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The Plight of River Pollution in Andhra Pradesh

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INTRODUCTION

Most of the surface waters in India, including both rivers and lakes, are getting increasingly polluted due to onslaught of human activities of diverse nature.[4] Though, several steps have been taken on a broader front including National River and Lakes Conservation Plans, but the quality of the water resources seems to be far from satisfactory. This is mainly due to the lack of coordination between various governing bodies and proper operation and maintenance of treatment plants, and various other factors like reluctance of people and frequent failures of electricity due to which untreated sewage or industrial wastes directly discharged into the water bodies. The National River Conservation Directorate has no satisfactory mechanism to see that the installed effluent treatment plants work well. In fact, the quality of waters has shown deterioration in past few years at several places.[5] Andhra Pradesh, with 10 polluted river stretches,[6] is at the top of the list in South India with the most number of polluted rivers. Tamil Nadu and Karnataka follow with nine and eight polluted river stretches respectively.[7] This article is intended to focus on the status of pollution particularly in the rivers of Andhra Pradesh and to substantiate the reasons for the unfortunate state of affairs and emphasize on the need for restoration of water quality in these rivers.

RIVERS OF ANDHRA PRADESH

The major rivers in Andhra Pradesh are Godavari, Krishna, Tungabhadra, Pennar, Manjira, Nagavali, and Vamsadhara. All the rivers in Andhra Pradesh are basically rain dependent and they have large currents in rainy season and low currents in summer. Some rivers are even dry in summer.[8] The Krishna and Godavari rivers are the largest and broadest in South India. In Andhra Pradesh all the rivers generally flow from northwest to southeast. Except Godavari, Pennar, Krishna, Tungabhadra, Bhima, Manjeera, Pranahita, all rivers have their source at East mountainsides and destination at Bay of Bengal. The Deccan Rivers (Godavari and Krishna) contribute about 30 % of the total out flow in India. Of this, the rivers that flow from the west to east account for 20 % and those from the east to west about 10 %.[9]

Water quality management is one of the many environmental problems in India. Increasing demand for human consumption, irrigation and growing industrial activities has impacted the water quality of rivers due to declining flows in rivers and depleting water levels of subsurface resources.[10] Recently, in February 2015, a report issued by the Central Pollution Control Board**,** Ministry Of Environment, Forests & Climate Change[11] entitled ***"River Stretches for Restoration of Water Quality",***[12] has highlighted on the water quality issues in 275 rivers comprising of 302 stretches in 27 states and 2 Union Territories. In this study, water quality data on rivers is analysed to compare with water quality criteria. Biochemical Oxygen Demand (BOD) has been

[4] Most of the Indian rivers and their tributaries viz., Ganges, Yamuna, Godavari, Krishna, Sone, Cauvery Damodar and Brahmaputra are reported to be grossly polluted due to discharge of untreated sewage disposal and industrial effluents directly into the rivers. These wastes usually contain a wide variety of organic and inorganic pollutants including solvents, oils, grease, plastics, plasticizers, phenols, heavy metals, pesticides and suspended solids. The indiscriminate dumping and release of wastes containing the above mentioned hazardous substances into rivers might lead to environmental disturbance which could be considered as a potential source of stress to biotic community. Sudheer Kumar Shukla, Water Pollution, Indian River Systems and Pollution, Available at http://www.eoearth.org/view/article/153800 (Last Updated: June 9, 2012) accessed on 1-12-2015.

[5] P. K. Goel, *Water Pollution: Causes, Effects and Control,* 2-3 (New Age International, 2006)

[6] CPCB data available with Express states that 10 river stretches were found to be polluted in AP. They are in the Godavari, Krishna, Manjira, Musi, Maner, Nakkavagu, Penner, Hundri, Kundu and Tungabhadra rivers.

[7] Tarun Nangia, "AP has more polluted rivers in South India" *The New Indian Express*, NEW DELHI, July 18, 2012. Available at http://www.newindianexpress.com/states/andhra_pradesh/article570027.ece

[8] Rivers in Andhra Pradesh, available at http://www.indiantravelportal.com/andhra-pradesh/rivers/ accessed on 1-12-2015.

