
15	16	17	18	19	20	21	22	

Note: The financial allocation can be for procuring and setting up instruments for measuring spring discharge, hiring staff for measuring discharge of springs

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement
				Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3		4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan													
II Five year plan													
III Plan													
IV Plan													
V Five Year Plan													
VI Five Year Plan													
VII Plan													
VIII Plan													
IX Plan													

4 River Basins

Concerned Departments: Central Water Commission & State Water Resources Department

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year								
						Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
						Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1														
2														

Current Financial Year								
Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
16	17	18	19	20	21	22	23	24

Note: The financial allocation can be for procuring and setting up stations for river gauging, measuring sediment transport, rain gauging, and measuring river water quality and hiring staff for taking the gauge readings and for doing river basin planning

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement
				Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3		4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan													
II Five year plan													
III Plan													
IV Plan													
V Five Year Plan													
VI Five Year Plan													
VII Plan													
VIII Plan													
IX Plan													

5 Projects: Irrigation/Multi-purpose Projects

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Type of Scheme #	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year								
							Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue G
							Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
1	2		3	4	5	6	7	8	9	10	11	12	13	14	15
1															
2															
3															
4															

Current Financial Year								
Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
16	17	18	19	20	21	22	23	24

Note: The financial allocation can be for building the head-works for the multipurpose projects, including dams, hydropower stations, spill ways and gates.

Type of scheme includes multi-purpose scheme and irrigation scheme

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Type of Scheme #	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement @
					Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3			4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan														
II Five year plan														
III Plan														
IV Plan														
V Five Year Plan														
VI Five Year Plan														
VII Plan														
VIII Plan														
IX Plan														

Type of scheme includes multi-purpose schemes and irrigation schemes

@ The physical target achievement in the case of multipurpose schemes should indicate the total volume of water that can be stored and effectively diverted, the total installed capacity of the hydropower stations, and the flood control potential in terms of area that can be protected.

6 Wetlands

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year								
						Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
						Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1														
2														
3														
4														
5														

Current Financial Year								
Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
16	17	18	19	20	21	22	23	24

Note: The financial allocation can be for procuring and setting up stations for water quality monitoring, building the engineering infrastructure for protection of wetland (excluding the investment for WWT plants) and training of staff for surveillance aimed at protection of wetland from pollution and contamination

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement @
				Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3		4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan													
II Five year plan													
III Plan													
IV Plan													
V Five Year Plan													
VI Five Year Plan													
VII Plan													
VIII Plan													
IX Plan													

@ The physical target achievement in the case of wetland will be in terms of areas of wetlands restored, conserved, etc

7 Ponds and Tanks

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year								
						Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
						Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1														
2														
3														
4														
5														

Current Financial Year								
Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
16	17	18	19	20	21	22	23	24

Note: The financial allocation can be for rejuvenation of tanks and ponds, including that for civil works and capacity building of local institutions for tank management

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement @
				Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3		4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan													
II Five year plan													
III Plan													
IV Plan													
V Five Year Plan													
VI Five Year Plan													
VII Plan													
VIII Plan													
IX Plan													

@ The physical target achievement in the case of areas of no. of **tanks/ponds** de-silted, repaired or rehabilitated and the additional storage capacity created

8 Coastal Belt:

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year							
						Central		State		Other Sources		Total Allocation	Total Expenditure
						Allocation	Exp.	Allocation	Exp.	Allocation	Exp.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1													
2													
3													
4													
5													

Current Financial Year							
Central		State		Other Sources		Total Allocation	Total Expenditure
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.		
15	16	17	18	19	20	21	22

Note: The financial allocation can be for coastal area protection works for erosion control; setting up of marine water quality monitoring, construction of seawater ingress prevention structures (tidal regulators), etc. along the coast

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement @
				Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3		4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan													
II Five year plan													
III Plan													
IV Plan													
V Five Year Plan													
VI Five Year Plan													
VII Plan													
VIII Plan													
IX Plan													

@ The physical target achievement in the case of areas of coastal areas should include area and length of protection works against coastal erosion, coastal zone surge monitoring; number of water quality monitoring stations set up; and number or tidal regulators built

9 Groundwater Resources

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year								
						Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
						Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1														
2														
3														
4														
5														

Current Financial Year								
Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
16	17	18	19	20	21	22	23	24

Note: The financial allocation can be for procuring and setting up groundwater observation stations for groundwater level and groundwater quality monitoring; groundwater survey and investigation and construction of artificial recharge structures

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement @
				Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3		4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan													
II Five year plan													
III Plan													
IV Plan													
V Five Year Plan													
VI Five Year Plan													
VII Plan													
VIII Plan													
IX Plan													

@ The physical target achievement in the case of areas of groundwater resources include number of observation wells established; number of artificial recharge schemes executed; and new groundwater survey and geo-hydrological investigation carried out via-a-vis the area covered

10 Wastewater

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year								
						Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
						Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1														
2														
3														
4														
5														

Current Financial Year								
Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
16	17	18	19	20	21	22	23	24

Note: The financial allocation can be for: collection and disposal of wastewater through sewerage systems from rural and urban areas; monitoring of wastewater quality; and design and setting up and running of wastewater treatment plants in rural and urban areas

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement @
				Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3		4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan													
II Five year plan													
III Plan													
IV Plan													
V Five Year Plan													
VI Five Year Plan													
VII Plan													
VIII Plan													
IX Plan													

@ The physical target achievement in the case of wastewater treatment include: the area and population covered by sewerage system, length of sewerage system, number of observation stations for wastewater quality monitoring; number of wastewater treatment plants and their total treatment capacity

Demand Side

1 Environment and Forests

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year							
						Central		State		Other Sources		Total Allocation	Total Expenditure
						Allocation	Exp.	Allocation	Exp.	Allocation	Exp.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1													
2													
3													
4													
5													

Current Financial Year							
Central		State		Other Sources		Total Allocation	Total Expenditure
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.		
15	16	17	18	19	20	21	22

Note: The financial allocation can be for setting up water quality monitoring of aquatic ecosystems such as rivers, lakes, ponds and tanks and groundwater for pollution monitoring; (compensatory) afforestation and its maintenance and protection; engineering interventions for cleaning of rivers and lakes (other than that already included under wastewater)

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement @
				Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3		4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan													
II Five year plan													
III Plan													
IV Plan													
V Five Year Plan													
VI Five Year Plan													
VII Plan													
VIII Plan													
IX Plan													

@ The physical target achievement in the case of environment shall include: number of water quality monitoring stations established for rivers, lakes and ponds and groundwater; area of compensatory afforestation made and number of trees raised; the length of river stretch, and total area of lakes cleaned up, etc.

2 A Rainfed Agriculture:

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year							
						Central		State		Other Sources		Total Allocation	Total Expenditure
						Allocation	Exp.	Allocation	Exp.	Allocation	Exp.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1													
2													
3													
4													
5													

Current Financial Year							
Central		State		Other Sources		Total Allocation	Total Expenditure
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.		
15	16	17	18	19	20	21	22

Note: The financial allocation can be for planning and implementing watershed development activities in rainfed areas (afforestation, construction of gully plugs and small check dams, and moisture conservation work)

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement @
				Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3		4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan													
II Five year plan													
III Plan													
IV Plan													
V Five Year Plan													
VI Five Year Plan													
VII Plan													
VIII Plan													
IX Plan													

@ The physical target achievement in the case of environment shall include: number of water quality monitoring stations established for rivers, lakes and ponds and groundwater; area of compensatory afforestation made and number of trees raised; the length of river stretch, and total area of lakes cleaned up, etc.

2B Irrigated Agriculture

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Name of the Scheme	Type of Irrigation Scheme #	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year								
							Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
							Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	**16**
1															
2															
3															
4															
5															

Current Financial Year								
Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
17	18	19	20	21	22	23	24	25

Note: The financial allocation can be for planning, design and construction of water distribution system for irrigation; operation and maintenance of the irrigation infrastructure (other than the head works); and capacity building of farmer organizations and dept. officials

Whether major, medium or minor irrigation

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Type of Scheme #	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement @
					Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3			4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan														
II Five year plan														
III Plan														
IV Plan														
V Five Year Plan														
VI Five Year Plan														
VII Plan														
VIII Plan														

@ The physical target achievement in the case of irrigated agriculture shall include: total area covered by the scheme over the entire year

Whether major, medium or minor irrigation

3 Industrial Water Supply

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year								
						Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
						Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	**15**
1														
2														
3														
4														
5														

Current Financial Year								
Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
16	17	18	19	20	21	22	23	24

Note: The financial allocation can be for planning, design and construction of water sources, setting up of water treatment and distribution system for industrial water supply

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement @
				Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3		4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan													
II Five year plan													
III Plan													
IV Plan													
V Five Year Plan													
VI Five Year Plan													
VII Plan													
VIII Plan													
IX Plan													

@ The physical target achievement in the case of industrial water use shall include: number of industrial areas covered and the total amount of water supplied by the agency per annum.

4 Water Supply for Urban Municipal Uses (Establishments and Domestic Use)

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year								
						Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
						Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	**15**
1														
2														
3														
4														
5														

Current Financial Year								
Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
16	17	18	19	20	21	22	23	24

Note: The financial allocation can be for planning, design and construction of water sources, setting up of treatment plants and distribution system for water supply to urban residential areas and establishments, and operation and maintenance and maintenance of the water supply system

$ Capital/O & M/Infrastructure/ R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement @
				Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3		4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan													
II Five year plan													
III Plan													
IV Plan													
V Five Year Plan													
VI Five Year Plan													
VII Plan													
VIII Plan													
IX Plan													

@ The physical target achievement in the case of urban water supply shall include: number of total urban population covered and the total amount of water supplied by the agency per annum.

3 Water Quality (already covered under environment and forests and Wastewater**)**

5 Sustainable and Efficient Technologies and Best Practices

Table 1: Financial Allocation and Expenditure (Current and previous year)

Sr. No	Name of Sector ++	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State)	Category of Financing $	Funding Scheme	Previous Financial Year								
							Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
							Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
1		2	3	4	5	6	7	8	9	10	11	12	13	14	**15**
1															
2															
3															
4															
5															

Current Financial Year								
Central		State		Other Sources		Total Allocation	Total Expenditure	Revenue Generation
Allocation	Exp.	Allocation	Exp.	Allocation	Exp.			
15	16	17	18	19	20	21	22	

Note: The financial allocation for this includes that as capital subsidies for drip and sprinkler irrigation systems, poly-house and net-house, poly tunnels, plastic mulching and land levelling; and amount of investment for research and development; and investment for capacity building of officials of water resources dept and agriculture dept., and farmer organizations; amount of investment for leakage reduction in water distribution systems of urban areas; capital subsidies for efficient water use technologies in urban areas; and capital subsidies for water-efficient manufacturing processes used in industrial areas

++ The sectors include agriculture/irrigation; urban municipal sector; rural domestic sector
$ Capital/ O & M/R & D/Capacity Building

Table 2: Historical Trends in Investment/Financing

Plan Period	Name of Dept.	Name of the Scheme	Nature of Scheme (Central/ State/ Others)	Total Financial Allocation (in lac rupees) under				Total Expenditure (in lac rupees) under				Financial target achievement	Physical target achievement @
				Capital	O& M	Capacity Building	R & D	Capital	O & M	Capacity Building	R & D		
1	3		4	5	6	7	8	9	10	11	12	13	13
I Five Year Plan													
II Five year plan													
III Plan													
IV Plan													
V Five Year Plan													
VI Five Year Plan													
VII Plan													
VIII Plan													
IX Plan													

@ The physical target achievement in this case should include: 1] area covered by drip irrigation, area covered by sprinkler irrigation and area under plastic mulching; 2] total area under technologies for control of production environment such as poly-house, net house and tunnels; 3] area under land levelling; 4] length of pipelines that are leak proofed; 5] number of water saving devices installed in urban dwellings and commercial establishments; 6] number of officials from water resources dept. and agriculture dept. and farmers trained; and, 7] total size of the industrial/thermal power units covered under water-efficient manufacturing processes.

II Economics of Water (Benefits and Costs)

Summary Table

Sr. No	Type of Project	Cost per Ha or KWhr or KL		Economics				
				Annualized Incremental Benefit	Annualized Capital Cost	Average annual O & M Cost	Total annualized Cost	B-C Ratio
1	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)= (5)/(8)
1	**Irrigation, Hydropower & Flood Control**							
1.1	Well Irrigation Scheme							
1.2	Surface Water Project							
1.2.1	Irrigation Project							
1.2.2	Major Irrigation							
1.2.3	Medium Irrigation							
1.2.4	Minor Irrigation							
1.2.5	Hydropower							
1.2.6	Flood Control							
2	**Water Supply**							
2.1	Rural Water Supply							
2.1.1	Reservoir based							
2.1.2	River Lifting							
2.1.3	Wells							
2.2	Urban Water Supply							
3	Wastewater Treatment							

4	Watershed Development(Rainfed)							
5	Micro irrigation technologies							

1 Cost and Performance of Well Irrigation System (Public Schemes)

Year of beginning construction: Year of completion:

Well Depth and Diameter:

Design Command Area (ha): Water Abstraction Device: Diesel/Electric Pump

Capacity of the Pump set: HP

Length of the Underground Distribution System (m): First year of irrigation service to the well command:

Name of the project	Annual capital investment in INR (lac), from the year of beginning construction		Annual Operation and Maintenance Cost $		Irrigation target achievement starting from the first year of water release		Well Deepening		If currently dysfunctional, mention the year	Annualized Cost per Ha of Irrigation (Rs)
	Year	Expenditure	Year	Expenditure	Year	Area (ha)	Year	Expenditure		
A Minor Groundwater Irrigation Scheme										

Note: 1) Note: For estimating annualized cost per KL of water, all capital costs have to be adjusted to the zeroth year. This is to be annualized using discounting technique and the average O & M cost per annum is to be added to this to obtain the annualized cost

2) It is assumed that the minor irrigation projects do not generate flood control benefits

$ Maintenance expenditure may be incurred even before operation began. Operation and maintenance expenditure includes salary paid to the operators, maintenance cost (pump sets, distribution system), cost of electricity/diesel used for running the pumps, etc.

