Report Code: 014_GBP_IIT_EQP_S&R_04_Ver 1_Dec 2011

Pulp and Paper Industries in Ganga River Basin:

Achieving Zero Liquid Discharge

GRB EMP : Ganga River Basin Environment Management Plan

by

Indian Institutes of Technology

IIT Bombay | IIT Delhi | IIT Guwahati | IIT Kanpur | IIT Kharagpur | IIT Madras | IIT Roorkee

Preface

In exercise of the powers conferred by sub-sections (1) and (3) of Section 3 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government has constituted National Ganga River Basin Authority (NGRBA) as a planning, financing, monitoring and coordinating authority for strengthening the collective efforts of the Central and State Government for effective abatement of pollution and conservation of the river Ganga. One of the important functions of the NGRBA is to prepare and implement a Ganga River Basin: Environment Management Plan (GRB EMP).

A Consortium of 7 Indian Institute of Technology (IIT) has been given the responsibility of preparing Ganga River Basin Environment Management Plan (GRBEMP) by the Ministry of Environment and Forests (MoEF), GOI, New Delhi. Memorandum of Agreement (MoA) has been signed between 7 IITs (Bombay, Delhi, Guwahati, Kanpur, Kharagpur, Madras and Roorkee) and MoEF for this purpose on July 6, 2010.

This report is one of the many reports prepared by IITs to describe the strategy, information, methodology, analysis and suggestions and recommendations in developing Ganga River Basin: Environment Management Plan (GRB EMP). The overall Frame Work for documentation of GRBMP and Indexing of Reports is presented on the inside cover page.

There are two aspects to the development of GRB EMP. Dedicated people spent hours discussing concerns, issues and potential solutions to problems. This dedication leads to the preparation of reports that hope to articulate the outcome of the dialog in a way that is useful. Many people contributed to the preparation of this report directly or indirectly. This report is therefore truly a collective effort that reflects the cooperation of many, particularly those who are members of the IIT Team. Lists of persons who have contributed directly and those who have taken lead in preparing this report is given on the reverse side.

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1. Prologue

The water quality in the rivers in the Ganga basin is largely affected by pollution from domestic, industrial and other sources. Significant quantities of industrial effluents are transported by the rivulets namely Dhella, Bahella, Kosi, Pilakhar, Kalyani, Baigul and Gola to river Ramganga. It is estimated that the total wastewater discharge directly or indirectly into the river Ramganga from Uttarakhand and Uttar Pradesh is ≈162 and ≈74 MLD respectively. This discharge not only affects the water quality of the river Ramganga but also adversely impacts river Ganga downstream of the confluence of the two rivers. Similarly, in the catchments of river Kali (East), 73 major industrial units discharge ≈86 MLD of wastewater bringing in an estimated 13,000 TPD of BOD load in the river system. River Kali meets river Ganga a few kilometres after the confluence of rivers Ganga and Ramganga at Kannauj, and further degrades water quality of the river Ganga.

Pulp and paper Industries, particularly the agro based, are one of the major contributors in polluting rivers Ramganga and Kali, and hence the river Ganga. Out of the total wastewater discharge into the river Ramganga from Uttarakhand and Uttar Pradesh, pulp and paper sector contributes about 146 MLD (90%) and 39 MLD (53%) respectively. It has also been estimated that out of the total wastewater discharge into the river Kali (East) system, contribution from 15 pulp and paper industries located in Uttar Pradesh is about 37 MLD.

The pulp and paper industries located in the clusters in Kashipur, Muzaffarnagar, Meerut and Moradabad are manufacturing a variety of unbleached and bleached grade of paper and paper products using agro residues, waste paper and imported pulp. The main varieties of paper produced are writing and printing paper, kraft paper, duplex board and newsprint. The scale of operation varies from 25 to 250 TPD with the use of either single or multiple paper machines. The mills having pulp mill capacity above 100 TPD and producing bleached variety of paper have already installed chemical recovery plant for black liquor while other mills making unbleached kraft paper from agro residues are operating without chemical recovery plant. All mills generally have effluent treatment facilities comprising primary clarifier, aeration system and secondary clarifier. The performance efficiency of existing effluent treatment plants (ETPs), however, is highly variable and is generally unsatisfactory.