[9] *Ibid.*

[10] Shashi Shekhar, Chairman, Central Pollution Control Board (A Government Organization) Ministry of Environment, Forest & Climate change, February 2015.

[11] Website: www.cpcb.nic.in e-mail: cpcb@nic.in

[12] Monitoring of Indian National Aquatic Resources, Series: MINARS/37 /2014-15

considered as principal parameters for identification of monitoring in excess of the criteria limit. The water data indicates that organic pollution as indicated by Biochemical Oxygen Demand continues to be the major water quality issues. This is mainly due to discharge of untreated domestic waste water from the urban centres of the country. The municipal corporations at large are not able to treat increasing load of municipal sewage flowing into water bodies. Secondly, the receiving water bodies also do not have adequate water dilution.[13]

GODAVARI RIVER POLLUTION

The Godavari River is the second longest river in India after the river Ganges.[14] It starts in Maharashtra and flows east for 1,465 kilometres (910 mi) emptying into Bay of Bengal draining the Indian states Maharashtra (48.6%), Telangana and Andhra Pradesh (combined 23.4%), Chhattisgarh (10.9%), Madhya Pradesh (10.0%), Odisha (5.7%) and Karnataka (1.4%).[15] The frequent drying up of the Godavari river in the drier months has been a matter of great concern. Indiscriminate damming along the river has been cited as an obvious reason. Within Maharashtra sugarcane irrigation has been blamed as one of the foremost causes of pollution of this river.[16] In 2013, the river was at its all-time low in the Nizamabad district of Telangana. This had hit the growth of fish making the life of fishermen miserable. The water-level was so low that people could easily walk into the middle of the river. Shortage in rainfall and closure of the controversial Babli project gates in Maharashtra was thought to have affected the water flow in the river and water availability to the Sriram Sagar Project except during above 20% excess monsoon (i.e. one out of four years) years.[17]

High alkalinity water is discharged from the ash dump areas of many coal fired power stations in to the river which further increases the alkalinity of the river water whose water is naturally of high alkalinity since the river basin is draining vast area of basalt formations.[18] This problem aggravates during the lean flow months in entire river basin. Already the Godavari basin area in Telangana is suffering from High alkalinity and salinity water problem which is converting soils in to unproductive sodic alkali soils.[19] The following are the few coal fired power stations located in the river basin:

- Koradi Thermal Power Station, 2,600 MW
- Khaparkheda Thermal Power Station, 1,340 MW
- Tirora Thermal Power Station, 3,300 MW
- Butibori Power Project, 600 MW.
- RattanIndia Nashik TPS, 1,350 MW
- Chandrapur STPS, 3,340 MW
- Mauda Super Thermal Power Station, 1,000 MW
- Parli Thermal Power Station, 1,130 MW
- Dhariwal Power Station, 300 MW
- Nashik Thermal Power Station, 910 MW
- Wardha Warora Power Plant, 540 MW
- NTPC Ramagundam, 2,600 MW
- Kothagudem Thermal Power Station, 1,720 MW
- Kakatiya Thermal Power Station, 1,100 MW
- Ramagundam B Thermal Power Station, 60 MW
- Manuguru Heavy water plant's power station
- Singareni thermal power station, 1,800 MW
- Bhadradri Thermal Power Plant, 1,080 MW
- Lanco Vidarbha Thermal Power, 1320 MW

According to experts, T-Coli (Total Coliform bacteria) levels are alarmingly high in the river water even before the *puskharams* commenced and they believe that the endless stream of pilgrims doing their ablutions would further increase the contamination levels. The T-Coli are a group of closely related bacteria which are common inhabitants of water and are mostly not harmful to humans. The T-Coli include bacteria that are found in the soil, surface water, and human or animal waste. However, a few forms of T-Coli bacteria will lead to health problems which may include diarrhoea, cramps, nausea, vomiting and even fever.