2 Cost and Performance of a Surface Water Project

Year of Starting the Construction: Year of Completion: Design Command Area (ha)

Year of first release of water for irrigation: Year of starting hydropower generation:

Year of completion of dam with spillway gates: Year of first release of water for municipal/drinking water supply:

Type of Scheme (Major Irrigation/Med. Irrigation/MI/ Multi-Purpose)	Type of Water Source (Reservoir/ River Lift/ Spring)	Annual capital investment in INR (lac) from the year of beginning construction		Annual Operation and Maintenance Cost, from the first year of maintenance work		Water Supply Benefits		Annual irrigation target achievement, starting from the first year of water release		Flood Control Benefits		Drainage System Provided		Hydropower Benefits	
		Year	Expenditure	Year	Expenditure	Year	Volume released (MCM)	Year	Area (ha)	Year	Area flood proofed or protected from floods (ha)	Year	Command Area covered (ha)	Year	Electricity Generation (Million Units)

Note: 1] For estimating annualized cost per KL of water, all capital costs have to be adjusted to the zeroth year using discounting. This (**C**) is to be annualized using discounting technique again and the average O & M cost per annum is to be added to this to obtain the annualized cost.

2) Capital investment should include cost of head works (dam, spillway, weir, gates), hydraulic control structures (HR, CR), road bridges and distribution systems

3) The operation and maintenance expenditure can start even before the project is completed, as certain components or phases of the project might be under operation. The O & M Expenditure should include the staff salaries; repair and maintenance expenses; equipments and vehicles for transport of staff and materials

4) The irrigation benefit and flood control benefits shall be arrived at by adding up the area irrigated in different talukas covered by the design command area.

3. Costs and Performance of Rural Water Supply Projects (based on surface reservoirs)

Name of reservoir: Location:

Year of starting work:

Year of completion:

Gross & Live storage capacity of the reservoir (MCM): Duration of Water Supply (Hours):

Monsoon:

Winter:

No. and total Capacity of the ESRs: Summer

Table 1: Cost and Performance of a Multi-Purpose Water Resource Project

Annual capital investment in INR (lac) from the year of beginning construction		Annual Operation and Maintenance Cost, from the first year of maintenance work		Water Supply Benefits		No. of villages covered by the scheme and no. of HHs covered	Annualized Cost per KL of Water
Year	Expenditure (lac Rupees)	Year	Expenditure (Lac Rupees)	Year	Volume released (MCM)		

Note: For estimating annualized cost per KL of water, all capital costs have to be adjusted to the zeroth year using discounting. This (**C**) is to be annualized using discounting technique again and the average O & M cost per annum is to be added to this to obtain the annualized cost. This can be divided by the volume of water supplied (KL) to arrive at the annualized cost per KL of water

4. Costs and Performance of a Rural Water Supply Projects (based on river lifting)

Location: Name of the River:

Year of starting work:

Year of Completion: No. and total Capacity of the ESRs (m3):

Capacity of the Pump Set: Duration of Water Supply (Hours):

Monsoon:

Winter:

Summer

Table 1: Cost and Performance of a Rural Water Supply Project based on River Lifting

Annual capital investment in INR (lac) from the year of beginning construction		Annual Operation and Maintenance Cost, from the first year of maintenance work		Water Supply Benefits				No. of villages covered by the scheme and no. of HHs covered	Annualized Cost per KL of Water
Year	Expenditure (lac rupees)	Year	Expenditure (Lac rupees)	Year	Volume released (MCM)				
					Monsoon Season	Winter Season	Summer Season		

Note: For estimating annualized cost per KL of water, all capital costs have to be adjusted to the zeroth year using discounting. This (**C**) is to be annualized using discounting technique again and the average O & M cost per annum is to be added to this to obtain the annualized cost. This can be divided by the volume of water supplied (KL) to arrive at the annualized cost per KL of water

5. Costs and Performance of a Rural Water Supply Projects (based on wells/bore well/tube well)

Location: Name of the Village:

Year of starting work:

Year of Completion: Type and Depth of the Well (m):

No. and Total Capacity of the ESR (m3):

Capacity of the Pump Set: Duration of Water Supply (Hours):
Monsoon:
Winter:
Summer

Table 1: Cost and Performance of a Rural Water Supply Project based on River Lifting

Annual capital investment in INR (lac) from the year of beginning construction		Annual Operation and Maintenance Cost, from the first year of maintenance work		Water Supply Benefits				No. of villages covered by the scheme and no. of HHs covered	Annualized cost per KL of Water
Year	Expenditure (lac rupees)	Year	Expenditure (Lac rupees)	Year	Volume released (MCM)				
					Monsoon Season	Winter Season	Summer Season		

Note: For estimating annualized cost per KL of water, all capital costs have to be adjusted to the zeroth year using discounting. This (**C**) is to be annualized using discounting technique again and the average O & M cost per annum is to be added to this to obtain the annualized cost. This can be divided by the volume of water supplied (KL) to arrive at the annualized cost per KL of water

6. Costs and Performance of Urban Water Supply Projects

Location: Name of the City:

Year of starting work:

Year of Completion:

Capacity of the Reservoir (MCM):

Capacity of the Pump Set:

Type and Depth of the Well (m):

No. and Total Capacity of the ESR (m3):

Duration of Water Supply (Hours):
Monsoon:
Winter:
Summer

Table 1: Cost and Performance of a Rural Water Supply Project based on River Lifting

The Water Sources	Annual capital investment in INR (lac) from the year of beginning construction		Annual Operation and Maintenance Cost, from the first year of maintenance work		Water Supply Benefits				No. of villages covered by the scheme and no. of HHs covered	Annualized cost per KL of Water
	Year	Expenditure (lac rupees)	Year	Expenditure (Lac rupees)	Year	Volume released (MCM)				
						Monsoon Season	Winter Season	Summer Season		

Note: For estimating annualized cost per KL of water, all capital costs have to be adjusted to the zeroth year using discounting. This (**C**) is to be annualized using discounting technique again and the average O & M cost per annum is to be added to this to obtain the annualized cost. This can be divided by the volume of water supplied (KL) to arrive at the annualized cost per KL of water

7. Cost and Performance of Wastewater Treatment System

Level of treatment of wastewater: primary/secondary/tertiary:

Type of Wastewater treatment System: Aerobic/Anaerobic#

Name of the System (ASP, WSP, AP, CW): Point of disposal of treated wastewater:

Capacity of the wastewater treatment plant (MLPD):

Table 1: Costs and physical performance of wastewater treatment plant

Annual capital investment in INR (lac) from the year of beginning construction		Annual Operation and Maintenance Cost, from the first year of maintenance work@		Amount of wastewater treated per day (MLD) or operational efficiency of the plant	Type of Use of Treated Wastewater (irrigation of crops, gardening, disposal into natural stream, irrigating trees)	Area irrigated in case of wastewater irrigation (ha)			
Year	Expenditure	Year	Expenditure (Lac rupees)			Crop 1	Crop 2	Crop 3	Crop 4

Note: private investments for construction of treatment systems such as septic tanks in housing stocks is not considered

@Annual operation and maintenance expenditure shall include staff salaries, expenses for vehicles and transport, water sample testing and maintenance and repairs

#ASP is Activated sludge process; WSP is waste stabilization pond; AP is anaerobic pond; CW is constructed wetland

8. Cost and Performance of Watershed Management Projects

Name of the Watershed: Name of River Basin/Sub-basin:

Year of starting work:

Year of Completion:

Table 1: Cost and Physical Achievements under a Watershed Development Project

Annual capital investment in INR (lac) from the year of beginning planning		Watershed Development achievements		Area under soil conservation work	No. of check dams/check walls	Area under plantation/afforestation (ha)	**No. of villages covered by the treatment activities**	**Cost per ha of Watershed Intervention (Rs)**
Year	Expenditure (lac rupees)	Year	Area Treated (ha)					

Note: 1) For estimating annualized cost per ha of watershed, all capital costs have to be adjusted to the zeroth year using discounting. This (**C**) is to be annualized using discounting technique again to obtain the annualized cost. This can be divided by the area of watershed treated to arrive at the annualized cost per ha of watershed intervention.

Note: 2] The capital expenditure should include the salary costs, cost of materials and professional fee for planning and design

II Economics

1 Economic Evaluation of Irrigation Schemes (Crop and Dairy Production)

In order to carry out economic evaluation of irrigation schemes, the estimates of net benefits from irrigation will have to be arrived at per unit of irrigated crop land and unit of livestock and can also be arrived at per ha of farm. This will have to be compared against the net income from crop production in the same area prior to the introduction of irrigation water from the scheme to arrive at the incremental income (post irrigation – pre irrigation) due to the water introduced from the new irrigation source. This estimate of annual benefit from irrigated area in the entire irrigation scheme in turn can be used for estimation of benefit cost ratio for irrigation systems by comparing it with the annualized (capital and O & M) cost of the system.

Table 1: Benefit Cost Calculation for Irrigation Scheme

Name of Crop	Area under the Crop after introduction of Water from the Scheme	Incremental Income from Irrigated Crop Production Over Pre Scheme Scenario per unit area	Name of Dairy Animal	Number of Dairy Animals (after the introduction of water from the scheme)	Incremental Income from the Dairy Animal per Year after the Introduction of Water from Scheme	Net Income from Fish Productio n	Annual Benefit from crop & livestock B_{ANNUAL}	Annualize d Capital + O & M Cost of the Scheme C_{ANNUAL}
1.	A	$\emptyset^1$	1.	N^1	β^1	¥		
2.			2.					
3.			3.					
4.			4.					
5.								

The benefit (B_{Annual}) cost (C) ratio can be worked out as:

$$\frac{B_{ANNUAL}}{C_{ANNUAL}} = \frac{\{\sum_{i=1}^{m} A_i{}^1 X\, \emptyset_i{}^1 + \sum_{j=1}^{n} N_j{}^1 X\, \beta_j{}^1 + ¥\}}{\{C[\frac{r(1+r)^{n-1}}{[(1+r)^n - 1]}] + \mu\}} = \ldots\ldots\ldots \text{(1)}$$

Where C is the capital investment for the irrigation infrastructure (adjusted to the zeroth year); r is the discount rate and n is the economic life of the system (scheme); μ is the annual operation and maintenance cost. Other variables are explained in Table 1. Similar exercise can be carried out for wastewater treatment system also, in which case the capital cost of the treatment plant and its operation and maintenance cost can be considered for estimating the annualized cost of the system.

Details of estimation of various parameters involved in the benefit cost estimation are given in Annexure 1.

2 Economics of Water Supply Schemes

For working out the economics of water supply schemes, we need to arrive at the cost per m^3 of water supplied. This should be the sum of: 1] the capital investments throughout the life of the scheme, adjusted to the zeroth year and annualized using discounting; and, 2] the average annual operation and maintenance costs.

$$\text{The unit cost of water supply} = \frac{\{C[\frac{r(1+r)^{n-1}}{[(1+r)^{n}-1]}]+\mu\}}{\text{Average Volume of Water Supplied per annum } (V_{ANNUAL})}$$

This figure needs to be compared against average unit cost of supplying the same quantum of water through alternative sources to examine the cost effectiveness of the water supply scheme.

3 Economics of Industrial Water Supply

In the case of industrial water supply, the net economic return from the industrial output generated from the use of water (gross market value of the industrial output-cost of production per unit volume of water used for manufacturing) for manufacturing can be compared against the unit cost of water supply. Here the unit cost of water supply is the price which the industries pay for obtaining water supply for production, and NOT the cost of production and supply of water.

Table 1: Economics of Industrial Water Supply

Name of Manufacturing Sub-Sector	Total Industrial Output (metric ton)	Price of the Industrial Product (Rs/metric ton)	Gross Revenue from the Output (Rs/year)	Total Cost of Production per Year# (Rs)	Total Volume of Water Used for Manufacturing (m^3/annum)	Net Income from Manufacturing per m^3 of water (Rs/m^3)	Unit Price of Water (Rs/m^3)$
(1)	(2)		(3)	(4)	(5)	(6)=(4)-(3)/(5)	
Integrated Iron & Steel							
Smelters							
Petrochemicals and Refinery							
Chemicals-Caustic Soda							
Textile & Jute							
Cement							
Fertilizer							
Leather Products							
Rubber							
Food Processing							
Inorganic Chemicals							
Sugar							
Pharmaceuticals							
Distillery (Req. Per 1000 litres)							
Pesticides							
Paper & Pulp							
General Engineering							

Notes:

It excludes the price of water used for production process.

$ If the price of water varies, weighted average of the price shall be considered

4 Economics of Micro Irrigation Systems

In the case of micro irrigation system, the incremental benefit from crops irrigated by micro irrigation systems over crops irrigated by traditional method of irrigation (TMI) (i.e., net income from MI irrigated crop – net income from crop irrigated by TMI, is to be compared against the additional cost associated with use of MI system to arrive at the benefit-cost ratio for the system. The additional cost will include capital cost of the system and the operation and maintenance cost of the system.

Table 1: Benefit Cost Calculation for Irrigation Scheme

Name of Crop	Area under the Crop after introduction of MI Schemes	Net Income from Irrigated Crop Production Using MI system	Net Income from Irrigated Crop Production under TMI for the whole cropped area	Incremental Income from crop production due to MI system per unit area	Capital Cost of the MI System	Annual O & M cost of MI system	Annualized Capital + O & M Cost of the Scheme
	A^1		$\emptyset$	$\emptyset^1$	C	µ	C_{ANNUAL}
1.							
2.							
3.							
4.							
5							

The benefit-cost ratio for MI irrigated crop can be worked out as:

$$\frac{B_{ANNUAL}}{C_{ANNUAL}} = \frac{\sum_{i=1}^{m} A_i{}^1 X\, \emptyset_i{}^1}{\{C[\frac{r(1+r)^{n-1}}{[(1+r)^{n}-1]}]+\mu\}} \quad \ldots\ldots\ldots (1)$$

III Estimating Economic Value of Water Use in Farming

Economic value of water use in farming is the surplus value product from the use of water in crop and dairy production. It could be estimated on the basis of estimates of water productivity in crop and dairy production (in terms of net return per unit volume of water used) due to the water used for all the crops and livestock in the farming system, respectively. In the case of crops, the irrigation water input to different crops is considered and in the case of dairy farming, the voluntary water use by animals and irrigation water used for growing the fodder and feed that are used as input for the animals have to be considered.

