Clean Ganga Mission

There is a universal reverence to water in almost all of the major religions of the world. Most religious beliefs involve some ceremonial use of "holy" water. The purity of such water, the belief in its known historical and unknown mythological origins, and the inaccessibility of remote sources elevate its importance even further. In India, the water of the river Ganga is treated with such reverence. The river Ganga occupies a unique position in the cultural ethos of India. Legend says that the river has descended from Heaven on earth as a result of the long and arduous prayers of King Bhagirathi for the salvation of his deceased ancestors. From times immemorial, the Ganga has been India's river of faith, devotion, and worship. Millions of Hindus accept its water as sacred. Even today, people carry treasured Ganga water all over India and abroad because it is "holy" water and known for its "curative" properties. However, the river is not just a legend, it is also a life-support system for the people of India. It is important because:

- The densely populated Ganga basin is inhabited by 47 percent of India's population.
- The entire Ganga basin system effectively drains eight states of India.
- About 47 percent of the total irrigated area in India is located in the Ganga basin alone.
- It has been a major source of navigation and communication since ancient times.
- The Indo-Gangetic plain has witnessed the blossoming of India's great creative talent.

The belief the Ganga river is "holy" has not, however, prevented over-use, abuse, and pollution of the river. All the towns along its length contribute to the pollution load. It has been assessed that more than 80 percent of the total pollution load (in terms of organic pollution expressed as biochemical oxygen demand (BOD)) arises from domestic sources, i.e. from the settlements along

the river course. Due to the over-abstraction of water for irrigation in the upper regions of the river, the dry weather flow has been reduced to a trickle. Rampant deforestation in the last few decades, resulting in topsoil erosion in the catchment area, has increased silt deposits which, in turn, raise the river bed and lead to devastating floods in the rainy season and stagnant flow in the dry season.

The principal sources of pollution of the Ganga river can be characterised as follows:

- Domestic and industrial wastes. It has been estimated that about 1.4 × 10^6 m^3 d^-1 of domestic wastewater and 0.26 × 10^6 m^3 d^-1 of industrial sewage are going into the river.
- Solid garbage is thrown directly into the river.
- Non-point sources of pollution from agricultural run-off containing residues of harmful pesticides and fertilisers.
- Animal carcasses and half-burned and unburned human corpses thrown into the river.
- Defecation on the banks by low-income people.
- Mass bathing and ritualistic practices.

The broad aim of the Ganga Action Plan (GAP) was to reduce pollution and to clean the river and to restore water quality at least to Class B (i.e. bathing quality: 3 mg/l BOD and 5 mg/l dissolved oxygen). This was considered as a feasible objective and because a unique and distinguishing feature of the Ganga was its widespread use for ritualistic mass bathing. The other environmental benefits envisaged were improvements in, for example, fisheries, aquatic flora, and fauna, aesthetic quality, health issues and levels of contamination. The multi-pronged objectives were to improve the water quality, as an immediate short-term measure, by controlling municipal and industrial wastes. The long-term objectives were to improve the environmental conditions along the river by suitably reducing all the polluting influences at the source. These included not only the creation of waste treatment facilities

but also invoking remedial legislation to control such non-point sources as agricultural run-off containing residues of fertilisers and pesticides, which are harmful to the aquatic flora and fauna. Prior to the creation of the GAP, the responsibilities for pollution of the river were not clearly demarcated between the various government agencies. The pollutants reaching the Ganga from most point sources did not mix well in the river, due to the sluggish water currents, and as a result of such pollution often lingered along the embankments where people bathed and took water for domestic use.

Namami Gange is being implemented by the National Mission for Clean Ganga (NMCG), and its state counterparts—State Programme Management Groups. NMCG would establish field offices wherever necessary. The National Ganga Council (NGC) was created.
And to give it utmost importance the Prime Minister was made the head of it. This council replaced the National Ganga River Basin Authority (NGRBA). NGC would have onboard the chief ministers of five Ganga basin states—Uttarakhand, Uttar Pradesh (UP), Bihar, Jharkhand, and West Bengal—besides several Union ministers and it was supposed to meet once every year.

The Water Resources, River Development, and Ganga Rejuvenation Ministry signed Memoranda of Understanding (MOUs) with 10 other ministries to synergise the activities under the Namami Gange. The government said it would involve grassroots level institutions such as urban local bodies and Panchayati raj institutions to implement the program.

SEWAGE TREATMENT

Sewage treatment plants (STPs) have been at the center of Ganga pollution abatement. Regulating STPs faces various challenges in various sectors.

- The new projects are delayed because land acquisition and other related activities were taking a lot of time.
- Illegally mixed industrial wastes and chemicals with the influents in the plants. Consider the STP at Kanpur, which holds the dubious distinction of being home to the "most polluted stretch" of the Ganga. The BOD and TSS levels of the effluents are higher than the norms because industrial waste and chemicals are illegally mixed with the influents in a plant not meant to treat industrial pollutants.
- Industries are not regulating the wastes they are releasing. Tanneries are discharging their wastewater directly into drains and the water of drains has mixed with groundwater which has become infected.
- Chromium treatment is a must before releasing, industries aren't treating them well when they should have compulsorily installed a treatment plant in their factory or a cluster of factories should have a common plant.
- Besides cleaning the Ganga, the Namami Gange also talks about afforestation as an important activity as it helps groundwater recharge. According to NMCG, it has already spent Rs 114 crore on afforestation.