The Andhra Pradesh Pollution Control Board (APPCB) which conducted a sample survey found that on July 8 this year, T-Coli levels were 10,600 colonies per 100 ml at Goshpada Kshetram in Kovvuru of West Godavari district. Similarly, the T-Coli levels at Valandhar Revu in Narasapuram of West Godavari and at the Pushkar Ghat in

[13] Shashi Shekhar (2015) *supra* note 7.
[14] "Godavari river basin map"
[15] Integrated Hydrological DataBook(Non-Classified River Basins)" (PDF). Central Water Commission. p. 9.
[16] http://www.dnaindia.com/mumbai/report-krishna-godavari-basins-drying-up-1812489
[17] J. Keller, A. Keller and G. Davids. "River basin development phases and implications of closure" (PDF). Accessed on 25 August 2015.
[18] Chemical weathering in the Krishna Basin and Western Ghats of the Deccan Traps, India
[19] "Alkalinity and salinity bane of soil in T state" Accessed on 23 October 2015.

Rajahmundry were recorded at 8,500 colonies per 100 ml and 8,400 colonies per 100 ml respectively.[20]

Fortunately, the Dissolved Oxygen and the Biochemical Oxygen Demand are at adequate levels. "The presence of T Coli bacteria in large numbers indicate contamination by sewage flowing into the river, human activity and cattle wading," the survey pointed out. The APPCB is conducting the study into the pollution levels in Godavari river at three stages - before, during and after the Godavari Pushkarams.

KRISHNA RIVER POLLUTION

The Krishna River is the fourth biggest river in terms of water inflows and river basin area in India, after the Ganges, Godavari and Brahmaputra. The river is almost 1,300 kilometres (810 mi) long. The river is also called Krishnaveni. It is a major source of irrigation for Maharashtra, Karnataka, Telangana and Andhra Pradesh.[21] River Krishna is on the verge of death.[22] Most of the years, the river water is not joining the sea due to full utilisation of water mainly in agriculture.[23] The river receives the waste from the large number of cities and the river basin population has increased to 80 million enhancing pollution load many folds in to the river. Adequate average and minimum continuous environmental flows to the sea are not taking place in most of the years constricting salt export and leading to formation of saline and sodic alkaline soils in the lower reaches of the river basin.[24] High alkalinity water is discharged from the ash dump areas of many coal fired power stations in to the river which further increases the alkalinity of the river water whose water is naturally of high alkalinity since the river basin is draining vast area of basalt rock formations.[25] The following are the few coal fired power stations located in the river basin:

- Vijayawada Thermal Power Station, 1,760 MW
- Raichur Thermal Power Station, 1,470 MW
- Bellary Thermal Power station, 1,000 MW
- Yermarus Thermal Power Station, 1,600 MW
- Solapur Super Thermal Power Station, 1,320 MW.
- Kudgi Super Thermal Power Project, 2,400 MW
- Yadadri Super Thermal Power Project, 7,500 MW

PENNAR RIVER POLLUTION

The river Penna rises on the hill of Nandi Hills in Chikballapur District of Karnataka state, and runs north and east through the state of Andhra Pradesh to empty into the Bay of Bengal. It is 597 kilometres (371 mi) long, with a drainage basin 55,213 square kilometres (21,318 sq mi) large.[26] The drinking water needs of the Nellore city are met by drawing water from the Penna riverbed and the infiltration sources that have been created there. There has been a long-pending demand for removing the scope for pollution of the drinking water sources due to the dumping of garbage and wastes from the city dwellings. Several drains, both small and big, carry these wastes and domestic refuse into the riverbed. This has become a matter of high concern for the people and also the municipal authorities.[27]

Seeing the emerging need, the big drain that passes through the Nagulamitta area near Old Municipal Office has been identified for immediate cleaning and diversion from the river. The municipal officials have proposed a special diversion channel for preventing this drain from flowing into the Penna. The officials are asked to draw plans to clean up and divert both small and big drains away from the river in the near future.[28]

