



Questions and Comments by Participants
of
“The Future of River Management”

01 May 2020

Exploring how the COVID-19 crisis can help shape river management
strategies of the future



1. *In the name of rejuvenation of urban river, concretization has been done in many cities. Is de-concretization of these rivers possible? Such as Swarn Rekha of river of Gwalior.*

Response: It really depends on the situation with the flows and engineering of the channel in each case. In LA, it's very challenging, because the River was engineered during channelization to move a huge amount of water very quickly. Any alteration of the concrete channel can trigger changes to the flow conditions that could raise flood risk. For other rivers, it may be possible to remove concrete, but it depends on if the flow conditions have the flexibility to deal with the change.

2. *Should we plan for 'naturalisation and de-concretisation' of rivers and other urban water bodies like lakes and ponds?*

Response: Concretization of rivers has been questioned by many scholars. The best way to go about is to learn from the many examples available across the globe about pros and cons of this exercise. However, de-concretisation is not always feasible. As Michael mentioned, it really depends on the situation with the flows and engineering of the channel in each case. Also, it is a cost intensive work and involves appropriate disposal of concrete waste. Thus, before doing it an assessment is very much essential. As pointed out by Michael, in LA de-concretisation is very challenging, because the River was engineered during channelization to move a huge amount of water very quickly. Any alteration of the concrete channel can trigger changes to the flow conditions that could raise flood risk. For other rivers, it may be possible to remove concrete, but it depends on if the flow conditions have the flexibility to deal with the change.

3. *Lockdown has arrested rivers from exploitation, encroachment and pollution. If lockdown can accomplish this, why can non-lockdown not protect rivers from exploitation, encroachment and pollution?*

Response: Yes, and I think a lot of it comes down to looking at behaviours. We can analyse -- and we largely already know -- what behaviours lead to poor water quality and other problems. The lockdown situation shows us what we already know. The question is, do we have the will, the resources, and the legal tools to essentially maintain the good behaviour we see now but in the context of normal times.

4. *COVID crisis has proved beyond point what was already known, that pollution of all kinds is by definition due to human actions. Then I guess that the solution also lies with us humans. Then why cannot this be done?*

Response: Indeed, humans are part of both the problem and solution. It will take a concerted effort from all sections of stakeholders to achieve this. Governments will need to take on a stronger regulatory role. Citizens will need to comply with these regulations. NGOs will need to become the interface between governments and citizens. Academicians will need to provide evidence-based decision support for policy making. Community groups will need to start taking the onus of some aspects of river governance. This will help bring about the desired change a lot faster.

5. *It will be a good idea to compile case studies on river management from different countries, and deliberate in India for our own projects. We from the National Institute of Hydrology would like to interact and collaborate.*

Response: As part of the ongoing project, NIUA is in the process of developing a knowledge product on “Innovation in urban river management” that focuses on this very aspect. We will be happy to collaborate with NIH for this.

6. *Master plan must also take into account the river catchment area and mark the 'blue and red lines' and designate as 'no development zone'*

Response: NIUA in association with the Town & Country Planning Organisation (TCPO) is in the process of developing a Strategic Document for river-sensitive development in the form of delineating the floodplains, identifying the Land Use Categories (Red/Blue zones), restricting certain non-compatible activities, coming up with specific Development Control Regulations for the zones, etc. This document will be ready in the next 3-4 months. At the basin level, NMCG has already earmarked clear zones to improve the situation in the Ganga River Basin.

7. *Should river management be planned more towards the safety of aquatic animals and river health, or for human use?*

Response: We need to recognise the dependency that society has on a functional ecosystem- that means including animals.

8. *Should we have a master plan for not disturbing the water bodies or a master plan for revitalization of water bodies? I think we should change the perception. Many water bodies such as river Ganga has its own way of rejuvenating itself if let on its own. Covid has shown this. So what is your take?*

Response: A master plan for revitalisation of the waterbodies highlighting the relevance of ‘not disturbing the water bodies’ seems an ideal option and would certainly be the best. However, water bodies in urban areas are also envisaged as an avenue for recreation activities. Hence, the human interaction cannot be completely avoided. As rightly pointed

out, a change in perception is desired. Rejuvenation plans must, therefore, ensure that this human-water body interaction is within the carrying capacity of the water body.