Table 1: Estimation of Economic Value of Water Use in Agriculture

Name of Crop	Volume of Irrigation Water Allocated (m3)	Irrigation Water Productivity in Crop Production (Rs/m3)	Name of Dairy Animal	Volume of Water Allocated (including embedded water)	Water Productivity in Milk Production (Rs/m3)
1			1		
2			2		
3			3		

4			4		
5			5		
6			89		

Economic value of Irrigation Water Used in Agriculture =

$$WP_{farm} = \frac{\sum_{i=1}^{m} WP_{crop\,i} V_{crop,i} + \sum_{j=1}^{n} WP_{dairy} V_{dairy,j} N_j}{\sum_{i=1}^{m} V_{crop,i} + \sum_{j=1}^{n} Nj X V_{dairy,j}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Here, $WP_{crop,i}$ is the water productivity of main product of crop i ; $V_{crop,i}$ is the total volume of water used for crop i ; $WP_{dairy,j}$ is water productivity in dairy production for livestock type j ; and $V_{dairy,j}$ is the volume of water used for dairy production per animal per year for livestock category j . N_j is the total number of livestock in category j

$V_{dairy,\ j} = 365\ Q_{MP,j} / WP_{MILK,j}$ ………………………….. (2)

The analytical procedure for estimation of values of these variables is discussed in Annexure 2.

Annexure 1: Estimation Procedure for Computing Cost of and Income from Crop and Dairy Production

Sample size: The primary survey shall be carried out in each agro-climatic region, and the minimum size of the sample for each region shall be 35, as one would expect that nearly 10% of the sample might turn out to be un-usable.

General Information:

a. Name of village	b. Name of block	c. Name of district	d. Name of state

2. Household Profile:

2.1 Name of the farmer	

3. Source of Irrigation:

a. Ground Water	b. Surface Water	c. Rain-fed	d. Other (Specify)

4. Source of Energy:

a. Electric Pump	b. Diesel Pump	c. Others

5. About Well/Tube-well

a. Depth of well/ bore (in feet)	b. Horse Power (HP)	c. Year of Construction	d. Repair/Maintenance cost Rs/year	e. Pump discharge rate litre/second

6. Cost of Installation of Tube-well (in the case of private wells)

a. Cost of making bore/ well	b. Cost of Motor/ Pump/ Diesel Pump	c. Other cost	d. Total cost of installation/Tube well/ Diesel Pump

7. Cost of Cultivation (Consider all the crops grown by the farmer including fodder crops**)**

Name of the season	Name of the crop	Area (Ha)	Source of Irrigation* (1/2)	No. of Irrigation	Total volume of irrigation water used (m^3)	Hours per irrigation	Crop yield (Qt/Ha)		Market price (Rs./Qt)		Input used (Rs./Per Hectare)							
							Main-product	By-product	Main-product	By-product	Cost of ploughing	Cost of seed	Cost of fertiliser & Manure	Cost of Pesticide	Cost of irrigation	Cost of labour	Cost of harvesting	Cost of transpor- -tation
Kharif	1.																	
	2.																	
	3.																	
	4.																	
	5.																	
Rabi	1.																	
	2.																	
	3.																	
	4.																	
	5.																	
Summer	1.																	
	2.																	

	3.																	
	4.																	
	5.																	

*: 1=Tube-well; 2=Canal

8. Cost of Cultivation for rain-fed crops (Consider all the crops grown by the farmer including fodder crops**)**

Name of the season	Name of the crop	Area (Ha)	Crop yield (Qt/Ha)		Market price (Rs/Qt)		Input used (Rs/Per Hectare)						
			Main-product	By-product	Main-product	By-product	Cost of ploughing	Cost of seed	Cost of fertiliser & Manure	Cost of Pesticide	Cost of labour	Cost of harvesting	Cost of transportation
Kharif	1.												
	2.												
	3.												
	4.												
	5.												
Rabi	1.												
	2.												
	3.												
	4.												

	5.												
Summer	1.												
	2.												
	3.												
	4.												
	5.												

*: 1=Tube-well; 2=Canal; 3=Rain-fed

3. MILK PRODUCTION

Sample size: Like in the case of crops, for dairy production also, the sample size shall be 35 for each agro climatic region.

1. Number and type of livestock:

Buffaloes			Crossbred Cow			Indigenous Cow		
In-milk	Dry	Calves	In-milk	Dry	Calves	In-milk	Dry	Calves

2. Drinking Water Use (Litres/Day/Animal):

Season	Buffaloes			Crossbred Cow			Indigenous Cow		
	In-milk	Dry	Calves	In-milk	Dry	Calves	In-milk	Dry	Calves
Monsoon									
Winter									
Summer									

3. Fodder Purchased

Name of Fodder	Quantity	Rate (Rs.)	Place
A. Dry Fodder			
1.			
2.			
3.			
4.			
B. Green Fodder			
1.			
2.			
3.			

4. Type and breed-wise feed and fodder (Kg/Day/Animal)

Month	Name of Dry Fodder	No. of In-milk animal	Buffalo			Crossbred Cow			Indigenous Cow			Price
			In-milk	Dry	Calves	In-milk	Dry	Calves	In-milk	Dry	Calves	(Rs./ Kgs)
Monsoon (July to October)												
Green Fodder												
Dry Fodder												
Concentrate												
Winter (November to February)												
Green Fodder												
Dry Fodder												
Concentrate												

Summer (March to June)												
Green Fodder												
Dry Fodder												
Concentrate												

5.0 Feeding Pattern of Calf

	Name of feed & Fodder	Buffalo Calves				Crossbred Calves				Indigenous Calves			
		Age of Calve (months)				Age of Calve (months)				Age of Calve (months)			
		0 - 3	3 – 6	6 – 9	9 -12	0 - 3	3 – 6	6 – 9	9 -12	0 - 3	3 – 6	6 – 9	9 -12
Monsoon [July to October]													
Green Fodder	1. 2. 3.												
Dry Fodder	1. 2. 3.												

Concentrate	1. 2. 3.												
Winter [November to March]													
Green Fodder	1. 2. 3.												
Dry Fodder	1. 2. 3.												
Concentrate	1. 2. 3.												
Summer [April to June]													
Green Fodder	1. 2. 3.												
Dry Fodder	1. 2. 3.												
Concentrate	1. 2. 3.												

6. Milk Yield by Different Type of Animals

Type of animal	Fat %/ Quantity	Month-wise* Milk Production (Lt/day/animal)											
		Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
A. Indigenous **Cow**	Quantity												
	Rs./Lt.												
	Fat %												
	No. of In-milk Animal												
B. Crossbred **Cow**	Quantity												
	Rs./Lt.												
	Fat %												
	No. of In-milk Animal												
C. Buffalo	Quantity												
	Rs./Lt.												
	Fat %												
	No. of In-milk Animal												

*Start month counting from the birth of calving

8. Lifecycle of Animals

Type of animals	Age of first Insemination (Month)	First Calving (month)	Length of milking (Month)	Length of inter-calving Period (month)	Total No. of Calving in the life(No.)
Indigenous cow					
Crossbred cow					
Buffalo					

Estimation of Benefit from an Irrigation Scheme

The net annual farm income due to the irrigation scheme should consider the difference between the net income from farming post the introduction of the scheme and the net income from farming prior to introduction of the scheme, and is termed here as incremental income due to irrigation. This essentially involves either a longitudinal study to find out the income from crop and dairy production pre and post introduction of the scheme in the designated command area, or a cross sectional study wherein the income from farming in the neighbouring area which does not get water from the scheme is compared is compared against that in the command area.

Incremental income from crop production for crop i ($£_i$) due to introduction of irrigation water is estimated as =

$\mathrm{I}CROP_{\mathrm{POST,i}} - \mathrm{I}CROP_{\mathrm{PR,E,i}}$ ………………………….. (1)

Where, $\mathrm{I}CROP$ is the net income from crop production per unit area, and suffixes $\mathrm{POST,i}$ and $\mathrm{PRE,i}$ represent post and pre Project respectively for crop, i. The values of variables, $\mathrm{I}CROP$ is obtained by subtracting the input cost per unit area from the gross return from crop production per unit area. The gross income from crop production is estimated by taking the yield of main and by product of the crop (kg) and the farm gate price per kg.

Incremental income from livestock production for livestock category j ($¥_j$)=

$\mathrm{I}LSTOCK_{\mathrm{POST,j}} - \mathrm{I}LSTOCK_{\mathrm{PRE,j}}$ ………………….… (2)

Where, $\mathrm{I}LSTOCK$ is the net income from livestock production per unit of livestock, and suffixes $\mathrm{POST,j}$ and $\mathrm{PRE,j}$ represent post and pre-project respectively for livestock type, j. The values of variables, $\mathrm{I}LSTOCK_{\mathrm{POST,j}}$ and $\mathrm{I}LSTOCK_{\mathrm{PRE,j}}$ are obtained by subtracting the input cost per animal unit from the gross income per animal unit. The gross income from dairy animals per livestock unit is estimated by taking the average annual milk yield from animals per livestock unit and the selling price of milk.

Now, let us assume that the farmers grow a total of m crops. Then the average incremental income (or also increase in average income) from crop production per unit of land can be estimated ($\emptyset^1$) as:

$$\emptyset^1 = \left\{\frac{\left[\sum_{i=1}^{m} \mathrm{A_i}^1 \mathrm{x}\ \mathrm{I}CROP_{\mathrm{POST,i}} - \sum_{i=1}^{m} \mathrm{A_i}\ \mathrm{x}\ \mathrm{I}CROP_{\mathrm{PRE,i}}\right]}{\sum_{i=1}^{m} \mathrm{A_i}^1}\right\} \text{ ……………… (3)}$$

Here, $\mathrm{A_i}$ is the area under crop i pre-project and $\mathrm{A_i}^1$ is the area under the crop i post project water introduction.

Now, let us assume that the farmers keep a total of n types of livestock. $\mathrm{N_j}$ is the total number of livestock in the jth category pre-project water, and $\mathrm{N_j}^1$ is the total number of livestock in the same category post project. Then the average incremental income from dairy production per unit of livestock (β^1) can be estimated as:

$$\beta^1 = \{\frac{\left[\sum_{j=1}^{n} \mathrm{N_j}^1 \mathrm{x}\ \mathrm{I}LSTOCK_{\mathrm{POST,j}} - \sum_{j=1}^{n} \mathrm{N_j}\ \mathrm{x}\ \mathrm{I}LSTOCK_{\mathrm{PRE,j}}\right]}{\sum_{j=1}^{n} \mathrm{N_j}^1}\} \text{ ………………….. (4)}$$

The average income from crop production pre project ($\emptyset$) can be estimated as:

$$\emptyset = \sum_{i=1}^{m} \mathrm{A_i}\ \mathrm{x}\ \mathrm{I}CROP_{\mathrm{PRE,,i}} \text{ …………………………. (5)}$$

Likewise, the average income from livestock production pre project intervention (β) can be estimated as:

$$\beta = \sum_{j=1}^{n} \mathrm{N_j}\ \mathrm{x}\ \mathrm{I}LSTOCK_{\mathrm{PRE,j}} \text{ ……………………. (6)}$$

The total incremental income from irrigation $= \sum_{i=1}^{m} \mathrm{A_i}^1\, X\, \emptyset^1 + \sum_{j=1}^{n} \mathrm{N_j}^1\, X\, \beta^1 + ¥$………….. (7)

Here, ¥ is the annual net income from fish production

Estimation of benefits in the case of multi-purpose projects

In the case of multi-purpose schemes, the annual revenue accrued from the sale of hydropower generated, drinking water supply to the (rural and urban) communities, industrial water supply can be added to the incremental benefits from irrigation water supply. In the case of drinking water supply (which is considered as a social good), often the water is supplied at highly subsidized rates and the price of water does not reflect the value of the resource. In such cases, the cost of producing the same quantum of water of similar quality though alternate sources can be treated as the value of drinking water supply in economic terms. In the case of hydropower benefits, the total amount of electricity produced in KWhr and the price of electricity generation from alternative source of energy generation could be treated as the basis for estimating the benefit from that stream. In the case of industrial water supply, the unit price of water sold to the industrial units and the volume of water allocated can be the basis.

Economic Benefit Cost Calculations

Annualized cost = $\lambda_{pc,i} = \{C[\frac{r(1+r)^{n} - 1}{[(1+r)^{n} - 1]}] + \mu\}$ ………………….. (8)

Where C is the capital investment for the irrigation infrastructure (adjusted to the zeroth year); r is the discount rate and n is the economic life of the system (scheme); μ is the annual operation and maintenance cost.

Annexure 2: Estimation Procedure

A. Estimation of Water Productivity in CROP PRODUCTION

Gross income = Crop yield (Main Product) x Market price + Crop yield (by- Product)

Input cost = All the expenditure made by farmer on different inputs of crop production i.e. cost of ploughing, cost of seed, cost of manure and fertiliser, cost of irrigation, cost of pesticide, cost of harvesting.

Net Income = Gross Income – Input costs

Table 2: Crop yield, Gross and net income per hectare

Name of the season	Name of the crop	Crop yield (Kg/Ha)		Gross Income (Rs/Ha)	Net income (Rs/Ha)
		Main product	By-product		
Kharif					
Rabi					
Summer					

5) Estimation of physical Water Productivity (Kg/m^3) = Crop yield (kg/ha)/ Volume of water use (m^3/ha)

6) Net water Productivity = Net income from main and by product (Rs/ha)/ Volume of Water use (m^3/ha)

Table 3: Irrigation Water Productivity

Name of the season	Name of the crop	Irrigation water use (m^3/ha)	Water productivity	
			Agronomic (kg/m^3)	Net economic (Rs/m^3)
Kharif				
Rabi				
Summer				

B. Estimation of Water Productivity in DAIRY PRODUCTION

1. Estimation of Life cycle of animal

Here, we try to find out the life cycle of the animal for indigenous cow, crossbred cow and buffalo based on the following information:

1. Age of the calf for first insemination (Month)

2. Age of first calving (Month)
3. Length of milking period (month)
4. Length of inter-calving period (month)
5. Total number of calving in the productive life (No.)

2. Feed and Fodder Used for Milk Production

First of all, we need to estimate season-wise average daily feed and fodder fed to in-milk and dry animal and calf. On the basis of average daily feeding pattern, we extrapolate these values into the entire lifecycle of the animal which consists of the calf stage, milking stage and dry stage. After estimating the feeding pattern for animal based on life cycle, we estimate feed and fodder use for one day.