KUNDU RIVER POLLUTION

The Kundu River is a tributary of the Penna River in the Rayalaseema region of Andhra Pradesh, India. In ancient times this river was known as the Kumudvathi.[29] Originating as a spring near the village of Uppalapadu in Orvakal Mandalof Kurnool District, it goes through many changes before merging with the Penna at Adinimmaya Palli village of Kadapa District. It is known for frequent floods that bring heavy damage to the Nandyal and Koilkuntla areas, and hence it is popularly called the "Sorrow of Nandyal." But nowadays Nandyal town became a big town with huge population so that the drainage water

[20] PS Dileep, High Bacterial Levels in Godavari Pose Health Risk, New Indian Express, July 17, 2015. Available at http://www.newindianexpress.com/states/andhra_pradesh/High-Bacterial-Levels-in-Godavari-Pose-Health-Risk/2015/07/17/article2924983.ece accessed on 10-12-2015.

[21] "Map of Krishna River basin" (PDF). Accessed on 27 March 2015.

[22] "River Water Quality & Environmental Factors". Accessed on 25 August 2015

[23] J. Keller, A. Keller and G. Davids. "River basin development phases and implications of closure" (PDF). Accessed on 25 August 2012; "IWMI Research report nos # 1, 3, 14, 56, 72, 83, 107, 111, 121, 123, 125 etc." Accessed on 25 August 2015.

[24] Oregon State University, USA. "Managing irrigation water quality" (PDF). Retrieved 28 August 2012."Alkalinity and salinity bane of soil in T state". Retrieved 23 October 2015.

[25] Chemical weathering in the Krishna Basin and Western Ghats of the Deccan Traps, India

[26] *Garg, Santosh Kumar (1999). International and interstate river water disputes. Laxmi Publications. pp. 7–8.* ISBN *978-81-7008-068-8.*

[27] Diversion channel mooted to check pollution of Penna, *The Hindu*, Andhra Pradesh, May 8, 2015. http://www.thehindu.com/news/national/andhra-pradesh/diversion-channel-mooted-to-check-pollution-of-penna/article7182638.ece

[28] *Id.*

[29] Rayalaseema Mukha Chitram, a publication of Seema Sahithi.

is discharged to the Kundu river without prior treatment. Industrialists focused their vision at more and more profits and they polluted the river to the maximum extent. The villagers who are living at down flow of the river from Nandyala are suffering with different skin diseases. The pollution impacts even animals health too.[30]

TUNGABHADRA RIVER POLLUTION

The Tungabhadra River is formed by the confluence of the Tunga River and the Bhadra River which flow down the eastern slope of the Western Ghats in the state of Karnataka. The journey of the Tunga and the Bhadra is 147 km (91 mi) and 171 km (106 mi) respectively, till they join at Koodli, at an elevation of about 610 metres near Holehonnur, about 15 km (9.3 mi) from Shivamogga, areca granary of the country. The Bhadra river flows through the industrial city Bhadravathi. More than 100 tributaries, streams, creeks, rivulets and the like contribute to the two rivers.[31] Industrial pollution has damaged the Tungabhadra river. Industry and mining on its banks in the Chikkamagaluru, Shimoga, Davangere, Haveri, Bellary, Koppal and Raichcur districts of Karnataka and Kurnool in Andhra Pradesh and Mahaboobnagar in Telangana (almost all the districts along the course of the river) generate enormous amounts of effluents. According to M. Shankar, "It is disturbing to note that nearly three crores of litres of effluents were being released to the Tunga from [Shimoga] every year."[32] As such, it is one of the most polluted rivers in the country.

Downriver from the industries, the water has turned dark brown and has a pungent odour. Altogether, Tungabhadra River pollution has affected 1,000,000 people in the sub-basin as most villages used the river water, previously obtained through the ancient tank system, for drinking, bathing, irrigating crops, fishing and livestock water. The livelihood of village fishermen has been harmed by regular fish kills that have exhausted Tungabhadra's fisheries.[33] However, interestingly, in a recent report the officials of Pollution Control Board officials who tested the water samples have come to the conclusion that the industrial discharges were not the cause of pollution of Tungabhadra river in and around Kurnool city.[34]

The Task Force of Pollution Control Board (PCB) carried out the tests by collecting samples at various points of the river and found that high growth of algae, decomposition of algae and increased levels of E Coli activity were the primary causes of river water pollution and the associated obnoxious odour.