9. *What can the Fraunhofer Society do to support cities on their way to sustainable water management?*

Response: Holistic river management is an emerging area of emphasis across the globe. Despite a lot of research work by various national and international agencies, gaps still remain. Fraunhofer Society and other similar organisations, can definitely share their technical expertise to plug these gaps.

10. *Any plans for river betterment should be not only at master plan level, but more at regional planning level*

Response: Couldn't agree more. Rivers do not follow administrative boundaries. Thus, best way to manage them is within the extent of the river basin, also taking care of the trans-boundary, inter-state interlinkages, more with a regional approach. In India, institutes like CWC, NIH, etc. are already working to an extent on the regional level approach to indicate factors of river improvement. However, in the absence of an empowered basin authority, individual cities will still need to play a leading role in maintaining the rivers within their limits.

11. *How do we prevent real estate to stop entrenching into river's floodplains? The concretisation and reclamation of land from the river can only be prevented with right engagement of citizens with the river.*

Response: That is something we struggle with, because the investment by private entities is helpful toward completing projects and driving connection to the river, but we are indeed seeing development in floodplains that could be a concern. In our opinion, this entrenchment of the river space can be controlled by a mix of two approaches: (a) enforcing strict norms for regulated development within the area and (b) right strategy for citizen sensitisation and engagement. Strict compliance based development control regulations and restrictions have to be quickly adopted through an efficient river-sensitive planning mechanism. Parallely, the river-city connect and the sense of ownership of the river by the inhabitants has to be strengthened to willingly avoid any violation of the restrictions imposed for betterment of the area.

12. *Do you think the COVID-19 virus can be found in wastewater? If so, what could be the best possible protective measures, particularly for people who use river water for drinking purposes?*

Response: There are studies¹ that have suggested the presence of corona virus in faeces/excreta flowing in the wastewater. Accordingly, the people coming in direct contact

¹ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7091381/>;
<https://www.sciencemag.org/news/2020/04/coronavirus-found-paris-sewage-points-early-warning-system>;
<https://www.sciencedaily.com/releases/2020/04/200423144056.htm>

with wastewater (staff dealing with sewage water) are directed to use personal protection equipment by the local authorities, to avoid the risk of not just this but any other sort of virus related transmission. However, the river water in majority of the cities is supplied after passing through a treatment system. In case of deep aquifers the transportation of water is through sand medium which also removes any impurities. So no case of any transmission of the virus from drinking water has been witnessed so far.

13. Will the impact of lockdown on ecology due to COVID-19 bring changes in urban river management policies & planning, and the outlook of planners?

Response: We certainly hope so. The current situation has clearly pointed out to the fact that riverine ecosystems can rejuvenate naturally over a period of time. The main lesson learnt for planners is to strive that optimal level of allowable development whose impacts the riverine systems can absorb naturally.

14. There should be more accountability of the stakeholders who are directly earning from the river, for example fisherman, temples authority, boatmen etc. How can they contribute in the river rejuvenation and its quality?

Response: Indeed. These stakeholders have the greatest stake in the river. Because their livelihoods depend upon the river, it may not very difficult to solicit their support for various rejuvenation activities. They can serve as the “eyes” of river management because they are usually the first ones who will observe any changes in the river. NMCG through its regular activities has already involved many such actors in their projects. Also, the stakeholder engagement and the community participation approach followed by most of the planning exercises nowadays makes this aspect even more significant.

15. When we speak about future development, what can be the measures to make these rivers and water bodies viable for development without losing their existing characteristics?

Response: The best philosophy for river management would be to use a sustainable development approach, considering the ecological, social and economic angles. Many current river-oriented planning and development approaches at the national, state and city level are beginning to see value in this approach. The framework for urban river management that NIUA has developed is also anchored in the principles of sustainable development.