3. Estimation of milk production

For estimation of total milk production from a dairy animal, we need to collect data on milk production during one lactation period. Base of this, total milk production for all lactation periods need to be estimated and from this the average daily value needs to be arrived at.

4. Estimation of Water use for feed and fodder production

$$\Delta_{milk} = \frac{Q_{cf}}{WP_{cf}} + \frac{Q_{df}}{WP_{df}} + \frac{Q_{gf}}{WP_{gf}} + \Delta_{DW} \qquad (1)$$

Where, Δ_{DW} is the daily drinking water consumption by livestock (m^3/day); Q_{cf} , Q_{df} and Q_{gf} are the average quantities of cattle feed, dry fodder and green fodder used for feeding a livestock unit per day (kg/animal/day); WP_{cf} ,WP_{df} and WP_{gf} are the physical productivities (kg/m^3) of cattle feed, dry fodder and green fodder, respectively; Δ_{DW} is the daily drinking water consumption by livestock (m^3/day). It is the average volume of water required by a dairy animal per day over its entire life cycle, including the water embedded in feed and fodder.

5. Physical Productivity of Water in Milk Production

The physical productivity of water in milk production for livestock WP_{Milk} (litres/m^3) can be defined as:

$$WP_{Milk} = \frac{Q_{MP}}{\Delta_{Milk}} \quad \ldots (2)$$

Where, WP_{milk} is the milk water productivity; Q_{MP} is the average daily milk output by one unit of livestock category over the entire live cycle (litres/animal/day). Δ_{Milk} is the total volume of water used per animal per day, including the water embedded in feed and fodder inputs, used in dairying for an animal in a day, worked out for the entire animal life cycle (m^3/animal/day). It is estimated as:

6. Net Economic Water Productivity in Milk Production

The net return of milk production, NR_{milk} (Rs/animal/day) would be estimated using values of Q_{MP} , the price of milk (Rs/litre) and the cost of production of the average amount of cattle inputs required in a day (Rs/animal/day) estimated for the entire animal life cycle. It is important to mention here that with import of green or dry fodder in a farm, the cost of fodder input could also go up. This in turn would affect net water productivity in dairying WP_{Milk} (Rs/m^3). It can be estimated as:

$$WP_{dairy} = \frac{NR_{milk}}{\Delta_{milk}} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(3) (Singh, 2004; Kumar, 2007)}$$

C. IMPACT OF IRRIGATION ON SURPLUS VALUE PRODUCT FROM CROP PRODUCTION

Since the crop can sometimes yield some outputs under rainfed conditions, it is important to segregate the effect of irrigation on yield and income for all crops in order to estimate the economic value of water use in farming.

1. Yield benefit due to irrigation (Main product) (Kg/Ha):

= Irrigated Crop yield (Kg/Ha) – Rain-fed crop yield (kg/ha)

2. Yield benefit due to irrigation (by-product) (Kg/Ha):

= Irrigated Crop yield (Kg/Ha) – Rain-fed crop yield (kg/ha)

3. Net income benefit due to irrigation (Rs/Ha):

= Net income from irrigated crop (Rs/Ha) - Net income from rain-fed crop (Rs/Ha)

Chapter 8

Outcome of Current Governance of Water Resources Issues

Ground Water related

Quantitative	Large unmet demand
	Over-exploitation of Ground Water Resources
	Aquifer mapping
	Low water productivity- Crop/ farming/ Industry
	Strategy for improving irrigation efficiency
	Sustainable Ground Water Development and Management.
	Recharging of Ground Water
	Land subsidence
Qualitative	Standards/Norms/Bench marks source wise and user wise
	Drinking Water
	Irrigation Water
	Industrial Water
	Salinity and Alkalinity
	Arsenic
	Fluoride
	Nitrate
	Saline Water Intrusion along coasts
	Specific Water Quality Issues
	Pollution
	Water borne diseases
	Water Pollutants Acid rain Bacteria in water Nitrogen Pesticides Phosphorus Runoff Sewage overflows Urbanization and water quality
Administrative	Encroachment of Water Bodies/Floodplains
	Watershed/Catchment Management
	Capacity building of various stakeholders
	Operation and Maintenance of Water Resources Structures
	Issues in Implementation of On-going Projects
	Water Resource Information System
Environmental	Waste Water: Reuse & Recycle related
	Water Treatment
	Effluent treatment
Disasters	

Surface Water related

Quantitative	Gap between IPC and IPU
	Large scale investment
	Completion of ongoing irrigation projects
	Improvement in the efficiency of irrigation system
	Strategies for reviving/improving traditional water storages
	Strategy for minor irrigation through groundwater development and management,
	Low water productivity- Crop/ farming/ Industry
	Increase in WUE
Disasters	Flood Zone Mapping
	Floods, Flash Floods and Storm water
	Droughts
	Desertification
	Drainage Congestion
	Water logging
	Landslides

	Coastal
Special issues	Erosion
	Sedimentation- Rivers, Reservoirs
Qualitative	Standards/Norms/Bench marks source wise and user wise
	River water Quality
	Drinking Water
	Irrigation Water
	Industrial Water
	Salinity and Alkalinity
	Saline Water Intrusion along coasts
	Specific Water Quality Issues
	Pollution
	Water borne diseases
	Water Pollutants Acid rain Bacteria in water Nitrogen Pesticides Phosphorus Runoff Sewage overflows Urbanization and water quality
	Carrying capacity
Administrative	Implementation of zero discharge statute
	Encroachment of Floodplains
	Watershed/Catchment Management
	Capacity building of various stakeholders
	Operation and Maintenance of Water Resources Structures
	Issues in Implementation of On-going Projects
	Dam Design and Safety aspects
	Sedimentation and Storage / Carrying capacity
	(un) reliability of Water Supply
	Establishment of River Basin Organizations/ Authorities.
	Water Resource Information System
	On line flood forecasting information system
Environmental	Glacier melt
	Drying up of springs
	Environmental Flows
	Ecological assets and aquatic species
	Waste Water: Reuse & Recycle related
	Water Treatment
Social	Participatory Irrigation Management
	Information, Education and Communication for mass awareness

For each of the Problem –Standard template -Sub Headings

(Not more than 2-3 pages)

1. Distribution and gravity of the problem across the Districts with a map for the current / Previous Year and previous year of 5 and 10 Years back.
2. Data table: Time trend of the problem- Area, Distribution, number of districts, gravity, impact of the problem.
3. Problem Tree / Root cause Analysis: Cause, Effect and Interventions
4. Financing
5. Best practices if any
6. Issues and Challenges
7. Performance Indicators / Management
8. Current strategy/action plan with timelines and responsible agency.

Chapter 9

Water Resources Planning and Development- Strategic Plan

Time Scale: Annual (Hydrological Year-1st June to 31st May) Space Scale: Basin or Sub-basin wise within the State Boundary

For effective and holistic water resources planning, development & management there is an emergent and urgent need for frequent assessment, constant measurement and regular monitoring of the various sources of water in terms of both the quantity and quality parameters. Also, since water follows the natural path within the Basin/Sub-basin/Watershed and the Aquifer beneath, it is rational and scientific that we carry out the Strategic Plan and Water Budgeting in those respective spatial units. For that the State need to be looked into as a spatial unit comprising of various Basins/Sub-basins and all other inputs/data necessary for this exercise has to be brought/modified to corresponding spatial domain. This can be done by the help of modern tools and technology like the GIS (Geographical Information System) considering State Boundary as the Total System Boundary and Basin/Sub-basin or part of them within the State as the Sub System Boundary. The time scale unit for Water Budget has been considered as One Year (Water Year i.e. from 1st June to 31st May)

Water Budget has to look into the Supply side and Demand side of this natural resource. For this we need to assess the Total Water Available, Utilizable Water out of the available water round the Hydrological/Water Year, Demands of Water from various Sectors for upcoming Water Year as well as Withdrawal and Consumptive Use for such sectors last year (or for last five years) and finally the Outflows of Water from the System/State Boundary round the Water Year. This will help us balance the Water Budget within the System Boundary in the form of the following Equation:

Input/Inflow of Water (round the Water Year) +/- Change in Storage of Water within the System (at the end of Water Year) = Consumptive Use of Water (round the Water Year) + Output/Outflow of Water (round the Water Year)

A. Tables on Water Availability

Total water availability in the Basins/Sub-basins within the State boundary is the first input. The various sources of total water available are:

1. Precipitation (including all forms like Rain, Snow, Hail, Dew etc.) within the State,
2. Inflow of water into the State from upstream States/Countries,
3. Inter-Basin Transfer through Canals etc. into the State,
4. Available Storages in the Reservoirs, Lakes, Ponds, Tanks, Wetlands etc. within the State (Basin/Sub-basin wise as on 1st June of the Water Year),
5. Ground Water Storage as on 1st June of the Water Year within the State,
6. Desalinated Water in case of Coastal States.

Table A1 consist of total precipitation falling on the land surface within the various basins/sub-basins of the State. Interception losses due to vegetation, forests etc must be deducted to arrive at the total precipitation reaching the land surface which finally leads to surface flow, surface storage and infiltration into the ground surface to increase soil moisture content and recharge ground water also. The Chapter 4.1.1 needs to be referred to for filling up the following table:

A1. Precipitation (including Snowfall): (MCM)			**REMARKS**
Basin/Sub-basin (Area in	**(mm)**	**(MCM)**	
Basin A/ Sub-basin			
Basin B/ Sub-basin			
Basin C/ Sub-basin			
TOTAL			

Table A1R consist of all runoff resulting from precipitation within the basin at its outlet. This includes inflow discharge from the upstream State & also includes the quantum of glacial melts within the basin/sub-basin under consideration. The Chapter 4.1.4 needs to be referred to for filling up the following table:

A1R. Runoff (including Glacial Melts within State Boundary): (MCM)		**REMARKS**
Basin/Sub-basin (Area in	**(MCM)**	
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

Table A2 to A4 consist of total inflow of water through river course, springs etc into the System/State Boundary from the upstream States/Countries round the Water Year. As discussed above, this input is also required in the spatial unit-wise (i.e.

Basin/Sub-basin). The inflow points must lie within some Basin/Sub-basin. It may happen that the inflow point is un-gauged i.e. measurement of flow is not done at present or not feasible and the contributing catchment of the flow lies outside the State. Under such circumstances the Rainfall-Runoff Hydrological modeling can be done to have a fair idea of total inflow within the State. If there are sources of Glacier outside the State, then water available from melting of such glaciers will also be included as inflow under this Table A2. Chapters 4.1.2, 4.1.3 and 4.1.4 may be referred to for filling up this Table.

A2. *Inflow from upstream State/ Country along the River Course: (MCM)		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

***** Hydrological Observation Station at the entry point of the river in the State will be having this data; if not, upstream discharge data may help in estimation of the inflow. New sites must be opened at such locations where HO Stations do not exist at present.

Table A3 is for glacial melts within the State Boundary.

A3. Inflow from Glacial Melts of the Basin/Sub-basin within the State Boundary: (MCM)		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

A4. *Inflow from Springs, Nallahs from upstream State/ Country or within the State:		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

***** [The water availability from the springs may be assessed from the inventory available with the State Government Agencies or from the National Wetland Inventory Assessment (NWIA) available with the India-WRIS or SAC, ISRO Ahmedabad for the entire country.]

Table A5 to A7 consist of the Water Available as Storage in the Major/Medium/Minor Water Resources Projects (**includes all public and private projects**) as on 1st of June of the Water Year. This volume of water is carryover storage from available water of last water year. The Elevation-Area-Capacity Curve of the Reservoir and the Water Level as on 1st of June would be required to have an idea of the Storage Volume, of course considering volume of sediment in the Dead/Live Storage Space. The projects would lie in different Basin/Sub-basin and need to be accordingly considered after referring to the Chapter 4.1.5 before filling up these Tables.

A5. Storage in Major Reservoir/Projects (MCM) as on 1st June (Cultivable Command Area >		**REMARKS**
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
TOTAL		

A6. Storage in Medium Reservoir/Projects (MCM) as on 1st June (CCA in between 2000 &		**REMARKS**
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
TOTAL		

A7. Storage in Minor Reservoir/Projects (MCM) as on 1st June (CCA < 2000 Hectares)		**REMARKS**
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
TOTAL		

Table A8 & A9 is related to the Storage Volume in water bodies like ponds, tanks, lakes, wetlands etc. The approximate volume of water available in these storage spaces as on 1st of June of the Water Year needs to be ascertained from the surface water area and average depth of water on the said date. Chapters 4.1.6, 4.1.7 & 4.1.8 may be referred to before filling up the data in this Table.

A8. Storage* in Ponds, Tanks (MCM) as on 1st June		REMARKS
In Basin A/ Sub-basin		
In Basin B/ Sub-basin		
In Basin C/ Sub-basin		
TOTAL		

A9. Storage* in Wetlands (MCM) as on 1st June		REMARKS
In Basin A/ Sub-basin		
In Basin B/ Sub-basin		
In Basin C/ Sub-basin		
TOTAL		

***** There is District-wise inventory of ponds, tanks, wetlands (including lakes) and other water resources available from the NWIA database available on India-WRIS and VEDAS for the entire country. The same may be used to estimate the Storage of Water in these sources. (https://vedas.sac.gov.in/vedas/node/59 & http://www.moef.gov.in/division/national-wetland-inventory-and-assessment-nwia)

Table A10 include that Water which has been added to the System through desalination of saline water from the Sea/Ocean in case of Coastal States. Such additional water volumes need to be considered in those Basin/ Sub-basin considering the location of the Desalination Plant. Chapter 4.1.9 need to be referred to while filling up this Table.

A10. Water available from Desalination Plants/ Sea Water (MCM)		REMARKS
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

Table A11 will include the total water quantity transferred through Canals etc. from water surplus Basin/Projects in other States round the Water Year. This water would also be entering through some basin/sub-basin within the State and need to be considered in that spatial unit accordingly. Chapter 4.1.4 need to be referred to before filling up this Table.