2. Proposed Water Management Strategy

A team of scientists and engineers from IIT Delhi, IIT Kanpur, IIT Roorkee and CPPRI Saharanpur conducted a detailed study, sponsored by the Central Pollution Control Board (CPCB) New Delhi, in the identified clusters of pulp and paper industries in Uttar Pradesh and Uttarakhand. The study involved collection of secondary data, representative primary data, meetings and workshop with various stakeholders, visits to some pulp and paper industries within the identified clusters as well as those which are outside the study area but following some of the best practices. A detailed report covering (i) background, (ii) objectives and methodology, (iii) inventory and status of pulp and paper mills in the identified clusters, (iv) cleaner technology and best practices options for overall

improvement with selected case studies, (v) water consumption benchmarks and strategies for minimizing water consumption, (vi) feasibility of setting up common chemical recovery plant (CCRP) and common effluent treatment plant (CETP), and (vii) action plan for wastewater management is presented elsewhere (Report No.: 023_GBP_IIT_EQP_ANL_01 Ver 1_Sep 2011).

In order to improve the health of the rivers in the Ganga basin, discharge of pollutants in the river channels needs to be stopped. Also, the trade effluent could be viewed as a source of water that can be used for various processes. Management of water in the pulp and paper mills needs a two prong action plan. First is to reduce water consumption through process improvements and implementation of recycle and reuse of water. Second is to have quantum improvement on the individual ETPs by adding tertiary treatment units. This would result in producing industry grade water from excess back water discharged from various processes within the industry.

At present there seem to be inadequate control on the quantity of water used and wastewater discharged from the pulp and paper industries of the study region due to availability of water and lack of implementation of polluter pays principle. These are the main de-motivating factors responsible for conservation of water in most of the industries. Hence a strict metering of the water used and wastewater generation is recommended. Proposed wastewater management strategies for wastepaper based and agro based mills are illustrated in Figure 1.

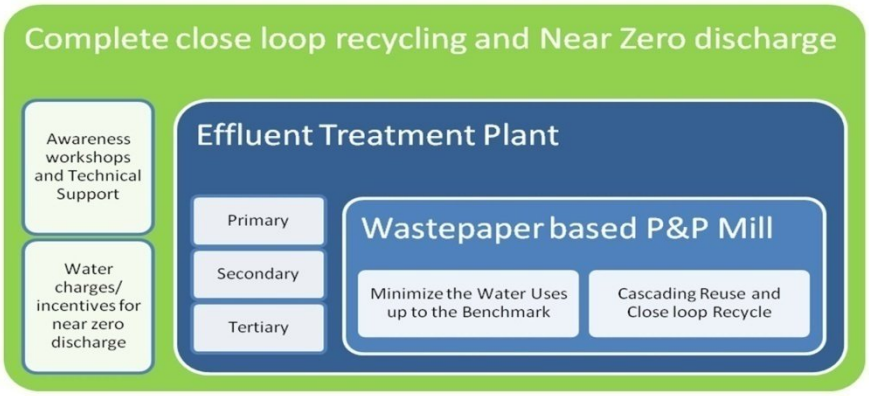

Figure 1: Proposed Water Management Strategy for the Pulp and Paper Mills

A survey was conducted in the study region to assess the existing water consumption for different operations in various industries. Also, a one day brainstorming meeting was conducted in order to synthesize the information on the best achieved water consumption in different categories of the mills within and outside the study region. Based on the consultation with the industries and the sector experts, the benchmarks for water consumption in the four different categories of pulp and paper industries were set. Table 1 presents the summary of results on four different estimates on water consumption based on field survey and outcome of the brainstorming.

Several technological and process improvements are plausible to reduce net water abstraction from natural sources and thereby also reduce the amounts of effluents generated. Suggested technological up-gradation/measures for reduction in water consumption for achieving the benchmark are mentioned in Table 2.