16. Wherever possible, transportation through rivers may increase the economic value of rivers. Comments.

Response: Indeed, river navigation is an effective source for generating economic benefits from the river ecosystem. It also complements the transport infrastructural requirements of the cities. However, cities must be careful that this does not come at the cost of the environment. A balanced approach considering the three verticals of Sustainable

Development, i.e, ecological, social and economic angle of development, is the best approach that can be adopted in such scenarios.

17. How helpful is the establishment of green infrastructure (ecological habitats to sustainable grey infrastructures) for upstream investments, in terms of groundwater and surface water enrichment which will aid in river flow enrichment?

Response: Extremely important. Here² is an interesting analysis of urban green growth strategies for Indian cities.

18. Lockdown has shown the GAP, YAP implemented earlier are working seamlessly. Who should be held accountable for turning rivers in sewers? Industrialists, Planners/River Management experts, Governments, or the local people?

Response: Degradation of urban rivers is not as a result of the activities of any single stakeholder. All the stakeholders mentioned in the question are culpable, some perhaps more than the others. Hence, the solution to the problem will also need to be a collaborative effort by these stakeholders.

19. River or any surface body are primary resources for domestic consumption, agro-allied activities, etc. But the pollution that is witnessed today has made these water bodies un-consumable. So in this regard, is the riverfront development a solution to deal with the situation.

Response: Riverfront development projects have the ability to highlight the river. These can be seen as very powerful tools to connect the citizens with the rivers. Polluted water in the rivers has the potential to completely nullify the benefits of a riverfront project. No one wants to visit a place which smells bad or looks ugly. Hence, a riverfront development project by itself is perhaps not the solution. It is, however, part of a larger set of solutions.

20. Can the linkage of urban planning and river be elaborated with few BMPs? Are the BMPs for urban planning and river available in Indian context? If yes, where?

Response: One of the BMPs for urban river management would be to mainstream river thinking into the urban planning framework. This gives it the required impetus and statutory status within the city’s larger vision. NIUA has recently prepared a guidance note in this regard, which will be in public domain shortly.

21. The riparian buffer development suggests preserving or restricting development to a certain proximity, and there is very less opportunity of carrying out such green-belt development. How can this be dealt through any rules/ regulations/ mechanisms?

Response: The concept of buffer surrounding these ecosystems is predominantly to preserve these ecologically sensitive habitats from the harmful impacts of the abutting

² https://www.niua.org/sites/default/files/reports/vol1-12feb2015_web.pdf

activities. These buffer areas thus require specific restrictions on the development within these areas. However, these areas can still be developed as natural landscapes, limiting to the permissibility restrictions. Other non-conforming activities linked with the river, can be planned in adjacent zones, wherever feasible, without disturbing the natural ecosystem. More details on the requisite buffers and restricted development in the form of regulations/ norms & standards, is being put together in a Strategic Document being prepared by NIUA in association the Town and Country Planning Organization (TCPO). This will be made available in public domain once officially finalised and released.

22. *Most of the master plans in India have reserved a lot of land as ecological belt without specifying any uses of activities, which leads to unauthorized development, encroachment and pollution. Can we talk about land use planning around urban lands abutting rivers?*

Response: Great point. NIUA in association with the Town & Country Planning Organisation (TCPO) is developing a strategic document for river-centric planning norms and regulations. It touches on aspects related to delineating river zones, identifying the land use categories, restricting certain non-compatible activities, regulating the buffer requirements, specific Development Control Regulations for the river zone, etc. The document will be available in public domain once officially finalised and released.

23. *Solutions need to come from a localized context. Every place have its own ecosystem and the solution lies in the need to be in harmony. Are there any guidelines to work on these lines?*

Response: Indeed, localized solutions are often that work best. While there are no specific guidelines for this per se, the significance of such solutions for river management can be highlighted through a thorough baseline assessment. The baseline is bound to bring to the fore very localized issues and challenges, which will set the premise for localized solutions as well.