RESTORING THE FLOW

There is another fundamental problem that will ensure the holy river remains dirty. A river is a self-purifying system only when water flows through it. The Ganga fails this basic test except during monsoons. So it's not just about

unclean Ganga. It is about the existence of Ganga. Even the fish die in summer due to a lack of water. People coming to ghats usually don't go for boat rides in summer because water level goes below-knee length in summers in various areas. Also if the flow in the river is maintained it can solve the problem of 60-80 percent of organic pollutants and we may not require such an elaborate program. The Ganga has medicinal properties that can treat skin infections. These properties come due to medicinal plants on the path of Ganga. Also, the Ganga is very rich in minerals and has bacteriophages that kill the bacteria.

SLUDGE CONTROL

The river has another persistent problem that is going to be more pronounced. if proper fecal sludge management is not in place, it would invariably pollute the Ganga. What should cause further concern is that fecal sludge is a bigger pollutant than sewerage. While the BOD of sewage is 150-300 mg/l, that of fecal sludge would be 15,000-30,000 mg/l. The earliest recorded coliform bacteria count – an indicator of sanitary quality – in every 100 ml of water measured downstream of Varanasi was 14,300 in January 1988. This increased to 140,000 in January 2008 and to a whopping 2.4 million in January 2014. Open defecation is a huge problem that must be solved as soon as possible because the Clean Ganga Mission would simply fall apart, as the level of pollution is rising exponentially due to solid wastes being dumped.

Toilets are constructed all over the basin under various programs run by the government of India, but people don't manage them well and then they clog and overflow making their houses dirty and smelly. Avoiding this situation they prefer open defecation.

Various areas across the basin are marked as Open Defecation Free zones (ODFs) but people still don't understand the seriousness of the issue and go on with their daily chores without giving a thought about the environment, pollution, and mother Ganga.

The river Ganga is slowly getting converted into a sludge, mainly due to the fall in the water level. Higher water velocity, he stresses, would result in better water quality. At present more than 95% water is withdrawn through these barrages, which results in instantaneous fall in river stage, drastic reduction in flow velocity, and fall in oxygen content, rise in biochemical oxygen demand load downstream and fall in level of groundwater table in the basin and lack of water quantity in the root zone, resulting in fall in crop yield, and increase in salinity in the basin soil.

Sludge dewatering separates sludge into liquid and solid components for waste minimisation. There are various technologies for sludge dewatering, including plate & frame and belt filter presses, centrifuging, and geomembranes. In addition to these, there are other options available.

It is important to note that dewatering is not intended to treat the sludge or liquid, it only separates the solid and liquid components so that it is easier and more cost-effective to handle the separate phases for final disposal. Once the sludge has been dewatered, both the solid and liquid components may contain contaminants that will need to be treated separately.

SCOPE

The solids that result from wastewater treatment may contain concentrated levels of contaminants that were originally contained in the wastewater. A great deal of concern must be directed to the proper disposal of these solids to protect environmental considerations.

Failure to do this may result in a mere shifting of the original pollutants in the waste stream to the final disposal site where they may again become free to contaminate the environment.

All the sewage sludge produced at a treatment plant must be disposed of ultimately. Treatment processes that may reduce its volume or change its character as to facilitate its disposal, still leave a residue which in most cases must be removed from the plant site.

About 180 MLD of sludge will be generated in the five Ganga Basin states (Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, West Bengal) when they become Open Defecation Free (ODF), and this too seems difficult. If proper sludge management is not done, this would invariably pollute the Ganga. What should cause further concern is that fecal sludge is a bigger pollutant than sewage – while BOD of sewage is 150-300 mg/litre, that of fecal sludge would be 15,000-30,000 mg/litre.

This poses a big issue to the environment as the treated sludge is dumped or sold to farmers to be used as manure. In many cases, farmers avoid the use of this sludge as it is very stinky and is low in nutrients as compared to modern fertilisers.

The purpose of sludge dewatering is for waste minimisation and to achieve overall cost efficiency for disposal. But even after dewatering, about 80% moisture content is present when dewatering is done through cost-efficient methods. If this ratio gets balanced through some method, the amount of sludge generation can be reduced.

The Ganga cannot run clean unless the sludge generated is managed effectively.

PROBLEM STATEMENT

- Process a complete model on how we can make the most out of this end waste sludge so as to keep the surroundings and the people safe from this hazardous material.
- Avoid generating energy from the sludge.
- The process must be economical and ready to go into action.
- Innovations are welcomed, but only if they are practically feasible.

NOTE-

- **Any team can have only 5 team members.**
- **The last date for abstract submission is 21 October 2020.**

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