Table 1: Water requirements for four different categories of the pulp and paper mills

Category	Existing Water Consumption m^3 / T paper (Average)	Achievable Water Consumption m^3 /T paper* (Average)	Best Achieved Water Consumption m^3 /T paper (Average)	Bench mark for water Consumption m^3 /T paper (Average)
A1: Agro Based *Writing & printing paper mills*	**100**	**80**	**60**	**50**
A2: Agro Based *Kraft paper mills*	**75**	**45**	**45**	**30**
B1: RCF Based *Writing & printing paper, Duplex board, newsprint*	**50**	**20**	**30**	**20**
B2: RCF based *Kraft paper mills*	**35**	**10**	**15**	**10**

** as per discussions with the representatives of the pulp and paper industries*

Table 2: Technological up-gradation/measures for reduction in water consumption for four different categories of industries

Category	Technological Up-gradation/ Adoption
A1: Agro Based *Writing & printing paper mills*	• Effective raw material washing/cleaning • Use of Continuous Digester (CD) for cooking of raw materials. • Adoption of Screw press/belt filter press for black liquor extraction followed by 2-3 stage Brown Stock Washer(BSW) • Adoption of Oxygen delignification • Adoption of Elemental Chlorine free (ECF) Bleaching • Oxygen/peroxide reinforced alkali extraction in bleaching process • Installation of PDF for fibre recovery as well as increased reuse of back water. • Use of self cleaning, oscillating type high pressure showers at paper machine
A2: Agro Based *Kraft paper mills*	• Effective Raw material washing/ cleaning • Installation of screw press with 2-3 stage Brown Stock Washer(BSW) • Installation of Chemical Recovery process(individual or common) • Installation of fibre recovery unit for paper machine back water • Self-cleaning, oscillating type high pressure showers at paper machine
B1: RCF Based *Writing & printing paper, Duplex board, newsprint mills*	• High Consistency pulper/Drum Pulper for imported waste paper • Replacement of Decker thickner with pressurised drum washer • Hydrogen Peroxide bleaching • Replacement of Potcher washers with 2 stage Brown Stock Washer(BSW) • Fibre recovery unit for paper machine back water • Self cleaning, oscillating high pressure shower at paper machine
B2: RCF Based *Kraft paper mills*	• Installation of high consistency pulper /Drum Pulper • Replacement of Decker Thickener with pressurised Drum washers • Fibre recovery unit for paper machine back water • Self Cleaning, Oscillating High Pressure shower at paper machine

3. Feasibility of CETPs

Table 3 presents the comparison of two options for treatment of pulp and paper effluents namely, effluent treatment at each industry (ETP) and effluent treatment in a common effluent treatment plant (CETP) for a group of industries in vicinity. The trade of is between the cost and efficacy of effluent treatment in a number of small size ETP within the premises of each industry and economy of scale and better management of CETP for a group of industries. As can be seen from the comparison of the estimated cost of treatment in ETP and CETP (refer last two columns in Table 3), the advantage of economy of scale is not applicable for the four clusters of Pulp and Paper industries under study in the Ganga Basin. In addition large length of conveyance system due to distant location of the industries would require substantial investment on conveyance (refer column 4 of Table 3) system. In addition the pumping cost, though much less in comparison to other costs, will increase the operation and maintenance burden on each of the industries. Further, the CETP option will discourage the industry to adopt recycling of treated water due to additional cost of conveying treated water back to the industry. This would act as a deterrent to move towards the concept of zero discharge. Based on the aforementioned information and arguments it can be inferred that the option of collecting effluents and treating in CETP is infeasible for the identified clusters in the Ganga Basin

Table 3: Comparison of ETP and CETP options for different clusters of Pulp and Paper Industries in the Ganga Basin