A11. Inter-basin transfers from Projects in other States (Import): (MCM)		REMARKS
In Basin A/ Sub-basin		
In Basin B/ Sub-basin		
In Basin C/ Sub-basin		
TOTAL		

Table A12 is related to the Replenishable Ground Water Storage (dynamic ground water resource). The ground water is available under the soil in aquifers whose areal extent and volume of ground water storage therein need to be apportioned to the Basin/Sub-basin scale. The quantum of ground water available for development is usually restricted to long term average recharge or Dynamic Ground Water (GW). For sustainable GW development, it is necessary to restrict the development to dynamic resources only. Static or in-storage ground water resources could be considered for development during exigencies that too for drinking water purposes. It is also recommended that no irrigation development schemes be based on static or in-storage ground water resources. In-storage computation is necessary not only for estimation of emergency storage available for utilization in case of natural extremities (like drought) but also for an assessment of storage depletion in over-exploited areas for sensitizing stakeholders about the damage done to the environment. Chapter 4.1.9 on Ground Water Resources has to be referred before filling up Table A12.

The Subsurface water exchange with neighboring basins/aquifers is assumed to be zero.

A12. *Replenishable Ground Water Resources (MCM) in Basin/Sub-basin A		REMARKS
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

*** To be apportioned from existing/ latest estimate of dynamic Ground Water Resources jointly done by CGWB & State Ground Water Department**

Treated/ Recycled Waste Water for Reuse is that water generated as waste within the System, round the Water Year, after some end-use which has been already accounted for in some form in the above sources of water, and is not an inflow into the system. So, considering that in Total Water Availability will lead to double-counting or Duplicity. Table A13 is just for monitoring purpose and Chapter 4.1.10 may be referred to for filling it up.

A13. Treated/recycled Waste Water for Reuse (MCM)		**REMARKS (For Monitoring Purpose)**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

Note. Water Quality Classification may be included in the above Tables as representative indicator of Source of Water in additional columns wherever possible/data available.

B. Tables on Utilizable Water

Not all water which is available within the State can be utilized round the year. This depends on existing land formation (topography) as a limitation towards storage of surface water (for construction of major/medium/minor reservoirs), existing hydro-geology for recharging and storing ground water, un-utilizable ground water due to contamination, water trapped as soil moisture in non-agricultural lands, water which gets evaporated from water bodies round the year, mandatory downstream releases etc. which leads to non utilization of Available Water.

Table B1 is that portion of precipitation from table A1 within the State Boundary that can be directly harvested in-situ for various local uses. For example, roof top rain water harvested for drinking purpose is an utilizable portion of the precipitation. Similarly, gain in soil moisture from the precipitation in the agricultural land in crop root zone which can be utilized for growing crops round the year (as rain-fed or natural supplement to irrigation) is also an utilizable fraction of the total precipitation.

B1. Utilization from Precipitation (From Table A1) (MCM)		**REMARKS**
Total Soil Moisture* gained through Precipitation useful for agriculture round the year		
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
Directly Harvested Precipitation for various uses round the year		
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

*Methods for estimating the soil moisture gain needs to be identified. One simple method could be to look for the satellite based soil moisture estimates available on daily basis from VEDAS portal hosted on the Space Application Centre (SAC), ISRO Ahmedabad (https://vedas.sac.gov.in/vedas/node/115)

Table B2 indicates that portion of the springs and Nallahs/small streams which is utilized or under use within the State Boundary. The glacial melts already appears in the rivers/streams & gets stored in reservoirs en-route and therefore not considered separately.

B2. Utilization from Springs, Nallahs (MCM) (From Table A4)		**REMARKS**
In Basin A/ Sub-basin		
In Basin B/ Sub-basin		
In Basin C/ Sub-basin		
TOTAL		

Tables B3 to B5 has to be filled up for the Major/Medium/Minor Projects respectively considering the abstractions from the corresponding reservoirs during the filling season and the live storage available after filling season plus the inflows during the post-filling season. The live storage water plus the Dead Storage as on 31st May (end of Water Year) would be available for the State for the next Water Year and has to be entered in Tables A5, A6 & A7.

Round the year there have been inflows to the reservoirs and withdrawals from the same and at times when the inflows may exceed the withdrawals significantly (during floods), storage may increase above the Full Reservoir Level, & then there is a need to release excess water downstream through spillways, under sluices etc. This spilled water cannot be utilized in the reservoir/project under consideration. If some projects are constructed later on, then such excess water may be stored in upstream/downstream reservoirs and utilized within the Basin/Sub-basin in the State, keeping in view the mandatory releases for downstream riparian States, ecology etc as per Tribunal Awards or Inter-State Water Sharing Agreement.

B3. Utilization of Surface Water: Major Projects* (Considering Tables A1R, A2 & A5)		**REMARKS**
Abstractions/Withdrawals during filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
Live Storage available after filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
Inflow during post filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
TOTAL		

*****similar exercise to be carried out for under construction and proposed projects after their commissioning

B4. Utilization of Surface Water: Medium Projects* (Considering Tables A1R, A2 & A6)		**REMARKS**
Abstractions/Withdrawals during filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
Live Storage available after filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
Inflow during post filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
TOTAL		

*****similar exercise to be carried out for under construction and proposed projects after their commissioning

B5. Utilization of Surface Water: Minor Projects* (Considering Tables A1R, A2 & A7)		**REMARKS**
Abstractions/Withdrawals during filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
Live Storage available after filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
Inflow during post filling season in MCM		
Projects in Basin A/ Sub-basin		
Projects in Basin B/ Sub-basin		
Projects in Basin C/ Sub-basin		
TOTAL		

*****similar exercise to be carried out for under construction and proposed projects after their commissioning

For tables B6 & B7, the utilizable surface water from ponds, tanks, wetlands etc can be assessed by considering the abstractions round the year and remaining storage as on the last day of the Water Year i.e. 31st May. Eventually, these water bodies again gets filled up during the monsoon in the next Water Year and water is available for utilization.

B6. Utilizable Surface Water: Ponds, Tanks (Considering Tables A1 & A8) (MCM)		**REMARKS**
Abstractions/Withdrawals round the year		
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
Storage* remaining after fulfilling all abstractions/withdrawals, losses etc. as on 31st May the next		
Basin A/ Sub-basin		
Basin B/ Sub-basin		

Basin C/ Sub-basin		
TOTAL		

B7. Utilizable Surface Water: Wetlands (Considering Tables A1 & A9) (MCM)		**REMARKS**
Abstractions/Withdrawals round the year		
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
Storage* remaining after fulfilling all abstractions/withdrawals, losses etc. as on 31st May the next year		
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

*There is District-wise inventory of ponds, tanks, wetlands (including lakes) and other water resources available from the NWIA database available on India-WRIS and VEDAS for the entire country. The same may be used to estimate the Storage of Water in these sources. (https://vedas.sac.gov.in/vedas/node/59 & http://www.moef.gov.in/division/national-wetland-inventory-and-assessment-nwia)

Table B8 would consist of that volume of water available from Desalination Plants after deducting any losses, if any due to leakages, evaporation etc. in respective Basin/Sub-basins.

B8. Water Utilization from Desalination Plants/ Sea Water (Considering Table A10) (MCM)		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

Table B9 indicates that portion of the Inter-Basin Transfer through Canals earmarked for the State through which it is passing. For example, a Trans-boundary canal may carry discharge for two or three recipient States and in such cases utilizable/utilized portion of water for a State is the portion earmarked for that State only.

B9. Utilization of Inter-basin Water transfers from Projects in other States (Import) (MCM) (From Table A11)		**REMARKS**
In Basin A/ Sub-basin		
In Basin B/ Sub-basin		
In Basin C/ Sub-basin		
TOTAL		

For table B10, utilizable ground water is basically the dynamic ground water resource (i.e. Replenishable annually) after deduction for annual base flow and quantity of ground water which has been contaminated. This is also called net annual ground water and need to be apportioned basin/sub-basin wise within the State Boundary.

B10. Utilizable Ground Water/ *Net Annual Ground Water in Basin/Sub-basin A: (MCM) (From Table A12)		**REMARKS**
Annual Replenishable Ground		
Natural Flows/ Base Flows (%)		
Poor Quality GW (E.C. >3000		
Net Annual Ground Water	= Annual Replenishable GW – Natural Flows – Poor Quality GW	
TOTAL		

*** To be apportioned from existing/ latest estimate of dynamic ground water resources done jointly by CGWB & State GW Dept.**

Treated water will enhance the availability of water internally (i.e. internal redistribution only) but not the total water availability of the system as it is not created or supplied into the system from outside. However, if utilizable water has been calculated by considering/setting aside bad quality water and if subsequently the quality of that untreated/used water (i.e. return flow) is improved by treatment then quantity of Utilizable Water will enhance.

B11. Water available from Treated/Recycled Waste Water minus any losses (Considering Table A13)		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

Note. Water Quality Parameters of Water Source and Permissible Water Quality for Designated End-use may be included as per data availability, while estimating Utilizable Water in the above Tables.

The various consumptive uses of water are in the field of agriculture, drinking and domestic uses for rural and urban areas including livestock consumption, municipal/commercial institutions, various industries and energy/power generation etc. Various other uses are non consumptive in nature like navigation, hydropower generation, tourism/recreation, Pisciculture etc. but there is a demand for water across all uses and sectors. The perceived demands for the Water Year need to be assessed and allocation of water is to be done based on the priority of use, utilizable water assessed and other considerations. The last five years demand and exact withdrawals/supply of water from different sources for various such uses during the last five years or so would give us an indication of the general trend of the gap between demand and supply and also the relative share of water put into various uses. The return flow/waste water generated for each of the uses also needs to be accounted for and deducted from the total withdrawals for estimating the consumptive use.

It must be kept in mind that the demand also needs to be projected/ apportioned in the same spatial unit (i.e. Basin/Sub-basin) as that of Water Availability for comparison and devising appropriate strategy e.g. supply side management or demand side management or a combination of the two depending on the situation.

C. Tables on Demand, Supply (Withdrawals) & Consumptive Use of Water

(Sector wise and Source wise: **For each Basin/Sub-basin**)

The acceptable quality of water for different consumptive uses can also be included so as to compare with the supply water quality (if available) and take suitable preventive/curative action. Please refer to Chapter 4.3 on Water Quality for this exercise.

Sector Wise Demand, Supply (Withdrawals) & Consumptive Use of Water:

C1. Farm Sector (MCM) Present Water Year from 1st June to 31st May next year (Chapter 4.2.2)									
Sub Sectors	Demand for Present Water Year *	Previous Year/ Average Annual Demand	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Return Flows **	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water/ Snow	Surface Water	Ground Water ***	**TOTAL SUPPLY**			
Agriculture Rain-fed Crops									
Agriculture Irrigated Crops									
Rice									
Wheat									
Sugarcane									
Cotton									
All other Crops									
TOTAL									
Horticulture									
Banana									
All other crops/plantations									
TOTAL									
Livestock, Birds & Others									
Fisheries & Others									
GRAND TOTAL									

* Demand can be calculated either from Direct Measurement or Crop Water Requirement and livestock population with individual demand.

** Calculations as per established methodology/assumptions

*** GW Draft can be calculated either from the number of GW abstraction structures & corresponding draft or Crop Water Requirements of each crop and extension/area of Crop (GEC Methodology)

ET/Consumptive Use from all the crops in agriculture can also be estimated and accounted for using the standard NDVI Algorithm.

(The data obtained from Village/Blocks etc should be aggregated to corresponding Basin/Sub Basin Level for Comparability with Water Availability or Utilizable Water)

Source Wise Previous Year/ Average Annual Water Supply:

C1. Farm Sector (MCM) Within the Basin/ Sub-basin A (Chapter 4.2.2)													
Source	Sub Source	Rain-fed Crops	Agriculture Irrigated Crops					Horticulture		Animal Husbandry (Livestock, Birds and Others)	Fishery & Others	**TOTAL**
			Rice	Wheat	Sugarcane	Cotton	All other crops	Banana	All other crops/ plantation			
Rain Water/ Snow	Direct Soil Moisture (useful)											
	Harvested Rain Water											
Total												
Surface Water	Glaciers											
	Springs, Nallahs											
	Major Projects											
	Medium Projects											
	Minor Projects											
	Wetlands											
	Ponds/Tanks											
	Desalinated Water/ Sea water											
	Inter Basin Transfer											
Total												
Ground Water * (Dynamic/ Static)	Dug wells (Total No. x Draft)											
	Dug cum Bore well (Total No.											
	Bore/Tube wells (Total No. x											
	Others											
Total												
Treated Waste Water												
GRAND TOTAL												

* GW Draft can be calculated either from the number of GW abstraction structures & corresponding draft or Crop Water Requirements of each crop and extension/area of Crop (GEC Methodology)

Sector Wise Demand, Supply (Withdrawals) & Consumptive Use of Water:

C2. Industry & Infrastructure (MCM) Present Water Year from 1st June to 31st May next year (Chapter 4.2.3)									
Industry/ Infrastructure (within the Basin/Sub-basin A):	Demand for Present Water Year	Previous Year/ Average Annual Demand	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water	Surface Water	Ground Water *	**TOTAL SUPPLY**			
1. Thermal Power Plants									
2. Textiles and Jute									
3. Paper & Pulp									
4. Iron & Steel									
5. Heavy Engineering/Automobile									
6. Pharmaceuticals									
7. Fertilizers									
8. Food Processing									
9. Mining									
10. Infrastructure									
11. Construction									
12. Water Transport									

13. Road/ Bus Transport									
14. Railways and Metro Rail									
15. Airports									
16. Tanneries									
17. Sugar									
18. Beverages									
19. Special Economic Zones (SEZ)									
20. Electronic Industry									
21. Chemical Industry									
GRAND TOTAL									

* GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

(The data obtained from Industries/Infrastructure located in Cities and Towns should be aggregated to corresponding Basin/Sub Basin Level for comparability with Water Availability or Utilizable Water and for appropriate strategy/decision making)

<u>Source Wise Previous Year/ Average Annual Water Supply: (for 21 types of Industries identified)</u>

C2. Industry & Infrastructure (MCM) Within the Basin/ Sub-basin A (Chapter 4.2.3)																							
Source	Sub Source	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	TOTAL
Rain Water	Direct Soil Moisture (useful)																						
	Directly Harvested Rain																						
Total																							
Surface Water	Glaciers																						
	Springs, Nallahs																						
	Major Projects																						
	Medium Projects																						
	Minor Projects																						
	Wetlands																						
	Ponds/Tanks																						
	Desalinated Water/ Sea																						
	Inter Basin Transfer																						
Total																							
Ground Water * (Dynamic/ Static)	Dug wells (Total No. x Draft)																						
	Dug cum Bore well (Total No. x Draft)																						
	Bore/Tube wells (Total No. x Draft)																						
	Others																						
Total																							
Treated Waste Water																							
GRAND TOTAL																							

* GW Draft can be calculated from the number of GW abstraction structures & corresponding draft for each Industrial Use/ Process.