24. *About 350-400 million people are associated with the Ganga directly or indirectly, which probably suggests that community participation is key, throughout its over 2000 kms length. How does go about this exhaustive exercise of engaging such large numbers?*

Response: This is a standard problem with basin planning processes and there is never the situation in which all can be engaged. Typically, we employ two main strategies. First, we reach out to representative agencies. Here the main point is to capture the diversity of possible interests. We don't necessarily need to engage with every farmer but if we get a few farmer association representatives on board we have a good chance to engage with the relevant perspectives. The same for different states and different districts. And this is the main approach, not to engage with all persons but with all perspectives. Second, we identify representative communities/districts. Here we often use statistical analysis to derive a typology of households/stakeholders. Then we run grassroots level activities (e.g. FGDs, surveys) in representative districts/communities. One method we use a lot of social simulation (aka agent based modelling). This helps us understanding the possible impacts on all people in a basin. And by simulating the baseline we can test how well we

represented the diversity of communities and households. If you come from a modelling perspective you might be interested in a paper with ten “principles” for policy impact, which has a lot to do with participatory processes³.

25. There is a huge change in the environmental behaviour post covid-19, as compared to the earlier scenario. Is it an indication for the human beings to change strategies & laws related to protection of environment, including cleaning rivers and water bodies?

Response: We hope you are right. We think we need to use this opportunity and show the new data (e.g. improved water quality) and show what is possible. Once people see, maybe there will be a long-term change.

26. Stake holder management for river management is something we need to emphasize on. One of the biggest partner will be the education sector. River management should be a mainstream subject taught in schools and colleges. Hopefully in a generation, we will see involved global citizens. What are your views on this?

Response: We couldn't agree more. MERFI has done a lot of training on various topics related to river management. But so far most training is addressing government officials. Introducing topics such as IWRM or climate adaptation into school curricula would indeed have much bigger effects. I believe it would improve the resilience of communities to water related changes at the grassroot level and cause system wide (or basin wide) improvements.

27. Interesting lessons on stakeholder engagement. In the context of the Covid-19 crisis, it is interesting to see the role of science and research in decision-making. It could be argued that in some countries (US/UK) science was not heeded until too late. A key question is why? Is this a failure of science?

Response: Many scientists are still focused on academic goals (e.g. publications). To be able to respond quickly in such a crisis situation means to (1) have already earned the trust of decision makers and (2) to have the relevant data and methods ready. The first part involves scientists to shift their focus on policy making, understand policy processes, and have worked with participatory processes for some time. This takes a lot of effort, which has often very few rewards. Hence, many scientists don't shift their focus to highly applied policy work. The second aspect is a challenge because funding is only available while certain topics are relevant to policy makers. Policy makers need to understand that they need to continue funding issues that are likely to arise in the future to receive the much needed evidence and decision support. I often refer to this as a part of an insurance package for crisis situations. And this second part is not really a failure of science. Some universities actually manage to divert funding for these issues and become suddenly extremely relevant and vocal during these crisis situations. That requires good leadership and dedication, which quite a few groups have demonstrated for the COVID19 pandemic.

³ 10.1007/978-3-319-18944-4-1

28. How important is it to maintain biodiversity in the fresh water systems? From the polls and questions asked, I can see river interlinking and pollution management are being given 'top priority'. Conserving the biodiversity has been low-key.

Response: We need to realise that maintaining biodiversity is also ultimately about sustaining people - they are not competing things. Thus this should be ranked as highly important.

29. Looking into COVID, is it possible to analyse the water quality of river and understand its spread or traces? Is any such study undertaken, which will help to monitor any such pandemic in coming future?

Response: New tests have emerged to test for COVID in the wastewater from buildings, compounds etc. Genetic testing thus makes it possible to test for COVID in rivers as well, although quantification remains difficult so it will be difficult to infer the numbers of infected people.