CETP	No. of Mills	Range of Quantity of Effluent Generated from each mill, MLD	Estimated Discharge to CETP, MLD	Conveyance System		Estimated Cost, ₹/m^3	
				Distance, km	Estimated Capital Cost, ₹ in lacs	ETP	CETP
Cluster I: Kashipur							
I A	15	2.5 - 25	38.8	51	1500 – 2500	10-15	10
I B	03	1 - 3	4.7			15	15
I C	03	1 - 3	5.0			15	15
I D	03	1 - 5	10.2			15	12
Cluster II: Muzaffarnagar							
II A	8	3 - 10	40.0	25	750 – 1250	10 - 14	10
	7	CETP Option Impractical					
	2	CETP Option Impractical					
	6	CETP Option Impractical					
Cluster III: Meerut							
III A	2	5 - 6	11	3	90 – 150	12	12
	3	1 - 3	07			15	13
	3	CETP Option Impractical					
Cluster IV: Moradabad							
IV A	4	1 - 3	5.9	3	90 – 150	15	14

4. Feasibility of Zero Discharge Paradigm

The typical characteristics of raw water used and effluent discharged from four different categories of industries are shown in Table 4. The individual industries are required to shift towards a near zero discharge paradigm. The financial implications of achieving zero liquid discharge have been worked out separately for the agro based and RCF as follows.

A - Agro Based: In this case two types of liquid wastes are generated. Black liquor is to be sent to the CRP while other effluents to be sent to the Effluent Treatment Plant (ETP) within the industry. The concept of CCRP is feasible for smaller mills within a cluster of industries while larger mills can have separate CRP. The ETP is to produce two types of industry grade water. The water required for pulp production for manufacturing of unbleached kraft paper should be used tertiary treated back water/wastewater without control on TDS while that required for other processes should include RO process as part of tertiary treatment. However, the reuse of back water/wastewater into process in mills manufacturing bleached grade quality paper will involve the application of RO process as a part of tertiary treatment for removal of colour. Thus cost of attaining zero discharge paradigm will involve (i) cost incurred in treating black liquor in CRP or CCRP as the case may be, (ii) cost of producing industry grade water from effluent without control on TDS for pulp production, and (iii) cost of producing industry grade water with TDS control of the balance effluent.

B - RCF Based: In this case part or all of the effluent may have to be tertiary treated to produce industry grade water with TDS control. Thus cost of attaining zero discharge paradigm will involve cost of producing industry grade water with tertiary and partly with RO treatment of the total effluent. The treatment can be done in ETPs installed in each industry or CETP. The option of CETP is not considered feasible due to (i) the amount of effluent generated in each of the industry is not small to make individual ETPs unviable, and (ii) the industries within the cluster are not close by and hence the cost of conveying effluents to the CETP and the cost of conveying industry grade water from CETP to each of the member industry is very high.

Table 4: Typical characteristics of water and wastewater from four different categories of industries

Parameters	Raw Water	Effluent			
		A1: Agro Based *Writing & printing paper mills*	**A2: Agro Based** *Kraft paper mills*	**B1: RCF Based** *Writing & printing paper, Duplex board, newsprint mills*	**B2: RCF Based** *Kraft paper mills*
pH	7.5 -7.8	7.0 -7.8	6	6.8 -7.3	6
TDS, mg/l	290	1100-6800	1560	800-1720	840-3240
TSS, mg/l	Nil	384-1950	466	160- 4387	56-680
COD, mg/l	Nil	776-5048	1010	262-1715	704-2016
BOD, mg/l	Nil	450-2234	543	180- 958	593-1058
Colour, RCO	Nil	800-1200	-*	-	-
Turbidity, NTU	Nil	35-19	106	2 -35	22- 299
Hardness, mg/l as $CaCO_3$	180 -185				

** Mills are using RCF only at present*

The capital and operation and maintenance cost of effluent treatment plants can be estimated based on information gathered from existing sewage and effluent treatment plants (STPs and ETPs) in India (reference report 003_GBP_IIT_EQP_S&R 02 Ver 1_Dec 2010). Three stage treatment, consisting of preliminary/pre treatment, primary and secondary treatment, and tertiary treatment without and with RO treatment as the case may be, has been considered to achieve industry grade water from effluents discharged with characteristics as reported in Table 4. The estimated costs are given for various ranges of capacities assuming 2010 as base year. The estimated costs for different capacity ranges are presented in Table 5.