Sector Wise Demand, Supply (Withdrawals) & Consumptive Use of Water:

C3. Establishments & Institutions (MCM) Present Water Year from 1st June to 31st May next year (Chapter 4.2.4)										
Establishment/Institutions (within the Basin/Sub-basin A):	Demand for Present Water Year	Previous Year/ Average Annual Deman	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water	Previous Year/ Average Annual Consumptive	Remarks
			Rain Water	Surface Water	Ground Water *	**TOTAL SUPPLY**			
1. Universities									
2. Schools									
3. Hospitals									
4. Government Office & Campuses									
5. Private Offices									
6. Hotels									
7. Restaurants									
8. Sports Establishment/ Golf									
9. Retail/Malls									
10. Convention Centre, Wedding									
11. Others									
GRAND TOTAL									

* GW Draft can be calculated either from the number of GW abstraction structures & corresponding draft for each Institution/Commercial Use or per capita consumption & population dependent on GW for commercial uses.

(The data obtained from Establishment/Institutions located in Cities and Towns should be aggregated to corresponding Basin/Sub Basin Level for Comparability with Water Availability or Utilizable Water and for appropriate strategy/decision making)

Source Wise Previous Year/ Average Annual Water Supply: (for 12 types of Establishments/Institutions identified)

C3. Establishments & Institutions (MCM) Within the Basin/ Sub-basin A (Chapter 4.2.4)													
Source	Sub Source	1	2	3	4	5	6	7	8	9	10	11	**TOTAL**
Rain Water	Direct Soil Moisture (useful)												
	Directly Harvested Rain Water												
Total													
Surface Water	Glaciers												
	Springs, Nallahs												
	Major Projects												
	Medium Projects												
	Minor Projects												
	Wetlands												
	Ponds/Tanks												
	Desalinated Water/ Sea water												
	Inter Basin Transfer												
Total													
Ground Water * (Dynamic / Static)	Dug wells (Total No. x Draft)												
	Dug cum Bore well (Total No. x Draft)												
	Bore/Tube wells (Total No. x Draft)												
	Others												
Total													
Treated Waste Water													
GRAND TOTAL													

* GW Draft can be calculated either from the number of GW abstraction structures & corresponding draft for each Institution/Commercial Use or per capita consumption & population dependent on GW for commercial uses.

Sector Wise Demand, Supply (Withdrawals) & Consumptive Use of Water:

C4. Drinking Water & Domestic Use (Rural) (MCM) Present Water Year from 1st June to 31st May next year (Chapter 4.2.5.1)									
District (Full or partial, within the Basin/ Sub-basin A)	Demand for Present Water Year = **Population x Per capita Demand**	Previous Year/ Average Annual Demand	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water/ Snow	Surface Water	Ground Water *	**TOTAL SUPPLY**			
District 1									
District 2									
District 3									
GRAND TOTAL									

* GW Draft can be calculated either from the number of GW abstraction structures & corresponding draft or per capita consumption & population dependent on GW for domestic use

(The data obtained from Districts should be aggregated to corresponding Basin/Sub Basin Level for Comparability with Water Availability or Utilizable Water and for appropriate strategy/decision making)

Source Wise Previous Year/ Average Annual Water Supply:

C4: Drinking Water & Domestic Use: Rural (MCM) Within the Basin/ Sub-basin A (Chapter 4.2.5.1)					
Source	Sub Source	District 1	District 2	District 3	**TOTAL**
Rain Water/ Snow	Direct Soil Moisture (useful)				
	Directly Harvested Rain Water				
Total					
Surface Water	Glaciers				
	Springs, Nallahs				
	Major Projects				
	Medium Projects				
	Minor Projects				
	Wetlands				
	Ponds/Tanks				
	Desalinated Water/ Sea water				
	Inter Basin Transfer				
Total					
Ground Water * (Dynamic/ Static)	Dug wells (Total No. x Draft)				
	Dug cum Bore well (Total No. x				
	Bore/Tube wells (Total No. x				
	Others				
Total					
Treated Waste Water					
GRAND TOTAL					

* GW Draft can be calculated either from the number of GW abstraction structures & corresponding draft or per capita consumption & population dependent on GW for domestic use

Sector Wise Demand, Supply (Withdrawals) & Consumptive Use of Water:

C5. Drinking Water & Domestic Use (Urban) (MCM) Present Water Year from 1st June to 31st May next year (Chapter 4.2.5.2)									
City/ Towns (within the Basin/Sub basin A)	Demand for Present Water Year = **Population x Per capita Demand**	Previous Year/ Average Annual Demand	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Waste Water Generated	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water/ Snow	Surface Water	Ground Water *	**TOTAL SUPPLY**			
City A									
City B									
City C									
Towns									
GRAND TOTAL									

* GW Draft can be calculated either from the number of GW abstraction structures & corresponding draft or per capita consumption & population dependent on GW for domestic use

(The data obtained from Cities and Towns should be aggregated to corresponding Basin/Sub Basin Level for Comparability with Water Availability or Utilizable Water and for appropriate strategy/decision making)

Source Wise Previous Year/ Average Annual Water Supply:

C5. Drinking Water & Domestic Use (Urban) (MCM) Within the Basin/ Sub-basin A (Chapter 4.2.5.2)						
Source	Sub Source	City A	City B	City C	Towns	**TOTAL**
Rain Water/ Snow	Direct Soil Moisture (useful)					
	Directly Harvested Rain Water					
Total						
Surface Water	Glaciers					
	Springs, Nallahs					
	Major Projects					
	Medium Projects					
	Minor Projects					
	Wetlands					
	Ponds/Tanks					
	Desalinated Water/ Sea water					
	Inter Basin Transfer					
Total						
Ground Water * (Dynamic/ Static)	Dug wells (Total No. x Draft)					
	Dug cum Bore well (Total No. x Draft)					
	Bore/Tube wells (Total No. x Draft)					
	Others					
Total						
Treated Waste Water						
GRAND TOTAL						

* GW Draft can be calculated either from the number of GW abstraction structures & corresponding draft or per capita consumption & population dependent on GW for domestic use.

Sector Wise Demand, Supply (Withdrawals) & Consumptive Use of Water:

C6. Forestry Sector (MCM) Present Water Year from 1st June to 31st May next year (Chapter 4.2.1)									
Sub Sectors	Demand for Present Water Year *	Previous Year/ Average Annual Demand	Previous Year/ Average Annual Supply				Previous Year/ Average Annual Return Flows **	Previous Year/ Average Annual Consumptive Use	Remarks
			Rain Water/ Snow	Surface Water	Ground Water ***	**TOTAL SUPPLY**			
1. Rain-fed Forestry									
2. Irrigated Forestry									
3. Wildlife									
GRAND TOTAL									

* Demand can be calculated either from Direct Measurement or Species Water Requirement

** Calculations as per established methodology/assumptions

*** GW Draft can be calculated either from the number of GW abstraction structures & corresponding draft or Species Water Requirements and extension/area of Forestry (GEC Methodology)

(The data obtained from District/Blocks etc should be aggregated to corresponding Basin/Sub Basin Level for Comparability with Water Availability or Utilizable Water)

Source Wise Previous Year/ Average Annual Water Supply:

C6. Forestry Sector (MCM) Within the Basin/ Sub-basin A (Chapter 4.2.1)					
Source	Sub Source	Rain-fed Forestry	Irrigated Forestry	Wildlife	**TOTAL**
Rain Water/ Snow	Direct Soil Moisture (useful)				
	Directly Harvested Rain Water				
Total					
Surface Water	Glaciers				
	Springs, Nallahs				
	Major Projects				
	Medium Projects				
	Minor Projects				
	Wetlands				
	Ponds/Tanks				
	Desalinated Water/ Sea water				
	Inter Basin Transfer				
Total					
Ground Water * (Dynamic/ Static)	Dug wells (Total No. x Draft)				
	Dug cum Bore well (Total No. x Draft)				
	Bore/Tube wells (Total No. x Draft)				
	Others				
Total					
Treated Waste Water					
GRAND TOTAL					

* GW Draft can be calculated either from the number of GW abstraction structures & corresponding draft or Species Water Requirements and extension/area of Forestry (GEC Methodology)

D. Tables on Outflow of Water from the System

The volume of water exported to other States/Countries through the Inter-basin Transfer Link after catering to certain demands in the present State need to be tabulated here as Outflow.

D1. Inter-basin transfers to other States (Export) (MCM)		**REMARKS**
Project A in Basin A/ Sub-		
Project B in Basin B/ Sub-		
Project C in Basin C/ Sub-		
TOTAL		

The total discharge flowing out of the State Boundary through various basin/sub-basins need to be entered in Table D2. Of course if the total annual water flowing out from the System through the rivers is more than the desirable amount, then the additional volume of water can be treated as Utilizable Water for the State, which is now running down because of non-storage or non-utilization or interstate water sharing commitments with the downstream states, if any.

D2. Discharge flowing out to downstream States (MCM)			**REMARKS**
		Desirable*	
Basin A/ Sub-			
Basin B/ Sub-			
Basin C/ Sub-			
TOTAL			

***** Desirable e-flow: There is no single 'best' EF methodology that can be universally applied under all circumstances. The e-flows estimates vary significantly from one method to other. The Building Block Method (BBM) is essentially a prescriptive approach, designed to construct a flow regime for maintaining a river in a predetermined condition and is also recommended by the MoEF & CC.

Outflows greater than Desirable Quantity (e.g. considering Inter-State/International Water Sharing Tribunal Award/Treaty) can be considered Utilizable Water for the State under consideration if appropriately harnessed by useful interventions within the Basins.

The Evapo-transpiration from the natural vegetation, forests etc form another large chunk of Outflow from the System. The forests and vegetation consumes water from the soil moisture and ground water storage to finally transpire them out of the system.

D3. Evapo-Transpiration * from natural dense forests, natural vegetation other than in Table C6 (MCM)		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

(When it cannot be measured, it has to be calculated basically as a difference in Mass balance to close the Water Budget)

*** If Evapo-Transpiration from forests and other natural vegetation need to be calculated, it can be carried out on the basis of NDVI (Normalized Difference Vegetation Index) at the Basin or Sub-basin scale.**

The water that is lost from the System through evaporation from water bodies would come in this Table D4 as another Outflow from the System Boundary in an annual scale.

D4. Evaporation ** from all Surface Water Bodies (MCM)		**REMARKS**
Basin A/ Sub-basin		
Basin B/ Sub-basin		
Basin C/ Sub-basin		
TOTAL		

**** Evaporation from the open water surfaces like Reservoirs, lakes, ponds, tanks and wetlands can be estimated using one of the standard methods like Pan Evaporation Method, Priestly-Taylor or any other standard and simple methods.**

Previous Year/ Average Annual Demand (D), Supply (S) and Consumption (C): Source and Sector wise in a BASIN/ SUB-BASIN A (similar tables for other Basin/Sub-basins must be prepared)

SOURCE/ Sub Source	Farm Sector (Agriculture/ Horticulture/ Animal Husbandry/ Fisheries)			Industry & Infrastructure			Establishments & Institutions			Rural Drinking Water Supply and Domestic Usage			Urban Drinking Water Supply and Domestic Usage			Forestry & Wildlife			**TOTAL (MCM)**		
	D	S	C	D	S	C	D	S	C	D	S	C	D	S	C	D	S	C	D	S	C
Rain Water (Direct useful Soil Moisture)																					
Rain Water (Directly Harvested)																					
Glaciers																					
Springs, Nallahs																					
Major Projects																					
Medium Projects																					
Minor Projects																					
Wetlands																					
Ponds, Tanks																					
Desalinated Water/ Sea water																					
Inter-Basin Transfer																					
Ground Water (Dynamic)																					
Ground Water (Static)																					
Treated Waste Water																					
TOTAL (MCM)																					

Previous Year/ Average Annual Demand (D), Supply (S) and Consumption (C): Source and Sector wise in the WHOLE STATE

SOURCE/ Sub Source	Farm Sector (Agriculture/ Horticulture/ Animal Husbandry/ Fisheries)			Industry & Infrastructure			Establishments & Institutions			Rural Drinking Water Supply and Domestic Usage			Urban Drinking Water Supply and Domestic Usage			Forestry & Wildlife			**TOTAL (MCM)**		
	D	S	C	D	S	C	D	S	C	D	S	C	D	S	C	D	S	C	D	S	C
Rain Water (Direct useful Soil Moisture)																					
Rain Water (Directly Harvested)																					
Glaciers																					
Springs, Nallahs																					
Major Projects																					
Medium Projects																					
Minor Projects																					
Wetlands																					
Ponds, Tanks																					
Desalinated Water/ Sea water																					
Inter-Basin Transfer																					
Ground Water (Dynamic)																					
Ground Water (Static)																					
Treated Waste Water																					
TOTAL (MCM)																					

GOVERNANCE:

Keeping in view the total water availability, total utilizable water, total demand/consumptive use of various sectors and total outflow and losses in the basin/sub-basins (and finally in the State) round the hydrological year, critical areas/hotspots need to be identified and appropriate strategy like supply side management or demand based management or a judicious mix of the two need to be devised by the State Government to bridge the gap considering the International/Inter-State Water Sharing Agreement and navigational requirement, e-flow etc. Water Budgeting, Water Accounting and Water Auditing thus serve as very useful tools of management.

Finally, the road map ahead and plan of action need to be elaborated here by the State for Water Governance and future Water Security, and accordingly water budgeting and water allocation need to be carried out as reflected in Chapter 10 (Dashboard).

Chapter 10: STATE/ UT WATER BUDGET/ Balance (DASHBOARD)

The totals and grand totals of Chapter 9, (basin/sub-basin wise) need to be brought here (right table) and then accumulated in the State/UT Water Budget Table (left table)
Checks: Appropriate Water Balance Checks may be applied considering the Time Scale and the Spatial Scale/ System Boundary.

