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:

$$\textbf{Specific Water Consumption};\ (m^3/kg \text{ or tonne}) = \frac{\text{Volume of water consumed by the Pulp \& Paper unit, } (m^3)}{\text{(Total Production by the unit), (kg or tonne)}}$$

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**:

$$\textbf{Water Intensity};\ (m^3/1000\ Rs \text{ or } m^3/US\$) = \frac{\text{Volume of water consumed by the Industry, } (m^3)}{\text{(Unit value added by Paper production), (1000 Rs or US\$)}}$$

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

	WF $_{\text{Supply Chain}}$	**WF** $_{\text{Operations}}$	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