Table 5: Estimated Capital and Operation and Maintenance Costs for ETPs

Capacity, *MLD*	**Treatment Cost up to Tertiary Treatment without RO , ₹/m^3** *(including capital, O & M, and Reinvestment Cost assuming 15 Years Life of ETP as on 2010)*	**Treatment Cost up to Tertiary Treatment with RO , ₹/m^3** *(including capital, O & M, and Reinvestment Cost assuming 15 Years Life of ETP as on 2010)*
0 – 5	15	100
5 - 20	15-10	100
> 20	10	100

Note: Actual cost will be technology and location specific

Estimated production costs for different grades of paper as obtained from informal market survey and discussions with some of the industry persons are given in Table 6.

Table 6: Estimated Production Cost and Selling Price for different grades of paper

Grade of Paper	**Production cost** *₹/ T paper*	**Selling Price** *₹ / T paper*
A1: Agro Based *Writing & printing paper*	32000 – 34000	38000 – 40000
A2: Agro Based *Kraft paper (100 % agro)*	19000 – 20000	23000 – 24000
B1: RCF Based *Writing & printing paper*	32000 – 33000	35000 – 36000
B2: RCF Based *Kraft paper*	22000 – 22500	23000 – 24000

Estimated costs of water reuse/recycle after tertiary treatment in a typical 25 TPD paper and pulp mill of four different categories are presented in Table 7. The estimated costs are based on the assumption that new treatment plants would be built by the industry, and hence the estimates are slightly on the higher side. The estimates are thus very conservative and meant for supporting policy decisions. If the existing effluent treatment infrastructure in each industry is taken into account, the percentage increase in the average production cost may marginally decrease. However, this decrease can be worked out through detailed design and estimates for each case and may not reflect in the crude estimates used in preparing this report.

Table 7: Estimated cost of water reuse/ recycle after tertiary treatment in a typical mill of capacity of 25 TPD paper and pulp mill

Category of Mill	Achievable Water Consumption m^3/T paper* (Average)	Average Production Cost ₹/ T paper	Estimated Cost, ₹/ T paper			Percentage Increase in the Average Production Cost
			Chemical Recovery from Black Liquor Using CRP/CCRP	Complete Recycling of Effluent	Attaining Zero Discharge Paradigm	
A1: Agro Based *Writing & printing paper*	80	33000	163	1,200 (5,875)#	1,363 (6,038)#	4.1 (18.3)#
A2: Agro Based *Kraft paper*	45	19500	163	675 (3,225)$	838 (3,388)$	4.3 (17.4)$
B1: RCF Based *Writing & printing paper, Duplex board, newsprint*	20	32500	Not Applicable	300 (2,000)*	300 (3,000)*	0.9 (6.2)*
B2: RCF Based *Kraft paper*	10	22250	Not Applicable	150 (1,000)*	150 (1,000)*	0.7 (4.5)*

 # Considering 25 and 55 m^3/T paper *without and with RO treatment respectively; $ Considering 15* and 30 m^3/T paper *without and with RO treatment respectively; *Considering RO treatment; Cost of recovery of solids from RO Reject on drying is included in the RO treatment*

Note: This analysis does not include the water charges and expenses levied on the fresh water use. Inclusion of that will further increase the economy of reuse/recycle.

Following observations and comments can be made based on the information given in Table 7.

1) Increase in average production cost for B1 and B2 categories of industry is in the range of 4 – 6 %. This analysis shows that the cost of tertiary treatment of the trade effluent is not prohibitive and is technically feasible. Achieving zero liquid discharge by all categories of the pulp and paper industries thus implies only an increase in cost of the paper production by a few percent of the production cost for B1 and B2 category of industry and must be enforced to save the precious resources like river Ganga in particular and Ganga system in particular. The implementation of this may result in slight reduction in profit margin or alternatively the cost will be passed on to the consumers. Thus it is strongly recommended that the "polluter pays principle" must be strongly adhered to achieve zero discharge paradigm in case of the pulp and paper industries. This will immensely help saving the rivers, in particular the river Ganga, from adverse impacts without significant impact on the industry or economy or employment opportunities.