STATE/UT WATER BUDGET (comprising all Basins/Sub-basins)

Total Availability (MCM)	Utilizable Water (MCM)	Consumptive Use (MCM)	Outflows (MCM)
A1. Precipitation including Snowfall	B1. Directly Harvested Rain Water + Useful Soil Moisture	C1. Farm Sector Consumptive Use	D1. Inter basin transfers (Exports)
A1R. Runoff due to precipitation	B2. Utilizable portion of Springs, Nallahs	C2. Industry & Infrastructure Use	D2. Downstream Outflows (actual) vis-a-vis desirable flow downstream*
A2. Upstream Inflows	B3, B4, B5. Utilizable portion from Major, Medium and Minor Projects	C3. Establishments & Institutions Use	D3. Evapo-Transpiration from Forests, Natural Vegetation
A3. Inflow from Glacial Melts	B6, B7. Utilizable portion from Ponds, Tanks, Wetlands	C4. Domestic Use (Rural)	D4. Evaporation from all Surface Water Bodies
A4. Inflow from Springs, Nallahs	B8. Water from Desalination Plants/ Sea water	C5. Domestic Use (Urban)	
A5, A6, A7. Storage in Major, Medium & Minor Reservoirs as on 1st June	B9. Utilizable portion of Inter-Basin Transfers	C6. Forestry & Wildlife Consumptive Use	
A8 & A9. Storage in Ponds, Tanks, Wetlands as on 1st June	B10. Utilizable Ground Water		
A10. Water available from Desalination Plants	B11. Water available from Treated/ Recycled Waste Water		
A11. Inter Basin Transfer			
A12. Net Annual Ground Water Availability			

Basin/ Sub-basin A

Total Availability (MCM)	Utilizable Water (MCM)	Consumptive Use (MCM)	Outflows (MCM)
A1. Precipitation including Snowfall	B1. Directly Harvested Rain Water + Useful Soil Moisture	C1. Farm Sector Consumptive Use	D1. Inter basin transfers (Exports)
A1R. Runoff due to precipitation	B2. Utilizable portion of Springs, Nallahs	C2. Industry & Infrastructure Use	D2. Downstream Outflows (actual) vis-a-vis desirable flow downstream*
A2. Upstream Inflows	B3, B4, B5. Utilizable portion from Major, Medium and Minor Projects	C3. Establishments & Institutions Use	D3. Evapo-Transpiration from Forests, Natural Vegetation
A3. Inflow from Glacial Melts	B6, B7. Utilizable portion from Ponds, Tanks, Wetlands	C4. Domestic Use (Rural)	D4. Evaporation from all Surface Water Bodies
A4. Inflow from Springs, Nallahs	B8. Water from Desalination Plants/ Sea water	C5. Domestic Use (Urban)	
A5, A6, A7. Storage in Major, Medium & Minor Reservoirs as on 1st June	B9. Utilizable portion of Inter-Basin Transfers	C6. Forestry & Wildlife Consumptive Use	
A8 & A9. Storage in Ponds, Tanks, Wetlands as on 1st June	B10. Utilizable Ground Water		
A10. Water available from Desalination Plants	B11. Water available from Treated/ Recycled Waste Water		
A11. Inter Basin Transfer			
A12. Net Annual Ground Water Availability			

*** Considering Existing Water Sharing Tribunal Award/Agreement (Inter State) for downstream Riparian State, International Treaty, Ecological flow, Navigation requirement etc.**

STATE/ UT WATER BUDGET (DASHBOARD)

Total Utilizable Water (MCM)			**Previous Year/ Average Annual Supply (MCM)**	**REMARKS**
Source	**Sub Source**	**Quantity**	**Supply (Withdrawal)**	
Rain Water	Directly Harvested Rain Water			
	Direct Soil Moisture (useful)			
Surface Water	Glaciers			
	Springs, Nallahs			
	Major Projects/ Reservoirs			
	Medium Projects/Reservoirs			
	Minor Projects/ Reservoirs			
	Wetlands			
	Ponds, Tanks			
	Desalinated Water/ Sea water			
	Inter Basin Transfer			
Ground Water	Dynamic			
	Static (Deep Aquifer)*			
Treated/Recycled Waste Water				
GRAND TOTAL		xxxx	xxxx	

**The quantum of ground water available for development is usually restricted to long term average recharge or Dynamic GW. For sustainable GW development, it is necessary to restrict development to the dynamic resources only. Static or in-storage ground water resources could be considered for development during exigencies that too for drinking water purposes. It is also recommended that no irrigation development schemes be based on static or in-storage ground water resources. In-storage computation is necessary not only for estimation of emergency storage available for utilization in case of natural extremities (like drought) but also for an assessment of storage depletion in over-exploited areas for sensitizing stakeholders about the damage done to the environment.*

SECTOR	Previous Year / Average Annual Demand (MCM)	Previous Year/ Average Annual Supply & Consumptive Use (MCM)		Demand for the Present Water Year (MCM)	Rain Water		**Allocation of Utilizable Water for the Present Hydrological Year** (MCM)**												
		Supply	Consumptive Use				Surface Water									Ground Water		**Treated/ Recycled Waste Water**	**TOTAL**
					Directly Harvested	Soil Moisture (Useful)	Glaciers	Springs, Nallahs	Major Projects	Medium Projects	Minor Projects	Wetland	Ponds, Tanks	Desalinated Water	Inter Basin Transfer	Dynamic	Static		
Farm Sector																			
Industry & Infrastructure																			
Establishments & Institutions																			
Domestic (Rural)																			
Domestic (Urban)																			
Forestry & Wildlife																			
GRAND TOTAL	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx

*** * Considering Existing Water Sharing Tribunal Award/Agreement (Inter State) for downstream Riparian State, International Treaty, Ecological flow, Navigation requirement etc.**
Note. An illustrative example of Water Budget is given in the Annexure

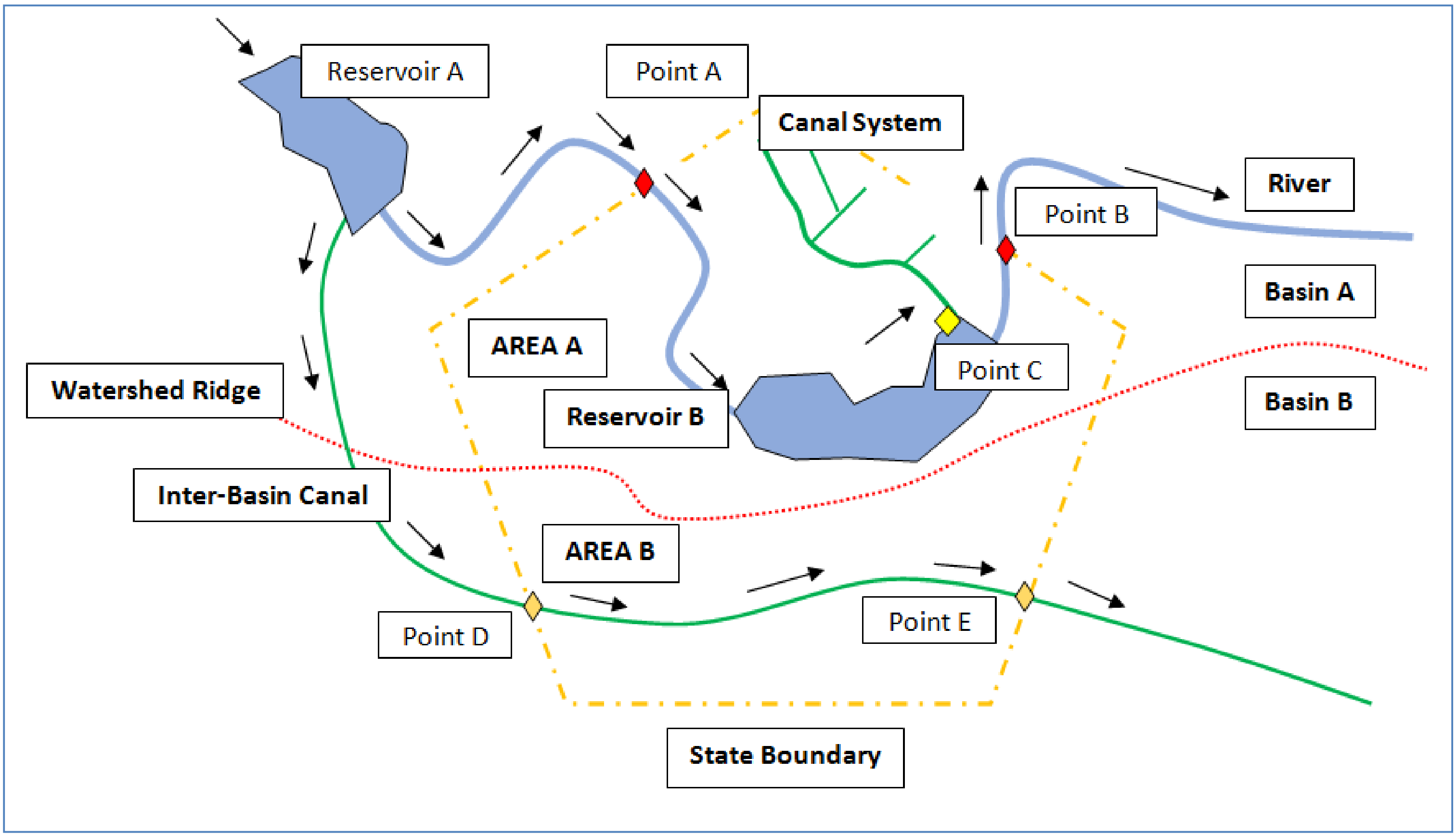

Figure 1. An Illustrative Example of Annual Water Budgeting for a State (hypothetical): Basin-wise

Legends and Assumptions:
• Area A (Intersecting Area between State Boundary and Basin A)
• Area B (Intersecting Area between State Boundary and Basin B)
• The River in Basin A is entering State Boundary at Point A and going out at Point B
• An Inter-Basin Canal is carrying water from Basin A to Basin B & is entering State Boundary at Point D and going out at Point E
• A Left Bank Canal System within the State Boundary is exiting the Reservoir B at Point C (Off take point)
• Assume, Area A1 from Point A to Point C (60000 Ha) is basically forest area which is nearly 60% of Area A and Area A2 from Point C to Point B (40000 Ha) is agricultural land which is nearly 40% of the Area A.
• Reservoir B elevation as on 1st of June = 224M i.e. 110MCM Live Storage (as per EAC Table below)
• Average GW Level in Area A1 as on 1st of June is 4.5 M below GL and equivalent GW Storage (dynamic) = 150 MCM say.
• Average GW Level in Area A2 as on 1st of June is 5.0 M below GL and equivalent GW Storage (dynamic) = 100 MCM say.
• Dynamic GW Storage Capacity is say 1000 MCM (at 1.5 M below GL) so that there is no Water Logging
• Depth of Soil in Area A1 & A2 = 2.0m; Field Capacity = 10% in area A1 & 15% in Area A2

Some more input data:

Elevation-Area-Capacity Curve of Reservoir B:

Area A (A1 + A2)		100000	Hectares (Ha)
Area B		50000	Hectares (Ha)
Average Uniform Rain in Area A	Annually	1000	mm
Average Uniform Rain in Area B	Annually	0	mm
Total Rain in Area A	Annually	**1000**	**MCM**
Total Rain in Area B	Annually	**0**	**MCM**

Reservoir B		**MCM**	**MCM**	**MCM**
Elevation	Area	Capacity	Dead Storage	Live Storage
220 (DSL)		110	**110**	0
221		125		15
222		145		35
223		175		65
224		220		110
225		290		180
226		370		260
227		470		360
228		600		490
229 (FRL)		**750**		**640**

BASIN A: (Refer to the table at the end)

- Say, the total inflow at Point A for the month of June is 200 MCM.
- Assume, Area A1 from Point A to Point C (60000 Ha) is basically Land Use - Land Cover (LULC) Type A which is nearly 60% of Area A and Area A2 from Point C to Point B (40000 Ha) is LULC Type B which is nearly 40% of the Area A.
- Assuming uniform distribution of total rainfall of 150 MCM in June, therefore, rainfall in Area A1 is 90 MCM and that in Area A2 is 60 MCM and corresponding interception losses (say, 10%) are 9 MCM and 6 MCM respectively.
- Therefore, actual effective rainfall is (90 - 9 =) 81 MCM and (60 - 6 =) 54 MCM respectively.
- Let the Directly harvested rainfall in Area A1 is 5 MCM in June, and in Area A2 it is 10 MCM in June.
- As a result of rainfall in Area A1, the runoff (the inflow to Reservoir B) is say, 45 MCM (Rainfall-Runoff Coefficient = 0.5 of total rainfall, say)
- As a result of rainfall in Area A2, the runoff at Point B (the outlet from the State) is say, 18 MCM (Rainfall-Runoff Coefficient = 0.3 of total rainfall, say)
- Assume the initial soil moisture (total) is 0 MCM in Area A1 and 0 MCM in Area A2 as on 1st June.

For Area A1 (June):

- The gain in soil moisture during June for Area A1 through infiltration = (Total Rainfall in June – Interception loss in June – Runoff from Area A1 during June – Directly harvested rain water in June) = 90 – 9 – 45 – 5 = 31 MCM.
- Similarly, the gain in soil moisture during June for Area A2 through infiltration = 60 – 6 – 18 – 10 = 26 MCM.
- Say, the actual evapo-transpiration (AET=PET in this case) from soil moisture for June is 10 MCM for Area A1. Therefore, residual soil moisture in Area A1 after June is = Initial Soil Moisture + Gain in soil moisture – ET = 0 + 31 – 10 = 21 MCM.
- Let us assume an average soil depth (unsaturated zone) as 2 M and field capacity is 10% for Area A1. That means total soil moisture holding capacity at field capacity = (60000*10^4)*2*(10/100)/10^6 = 120 MCM
- Now, when residual soil moisture is more than field capacity, then it will lead to ground water recharge. Accordingly, GW Recharge during June = 0 MCM (As, 21 MCM < 120 MCM)
- Say, initial GW storage as on 1st June for Area A1 is 150 MCM.
- Let actual ET (AET) from GW be 10 MCM during June from Area A1 and Base Flow is 10% of Ground Water Storage i.e. 10% of 150 = 15 MCM.
- Residual GW Storage at the end of June for Area A1 = Initial GW Storage + GW Recharge – ET from GW – Base Flow during June = 150 + 0 – 10 – 15 = 125 MCM
- Let initial Live Storage as on 1st June be 110 MCM in the Reservoir B.
- Evaporation loss during June= 5% of initial live storage = 5% of 110 = 5.5 MCM
- Abstraction from the Reservoir at Point C during June = 100 MCM.
- Therefore, Live Storage in Reservoir B at the end of June = Initial Live Storage + Inflow at Point A + Runoff from Point A to Point C + Base Flow – Evaporation Losses – Seepage losses (if any) – Abstraction during June = 110 + 200 + 45 + 15 – 5.5 – 0 – 100 = 264.5 MCM

- Say, Live Storage corresponding to FRL is 640 MCM, now since 264.5 < 640, therefore downstream spillage = 0 MCM.