The report noted that the flow in the river dwindled to minimum level and the water stagnation was noticed on the southern bund of the river while a lean flow was observed along the northern river bund. The huge amount of water stagnated in the pools for a long period triggered the algae growth which caused serious depletion of oxygen levels in the water which in turn caused putrefaction of algae. The decomposed algae caused obnoxious odour and released cyano toxins which were responsible for complaints of skin rashes.[35]

Also a great amount of flow of sewage from the residential areas of Kurnool city was observed at various points which contributed to total coli and E coli activity. The report pointed out that the presence of coli would cause harm to downstream water users.

The PCB estimated that around 3,000 to 4,500 cubic meters of sewage was flowing into the river per hour and directed the Municipal Corporation to take immediate steps to intercept the sewage flow and construct the sewage treatment plant for a capacity of 1 million litres per day. A high amount of sewage flow into the river was observed at Pump House, TGV House, Kota Anjaneya Swamy Temple, Raghavendra Mutt, Jammichettu and Laxmi Gardens into Hundri river.[36]

HUNDRI RIVER POLLUTION

Hundri, which was known as Hydravathi river in ancient literature has great significance in development of human habitations alongside river banks. A few decades ago, Kurnool city dependant on the river for the drinking water needs, when the river flowed through summer months without a break. However, the river went dry gradually due over exploitation of water resources in the upper reaches for agriculture, construction of Gajuladinne project, 50 km upstream of the city and failing monsoons. Indiscriminate release of sewage into the river, extraction of sand from the river bed, encroachment of the river bed for structures and cultivation were the significant threats to the safety of the river.[37]

DEFAULTING GROSSLY POLLUTING INDUSTRIES

Rivers across Andhra Pradesh are getting polluted as more than half the Grossly Polluting Industries (GPIs) are not complying with the set standards. There are nine defaulters of the 16 GPIs in the state whose effluents are entering the rivers on whose banks they are situated. Those to blame include paper mills, sugar factories, a thermal power station and chemical

30 https://en.wikipedia.org/wiki/Kundu_River
31 https://en.wikipedia.org/wiki/Tungabhadra_River
32 The Hindu, 6 June 2008
33 River Krishna". Accessed on 20 September 2016.
34 Tungabhadra river pollution: clean chit to industries, Special Correspondent, *The Hindu,* Kurnool, February 20, 2014.
35 *Id.*
36 *Id.*
37 December 5 is 'Hundri River Day' *The Hindu*, Kurnool, April 28, 2013.available at http://www.thehindu.com/todays-paper/tp-national/tp-andhrapradesh/december-5-is-hundri-river-day/article4662144.ece. Accessed on 10-12-2015.

units.[38] Amongst the water bodies getting polluted by these industries are the river Godavari at various points in Rajahmundry, East Godavari District, Chittoor, Adilabad and Warangal; the river Krishna at Ibrahimpat-nam in Krishna District; the rivers Pennar and Swarnamukhi in SPSR, Nellore district; the Pedda-cheruvu water tank at Nacharam and Nallacheruvu lake at all leading to the river Musi in Ranga Reddy district.[39]

In 1997, Andhra Pradesh had 60 such GPIs, of which only seven were identified to be flouting norms under the Water (Prevention and Control of Pollution) Act 1974 and they were various private sector units, co-operative sector units, state government undertakings and state public units. The Union ministry of environment and forests has directed that polluting industries have to install effluent treatment systems or face closure. Nine of the 16 identified GPIs in AP do have such plants but they are a mere eye-wash and the units have been found to be 'not complying with standards' set by the APPCB. The Central Pollution Control Board is supposed to be monitoring the implementation of its programme launched way back in 1993-94 for identification of GPIs and compliance for pollution control.