2) Increase in average production cost for A1 and A2 categories of industry to attain zero discharge paradigm is in the range of 17-19 %. This is on the higher side. However, in

the nations' larger interest zero discharge paradigm must be enforced to protect rivers like Ganga, and the Ganga system. At the same time these category of industry are important from several considerations including utilization of renewable agro based residues that will otherwise be burnt and create air pollution problems. Hence closure of these types of industry is not in the larger interest.

5. Justification for Tertiary Treatment and Implementing Zero Discharge Concept

Pulp and paper Industries, particularly the agro based, are one of the major contributors in polluting rivers Ramganga and Kali, and hence the river Ganga. Out of the total wastewater discharge into the river Ramganga from Uttarakhand and Uttar Pradesh, pulp and paper sector contributes about 146 MLD (90%) and 39 MLD (53%) respectively. It has also been estimated that out of the total wastewater discharge into the river Kali (East) system, contribution from 15 pulp and paper industries located in Uttar Pradesh is about 37 MLD. The experience of effluent treatment to specified standards has been highly unsatisfactory and the National River Ganga continues to get polluted.

Unlike the western countries, rain fall in India is highly uneven and occurs essentially during monsoon season which is spread over not more than 90 days. This results in very low flows during the lean period. The effluent discharge standards implemented so far are based on the premise that the back ground river water quality is very good and at least 10 times dilution is available. However, these conditions are not met in most of the Indian rivers including Ramganga and Kali in which treated/partially treated/untreated industrial and domestic effluents are discharged. As such it is essential that treatment up to tertiary level is made mandatory. Further, over exploitation of ground water has resulted in decrease in the base flow during lean period. If the current trend of ground water exploitation continues, it is likely that many rivers of the Ganga Basin may dry during the lean period. Thus it is essential that ground water abstraction is reduced through efficient water uses and recycling of industrial effluents. This is plausible through implementation of the concept of zero discharge. Also, it is relatively easy to monitor and implement the zero discharge paradigm compared to monitoring the quality of discharge from the industries by the regulating agencies. Thus in long term perspective in the larger interest of the nation and saving rivers from drying and getting polluted, it is essential to implement the zero discharge paradigm for industrial effluents in general, and pulp and paper industries in the Ganga Basin in particular.

6. Design, Build and Operate (DBO) Model for ETPs within the Industry

The past experiences reveal that most of the ETPs perform much bellow the expected level and most of the times effluent discharge norms are violated. Number of reasons, including lack of knowledge and expertise to manage the ETPs, has been cited by the

industry for poor performance. Also the regulating agencies, such as State Pollution Control Boards (SPCBs), have cited many reasons including lack of resources and man power for enforcing the regulations and taking actions for unabated pollution of rivers due to discharge of industrial effluents. In several instances, as shown in the case of pulp and paper industries, causes beyond technical and financial are responsible for unabated pollution of rivers.

Experience with other industrial sectors, particularly in water scarce areas, suggests that third party involvement and ETPs producing industrial grade water have been performing well. As such it is recommended that ETPs are planned on design, build and operate (DBO) model with the involvement of a company floated by the Association of Industries. This company will be responsible for managing the effluent recycling plants through service provider using DBO model and will receive funds in the beginning of the year from each of the industry towards supply of treated water of industrial grade produced from effluents discharged by the same industry. The ETPs will be in the premises of the industry. Land for the ETP is to be provided by the industry. The service provider will get the payment based on quantity of industrial grade water produced from the effluents on monthly basis. Renewing consent to operate the industry may be linked to deposition of funds in the accounts of the company floated by the Association of Industries by the member industries.

