

## 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
  - o Notified forest area (Annexure – 4.2.1.1 A)
  - o Area under forest covers (Annexure – 4.2.1.1 B)
  - o 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 1<sup>st</sup> 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					
<b>Total (MCM)</b>					

**Forest Division Wise -Water Budget (June 1 – May 31) (As on 1<sup>st</sup> 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					
<b>Total (MCM)</b>					

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

<b>C6. Forestry Sector (MCM) Present Water Year from 1<sup>st</sup> June to 31<sup>st</sup> May next year (Chapter 4.2.1)</b>									
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 ***	<b>TOTAL SUPPLY</b>			
1. Rain-fed Forestry									
2. Irrigated Forestry									
3. Wildlife									
<b>TOTAL</b>									
<b>GRAND TOTAL</b>									

\* 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:**

<b>C6. Forestry Sector (MCM) Within the Basin/ Sub-basin A (Chapter 4.2.1)</b>					
Source	Sub Source	Rain-fed Forestry	Irrigated Forestry	Wildlife	TOTAL
Rain Water/ Snow	Direct Soil Moisture (useful)				
	Directly Harvested Rain Water				
<b>Total</b>					
Surface Water	Glaciers				
	Springs, Nallahs				
	Major Projects				
	Medium Projects				
	Minor Projects				
	Ponds/Tanks				
	Wetlands				
	Desalinated Water/ Sea water				
	Inter Basin Transfer				
<b>Total</b>					
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				
<b>Total</b>					
Treated Waste Water					
<b>GRAND TOTAL</b>					

\* 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.

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

(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 Harvesting (RWH)	River/ Stream	Spring/ Nala	Watershed/W etlands	G. Water	Precipitation/ 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					