Andhra Pradesh got Rs 40 crore as central government grant for river conservation, the highest among the five south Indian states. Out of a total of 150 polluted river stretches identified by the Central Pollution Control Board (CPCB),[40] 37 are in five south Indian states of Karnataka, Tamil Nadu, Andhra Pradesh, Kerala and Orissa.[41] For river conservation projects undertaken by the state government, the central government gives 70 percent of the money; the rest is to be spent from the state's coffers. The state got a grant of Rs 38.18 crore in 2009-10. While it received no funds in 2010-11, it got 1.90 crore in 2011-12.

IMPACT OF RIVER WATER POLLUTION

The pollutants include oils, greases, plastics, plasticizers, metallic wastes, suspended solids, phenols, toxins, acids, salts, dyes, cyanides, pesticides etc. Many of these pollutants are not easily susceptible to degradation and thus cause serious pollution problems. Contamination of ground water and fish-kill episodes are the major effects of the toxic discharges from industries. Discharge of untreated sewage and industrial effluents leads to number of conspicuous effects on the river environment. The impact involves gross changes in water quality viz. reduction in dissolved oxygen and reduction in light penetration that's tends loss in self-purification capability of river water.[42]

The indiscriminate dumping and release of wastes containing hazardous substances into rivers lead to environmental disturbance which could be considered as a potential source of stress to biotic community. River water pollution leads sever impact on living community. Some recent studies show terrific facts like; Death of ghariyals in the Chambal sanctuary, pesticide pollution in Yamuna River etc.

IDENTIFICATION OF POLLUTED RIVER STRETCHES

The stretches of rivers not meeting with the criteria are identified as polluted stretches and categorized in five priority classes. As the level of BOD varies widely in River stretches the same are prioritized in five categories based on BOD concentration consistently exceeding to BOD levels >30 mg/l, BOD between 20&30 mg/l, BOD between 10&20mg/l, BOD between 6-10 mg/l and BOD between 3& 6 mg/l. The data obtained are analyzed statistically and compared with the water quality criteria with respect to BOD.

The water quality data for the years 2009-2012 is analyzed and monitoring locations exceeding the water quality criteria are identified as polluted locations with respect to risk. The degree of violation is with respect to water quality criteria for drinking water source with conventional treatment with respect to BOD. The polluted locations in a continuous sequence are defined as polluted river stretches.

CRITERIA FOR PRIORITIZATION

The rivers have been prioritized based on the concentration of BOD in five classes from priority I to V. The criteria of each priority are elaborated indicating the concentration range of BOD in mg/l.

- **Criteria for Priority I**

Monitoring locations exceeding BOD concentration 30 mg/l has been considered as the standard of sewage treatment plant and in river it appears without dilution.

[38] Jatinder Kaur Tur, Andhra Pradesh rivers being polluted by sugar factories, paper mills, *Deccan Chronicle* March 25, 2013. Available at http://archives.deccanchronicle.com/130325/news-current- affairs/article/andhra-pradesh-rivers-being-polluted-sugar-factories-paper-mills Accessed on 1-12-2015.

[39] *Ibid.*

[40] CPCB monitors the water quality of various water bodies in the country at 2500 stations in 28 states and six union territories. The monitoring network covers 445 rivers, 154 lakes, 12 tanks, 78 ponds, 41 creeks, 25 canals, 45 drains, 10 water treatment plants and 807 wells.

[41] Tarun Nangia, (2012) *supra* note 4.

[42] Sudheer Kumar Shukla, Water Pollution, Indian River Systems and Pollution, Available at http://www.eoearth.org/view/article/153800 (Last Updated: June 9, 2012) accessed on 1-12-2015.

(River locations having water quality exceeding discharge standards for BOD to fresh water sources)

- **Criteria for Priority II**

Monitoring locations having BOD between 20-30 mg/l.

- **Criteria for Priority III**

Monitoring locations having BOD between 10-20 mg/l.

- **Criteria for Priority IV**

Monitoring locations having BOD between 6-10 mg/l.

- **Criteria for Priority V**

Monitoring locations having BOD between 3-6 mg/l.