7. Action Plan for Zero Discharge Paradigm

S No	Action		Time Frame	Monitoring Mechanism
I.	**Process improvement and Water use Benchmarks**			
	Installation of the meters for water uses and effluent generated Flow measuring devices should be installed for input water as well as at the outlet of the treatment plant. These flow devices should be of properly calibrated V notch with arrangements for automatic measurement of head. Additional electronic or other type of flow meters may also be installed. Arrangements should be made for real time display of measured (both current and monthly cumulative) flows at prominent places		4 months	Checking of the installation of water meters for water withdrawal and effluent discharge points by SPCBs
	Achieving the Benchmark		6 months	Monthly check by SPCBs + Random check by CPCB Monthly check by SPCBs + Random check by CPCB Monthly check by SPCBs + Random check by CPCB + Water, Energy and Waste Audit by Third Party, every six months + Annual check by an Independent Monitoring Committee
	Short-term standards-Best Achieved			
	Category A1- Agro based writing-printing paper (Bleach Variety) mills	60m^3/T		
	Category A2: Agro–based Kraft paper mills	45 m^3/T		
	Category B1: Waste paper based writing-printing paper mills	30 m^3/T		
	Category-B2: Waste paper based Kraft paper mills	15 m^3/T		
	Benchmark standards		18 months	
	Category A1: Agro based writing-printing paper (Bleach Variety) mills	50 m^3/T		
	Category A2: Agro–based Kraft paper mills	30 m^3/T		
	Category B1: Waste paper based writing-printing paper mills	20 m^3/ T		
	Category B2: Waste paper based Kraft paper mills	10 m^3/ T		
II.	**Improved ETP with tertiary treatment** The Treated wastewater should be reused for industrial purpose. The suggested unit operations include: Screen (Coarse followed by medium/fine) -> Equalization tank -> Primary clarifier (plate/ tube settler) Biological treatment with coagulation – flocculation -> Micro-filter and/or Pressure Sand Filter (part wastewater be recycled) -> RO for partial or full stream as the case may be with recovery of solids from reject water by drying.		18 months	ETPs to be managed by the Company formed by Association of Industries. Consent to operate the industry is to be given only on advance payment to the company. DBO model is to be applied for ETPs. Service provider is to be paid on the basis of quantity of treated water produced from the effluents of each of the industries from the ETPs operated within the premises of the industry. **Limits on Fresh Water uses (fresh water to be used only as make-up water)**
III.	**CRP/ CCRP**		24 months	Design check by SPCB/CPCB After implementation: Monthly check by SPCBs + Random check by CPCB + Audit by an Independent Party

8. Highlights

- Pulp and Paper Industries, both agro and RCF based, are important for growth and development.
- Shifting towards zero liquid discharge paradigm is feasible and must be implemented to save rivers and help maintain “Nirmal and Aviral Dhara”.
- Improvements in technology and following best practices can lead to substantial reduction in water consumption and lower the cost of attaining zero discharge paradigm.
- Black liquor from agro based pulp and paper industries must be sent to CCRP for smaller units (< 100 TPD). Larger units may be allowed to have their own CRP.
- ETPs must be upgraded to tertiary level treatment. Some or all, depending on requirement, tertiary treated water may have to be treated using RO.
- The cost of treatment up to tertiary treatment including RO treatment may increase the production cost only by 4-6 % for RCF based industries and must be enforced.
- The cost of treatment up to tertiary treatment including RO treatment may increase the production cost by 17-19 % for agro based industries, but also must be enforced. However, some concessions may be offered to promote agro based industries.
- CETPs do not appear to be viable for Pulp and Paper Industries in the identified clusters in the Ganga River Basin. However, all ETPs are to be managed by a company formed by association of industries.
- Renewing consent for operating the industry may be linked to annual advance payment to the company for producing industry grade water by operating state-of-the-art ETP in each industry.
- DBO model may be applied for all ETPs. Service provider is to be selected by the company and paid on the basis of quantity of industry grade water produced from the effluents.
- Flow meters to be installed at the inlet and outlet of each ETP.
- Industries are allowed to take fresh water only to make up for the losses due to evaporation, minor leakages, etc.
- The suggested action plan is to be implemented within 24 months.