<u>For Area A1 (July):</u>

- Say the total inflow at Point A for the month of July is 300 MCM.
- Total rainfall in the month of July in Area A1 is 150 MCM and that in Area A2 is 100 MCM and corresponding interception losses are 15 MCM and 10 MCM respectively.
- Therefore actual rainfall is (150 – 15 =) 135 MCM and (100 – 10 =) 90 MCM respectively.
- Directly harvested rainfall in Area A1 is 5 MCM in July, and in Area A2 it is 10 MCM in July.
- As a result of rainfall in Area A1, the runoff (the inflow to Reservoir B) is say, 75 MCM (=0.5*150)
- As a result of rainfall in Area A2, the runoff at Point B (the outlet from the State) is say, 30 MCM (=0.3*100)
- The initial soil moisture (total) for July is 21 MCM in Area A1 (i.e. residual soil moisture of June) as on 1st July.
- The gain in soil moisture during July for Area A1 through infiltration = (Total Rainfall in July – Interception loss in July – Runoff from Area A1 during July – Directly harvested rain water in July) = 150 – 15 – 75 – 5 = 55 MCM.
- Similarly, the gain in soil moisture during July for Area A2 through infiltration = 100 – 10 – 30 – 10 = 50 MCM.
- Say, the actual evapo-transpiration from soil moisture for July is 10 MCM for Area A1. Therefore, residual soil moisture in Area A1 after July is = Initial Soil Moisture + Gain in soil moisture – ET = 21 + 55 – 10 = 66 MCM.
- Now, if residual soil moisture is more than field capacity (120 MCM) then it will lead to ground water recharge. Accordingly, GW Recharge during July = 0 MCM (As, 66 MCM < 120 MCM)
- GW storage as on 1st July for Area A1 is 125 MCM i.e. residual GW Storage for June.
- Let actual ET from GW be 10 MCM during July from Area A1 and Base Flow is 10% of Ground Water Storage i.e. 10% of 125 = 12.5 MCM.
- Residual GW Storage at the end of June for Area A1 = Initial GW Storage + GW Recharge – ET from GW – Base Flow during June = 125 + 0 – 10 – 12.5 = 102.5 MCM
- Initial Live Storage as on 1st July is 215 MCM in the Reservoir B (residual live storage of June)
- Evaporation loss during July= 5% of initial live storage = 5% of 264.5 = 13.225 MCM
- Abstraction from the Reservoir at Point C during July = 150 MCM.
- Therefore Live Storage in Reservoir B at the end of July = Initial Live Storage + Inflow at Point A + Runoff from Point A to Point C + Base Flow – Evaporation Losses – Seepage losses (if any) – Abstraction during July = 264.5 + 300 + 75 + 12.5 – 13.225 – 150 = 488.775 MCM
- Live Storage at FRL is 640 MCM, therefore as 489 < 640, therefore downstream spillage = 0 MCM.

<u>For Area A2 (June):</u>

- The gain in soil moisture during June for Area A2 through infiltration = Total Rainfall in June – Interception loss in June – Runoff from Area A2 during June – Directly harvested rain water in June
- Therefore, the gain in soil moisture during June for Area A2 through infiltration = 60 – 6 – 18 – 10 = 26 MCM.
- Abstraction of Water during June is 100 MCM, in which irrigation water is generally 80% and the overall efficiency up to the farm is 50% (assumed). Therefore, increase in soil moisture due to irrigation water = 0.8*100*0.5= 40 MCM. (Loss of 50% is assumed to be due to evaporation 25% and seepage 25% in the distribution network)
- Evaporation Loss from Canal System = say, 25% of Irrigation Water Supplied = 0.25*0.8*100 = 20 MCM
- Seepage Loss from Canal System = say, 25% of Irrigation Water Supplied = 0.25*0.8*100 = 20 MCM which of course will add to GW Recharge in the area.
- Say, evapo-transpiration from soil moisture is 50 MCM from the Crops during June.
- Residual Soil Moisture for June = Initial Soil Moisture + Gain in Soil Moisture from Rain + Gain in Soil Moisture from Irrigation – ET (Crops) = 0 + 26 + 40 – 50 = 16 MCM
- Let us assume an average soil depth as 2 M and field capacity is 15% for Area A2. That means total soil moisture holding capacity at field capacity = (40000*10^4)*2*(15/100)/10^6 = 120 MCM
- Now, if residual soil moisture (RSM) is more than field capacity (FC =120 MCM) then only it will lead to ground water recharge. Accordingly, GW Recharge during June = 0 MCM (As, 16 MCM < 120 MCM)
- Effective GW Recharge = say, 80% of (RSM – FC) = 0 MCM; Return Flow from Irrigation = say, 20% of (RSM – FC) =0 MCM
- Initial GW storage as on 1st June for Area A2 is 100 MCM

- Let actual ET from GW be 0 MCM during June from Area A2 and Base Flow is 10% of initial Ground Water Storage i.e. 10% of 100 = 10 MCM. Therefore, return flow + base flow = 0 + 10 = 10 MCM.
- Residual GW Storage at the end of June for Area A2 = Initial GW Storage + GW Recharge – ET from GW – Base Flow during June = 100 + (0+20) – 0 – 10 = 110 MCM
- Outflow from Point B = Return Flow of Irrigation + Base Flow + 80% Return Flow of Other Uses (i.e. 20% of Abstraction for drinking/domestic uses) + Spillage from Reservoir at Point C + Runoff generated from Area A2
- Outflow from Point B during June = 0 + 10 + 0.8*0.2*100 + 0 + 18 = 44 MCM

<u>For Area A2 (July):</u>

- Runoff from Area A2 during July = 30 MCM
- The gain in soil moisture during July for Area A2 through infiltration = Total Rainfall in July – Interception loss in July – Runoff from Area A2 during July – Directly harvested rain water in July
- Therefore, the gain in soil moisture during July for Area A2 through infiltration = 100 – 10 – 30 – 10 = 50 MCM.
- Abstraction of Water during July is 150 MCM, in which irrigation water is generally 80% and the overall efficiency up to the farm is 50% (assumed). Therefore, increase in soil moisture due to irrigation water = 0.8*150*0.5= 60 MCM.
- Evaporation Loss from Canal System = 25% of Irrigation Water Supplied = 0.25*0.8*150 = 30 MCM
- Seepage Loss from Canal System = 25% of Irrigation Water Supplied = 0.25*0.8*150 = 30 MCM which of course add to GW Recharge in the area.
- Say, evapo-transpiration from soil moisture is 60 MCM from Crops during July.
- Gain in Soil Moisture from Rain = 50 MCM
- Residual Soil Moisture for July = Initial Soil Moisture (i.e. residual soil moisture from June) + Gain in Soil Moisture from Rain + Gain in Soil Moisture from Irrigation – ET (Crops) = 16 + 50 + 60 – 60 = 66 MCM
- Now, if residual soil moisture (RSM) is more than field capacity (FC =120 MCM) then it will lead to ground water recharge. Accordingly, GW Recharge during July = 0 MCM (As, 66 MCM < 120 MCM)
- Effective GW Recharge = 80% of (RSM – FC) = 0 MCM; Return Flow of Irrigation = 20% of (RSM – FC) = 0 MCM
- Initial GW storage as on 1st July for Area A2 is 110 MCM (i.e. residual GW Storage from June)
- Let actual ET from GW be 0 MCM during July from Area A2 and Base Flow as 10% of initial Ground Water Storage i.e. 10% of 110 = 11 MCM. Therefore, return flow + base flow = 0 + 11 = 11 MCM.
- Residual GW Storage at the end of July for Area A2 = Initial GW Storage + GW Recharge – ET from GW – Base Flow during July = 110 + (0+30) – 0 – 11 = 129 MCM
- Outflow from Point B = Return Flow of Irrigation + Base Flow + 80% Return Flow of Other Uses (i.e. 20% of Abstraction) + Spillage from Reservoir at Point C + Runoff generated from Area A2
- Outflow from Point B during July = 0 + 11 + 0.8*0.2*150 + 0 + 30 = 65 MCM

<u>BASIN B:</u>

- Let the monthly volume of water flowing through the IBT Canal into the State at Point D is 30 MCM.
- Let the withdrawal of water from this canal during the month of June be 10 MCM for domestic and industrial purpose and the return flow after use be 80%. Therefore, waste water generated is 8 MCM which is treated for reuse and put back into the canal.
- Therefore, the effective volume of water flowing out of the IBT Canal through Point E out of the State Boundary = 28 MCM. (30 – 10 + 8 = 28 MCM.)
- Now, if the designated share of water in the IBT Canal to downstream State be 20 MCM, then this 8 MCM (treated for reuse and put back into the canal) is utilizable for the present State (if such requirement is there in future).

MCM BASIN A	INFLOW AT POINT A	Rain in 60% Area A (Forest Area), A1	Interception Loss, say 10%	Directly Harvested Rain Water	Runoff generated from A to C	Initial Soil Moisture	Gain in Soil Moisture from Rain Water	Evapo Transpiration from Soil Moisture	Residual Soil Moisture (RSM)	If RSM > Field Capacity, then GW Recharge	Initial GW Storage	Evapo Transpiration from Ground Water	Base Flow, say 10% of Ground Water Storage	Residual GW Storage (incl. seepage loss from reservoir)	Initial Surface Water Storage (Live Storage at Start)	Spillage from Reservoir at Point C	Evaporation Loss from Reservoir, say 5% of Live Capacity at Start	Seepage loss from Reservoir = GW Recharge (say 0%)	Abstraction from the Reservoir at Point C	Residual Surface Water Storage (Live Storage at End)	Rain in 40% Area A (Agricultural Farm), A2	Interception Loss, say 10%	Directly Harvested Rain Water	Runoff generated from C to B	Initial Soil Moisture	Gain in Soil Moisture from Rain Water	Increase in Soil Moisture due to Irrigation Water	Evapo Transpiration from Soil Moisture	Residual Soil Moisture (RSM)	If RSM > Field Capacity, then GW Recharge	Effective GW Recharge (deducting return flow 20%)	Initial GW Storage	Evapo Transpiration from Ground Water	Return Flow 20% * (RSM - FC) + Base Flow 10% * initial GW Storage	Residual Ground Water (Considering recharge from SW)	Evaporation Loss from Canal System, say 25%	Seepage loss from Canal System = GW Recharge, say 25%	OUTFLOW FROM POINT B
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**
Months											**A8**				**A5**																	**A13**						
Jun	200	90	9	5	45	**0**	31	10	21	0	**150**	10	15	125	**110**	0	6	0	100	265	60	6	10	18	**0**	26	40	50	16	0	0	**100**	0	10	110	20	20	44
Jul	300	150	15	5	75	21	55	10	66	0	125	10	13	103	215	0	11	0	150	441	100	10	10	30	16	50	60	60	66	0	0	110	0	11	129	30	30	65
Aug	350	210	21	5	105	66	79	10	135	15	103	10	10	97	441	0	22	0	250	634	140	14	10	42	66	74	100	70	170	50	40	129	0	23	206	50	50	105
Sept	250	120	12	5	60	135	43	10	168	48	97	10	10	126	634	123	32	0	150	640	80	8	10	24	170	38	60	80	188	68	54	206	0	34	270	30	30	205
Oct	100	30	3	5	15	168	7	10	165	45	126	10	13	148	640	0	32	0	100	636	20	2	10	6	188	2	40	90	140	20	16	270	0	31	279	20	20	53
Nov	50	0	0		0	165	0	10	155	35	148	10	15	158	636	0	32	0	100	569	0	0		0	140	0	40	50	130	10	8	279	0	30	279	20	20	46
Dec	50	0	0		0	155	0	10	145	25	158	10	16	157	569	0	28	0	150	456	0	0		0	130	0	60	60	130	10	8	279	0	30	289	30	30	54
Jan	50	0	0		0	145	0	10	135	15	157	10	16	147	456	0	23	0	150	349	0	0		0	130	0	60	70	120	0	0	289	0	29	290	30	30	53
Feb	50	0	0		0	135	0	10	125	5	147	10	15	127	349	0	17	0	200	196	0	0		0	120	0	80	80	120	0	0	290	0	29	301	40	40	61
Mar	50	0	0		0	125	0	10	115	0	127	10	13	104	196	0	10	0	100	149	0	0		0	120	0	40	60	100	0	0	301	0	30	291	20	20	46
April	50	0	0		0	115	0	10	105	0	104	10	10	84	149	0	7	0	0	202	0	0		0	100	0	0	50	50	0	0	291	0	29	262	0	0	29
May	50	0	0		0	105	0	10	**95**	0	84	10	8	**65**	202	0	10	0	0	**250**	0	0		0	50	0	0	50	**0**	0	0	262	0	26	**236**	0	0	26
Total	**1500**	**600**		**25**			**215**	**120**				**120**					**230**		**1450**		**400**		**50**			**190**		**770**								**290**		**787**
Tables	**A2**	**A1**		**B1**	**A1R**		**B1**	**D3**				**D3**		**B11**			**D4**		**B3**	**B3**	**A1**		**B1**	**A1R**		**B1**		**C1**							**B11**	**D4**		**D2**

BASIN B	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	**Total**	**Tables**
IBT Canal Inflow (Import)	30	30	30	30	30	30	30	30	30	30	30	30	**360**	**A12**
Withdrawal for Use	10	10	10	10	10	10	10	10	10	10	10	10	**120**	**C2**
Outflow (Export)	28	28	28	28	28	28	28	28	28	28	28	28	**336**	**D1**
Return Flow	8	8	8	8	8	8	8	8	8	8	8	8		