POLLUTED RIVER STRETCHES IN ANDHRA PRADESH

Water Quality of rivers in A.P. is monitored at 50 locations on 9 rivers and out of which 38 locations are non-complying to the Water Quality Criteria with respect to BOD. These 38 locations are on 6 rivers. The names of 6 polluted rivers are Godavari, Hundari, Krishna, Tungabhadra, Pennar and Kundu. These rivers are classified in **five classes** based on the level of BOD falling in priority class-V.

Polluted River Stretches in Andhra Pradesh

S no.	River Name	Stretch Identified	Towns Identified	Approx length of the stretch (in Km)
1.	GODAVARI	RAYANPETA TO RAJAHMUNDRI	RAJAHMUNDRI, RAYANAPETA	140
2.	HUNDRI	LAXMIPURAM TO JOHARPURAM (KURNOOL)	KURNOOL	10
3.	KRISHNA	AMRAVATHI TO HAMSALA DEEVI	VIJAYWADA	270
4.	TUNGABHADRA	MANTHRALAYAM TO BAVAPURAM	KURNOOL	50
5.	PENNAR	TADPATRI TO NELLORE	JAMMALAMADUGU,PRODDATUR,KADAPA	120
6.	KUNDU	NANDYAL TO MADDURU	NANDYAL	120

Source: River Stretches for Restoration of Water Quality[40]

CONCEPT OF WATER QUALITY MANAGEMENT IN INDIA

The water quality management in India is performed under the provision of Water (Prevention and Control of Pollution) Act, 1974. The basic objective of this Act is to maintain and restore the wholesomeness of national aquatic resources by prevention and control of pollution. The Act does not define the level of wholesomeness to be maintained or restored in different water bodies of the country. The Central Pollution Control Board (CPCB) has tried to define the wholesomeness in terms of protection of human uses, and thus, taken human uses of water as base of or identification of water quality objectives for different water bodies in the country.

According to CPCB in its report on ***"River Stretches for Restoration of Water Quality",*** it was considered ambitious to maintain or restore all natural water body at pristine level. Planning pollution control activities to attain such a goal is bound to be deterrent to developmental activities and cost prohibitive. Since the natural water bodies have got to be used for various competing as well as conflicting demands, the objective is aimed at restoring and/or maintaining natural water bodies or their parts to such a quality as needed for their best uses. Thus, a concept of "designated best use" (DBU) was developed. According to this concept, out of several uses a water body is put to, the use which demands highest quality of water is termed as "designated best use", and accordingly the water body is designated. Primary water quality criteria for different uses have been identified.

The entire water resources of the country were classified according to their designated best uses and a "Water Use Map" was prepared. For identification of the water bodies or their parts where water quality is at variance with water quality criteria, it was felt important to measure water quality of that water body or its part. It would help in preparation of "Water Quality Map" of India. The idea was to superimpose "Water Quality Map" on "Water Use Map" to identify the water bodies or their parts, which are in need of improvement (restoration). Subsequently through a wide network of water quality monitoring, water quality data are acquired. A large number of water bodies were identified as polluted stretches for taking appropriate measures to restore their water quality. Today almost all policies and programmes on water quality management are based on this concept including the Ganga Action Plan and National River Action Plans.

CONCLUSION

Though, CPCB has laid down new stringent environmental norms in the form of CREP (Corporate Responsibility for Environmental Protection). But it was observed that only about 45% of the grossly polluting industrial units have installed Effluent Treatment Plants. Out of these, over 18% did not function properly and also did not meet the technical standards. The NRCD also have no mechanism to ensure that the installed Effluent Treatment Plants function properly. Therefore, punitive action should be taken against the violators of norms in this regard and defaulting industrial units should either be closed down or allowed to function only after they install ETPs and ensure their proper functioning. It was also observed, that the contribution to the pollution load by various sources was estimated at 75% and 25% each for domestic effluent and industrial waste.

Apart from ensuring proper operationalization of assets created under different schemes, it is need to strengthen mechanism and the capacity of institutions for effective control of water pollution and waste from point source by emphasizing socio-economic measures at the same time as using law enforcement measures.

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