30. Biodiversity awareness is a necessity in the political network. We are having cabinet decisions legalising sand mining in water bodies in the urban areas of Bangalore. Now how do we deal with this?

Response: There is no substitute for education! This is an ongoing issue in every country. COVID has taught us an important lesson, i.e. that policy makers need to listen to scientific advice and to stop thinking that they know everything. Thus, evidence based decision making is most necessary and needs to be adopted by policy makers.

31. The pollution crisis in the Rhine led to major changes in river water management and enhanced cooperation between the countries. Does the Covid-19 crisis present a similar opportunity for River Basin Management or is it too indirectly related?

Response: There is a possibility that society will emerge from the pandemic with a greater sensitivity to environmental issues and to the warnings of scientists. I suspect that the status of scientific recommendations will become elevated which should result in greater cooperation for basin management.

32. I would like to drag your attention towards the proposed Hydro-power project on Dibang Valley, Arunachal Pradesh, an abode of rich biodiversity. This project requires clearance of about 2.7 lakh trees. From your experience in other countries, what can be an alternative to such projects?

Response: Here⁴ is an example of Sustainable Hydropower Assessment Protocol, so it is possible to make hydropower projects more sustainable. One of the reasons for clearing trees from a hydropower dam is to stop methane emissions from rotting vegetation. Hydropower dams can also be turned into attractive recreation facilities or parks, with the trees removed during construction ultimately replaced around the perimeter of the dam.

⁴ <https://www.hydropower.org/topics/featured/hydropower-sustainability-assessment-protocol>

The main alternative is to avoid building any storage structure but using a run-of-river construction instead, with just a low weir to divert the water. Obviously, this alternative depends on the site conditions and flow regime, but it may be worthwhile considering. Finally, there are many other alternative energy sources such as wind and solar, and with recent developments in battery storage, off-grid approaches are becoming cost-effective, often with upfront costs paid by an energy service company.

33. You mentioned about the use of big data in river management? Can you elaborate on some specific applications?

Response: There are some excellent reviews available such as this⁵ relatively recent overview:

This particular study listed several examples such as:

- Use of automated sensor and monitoring systems
- Geo-spatial data from cell-phones, GPS, and airborne sensors
- Atmospheric and ocean models
- Flood, drought, GLOF, and earthquake prediction
- Water quality data and ecosystem impacts
- Crop assessment and forecasting
- Urban water demand projections
- Central control systems for river managers

34. Climate change impacts cannot be looked in isolation. How should a city plan for climate change impacts on its stretch of the river, given its interaction with the overall river system?

Response: There has been quite a lot written about how cities are responding to climate change as shown in this⁶ paper.

In Melbourne, Australia, the local water authority is investigating climate change impacts on:

- Water supply – adapting to less rainfall by harnessing alternative water sources like desalination, stormwater and recycled water, and conducting controlled burns to protect water supply catchments from bushfires;
- Sewerage system – monitoring and upgrading our system to reduce the risk of spills during extreme storms, and researching solutions to sewer corrosion and odour caused by more concentrated sewage;
- Drainage system – upgrading drainage in high risk areas to cope with floods, and reviewing guidelines for development in flood-prone areas; and
- River health – researching catchments at risk from low river flows and species most affected by temperature increases.

⁵https://www.researchgate.net/publication/334710343_An_Overview_of_Big_Data_Applications_in_Water_Resources_Engineering

⁶ <https://www.sciencedirect.com/science/article/pii/S0959652618308977>

35. We already know the status of Ganga near industrial towns like Kanpur and also the reasons for contamination and pollution. Then why not mandate any policy to stop draining of polluted fluid in the Ganga river? A very strict regulation for treatment of hazardous industrial fluids could be effective. Isn't it possible to locate/shift industries at some distance away from river's effective buffer area, like some barren land or at any remote area away from river's reach?

Response: Treatment of municipal sewage is essentially the responsibility of urban local bodies/state government agencies while treatment of industrial effluent is the responsibility of industries themselves. NMCG and Central Pollution Control Board have identified Grossly Polluting Industries (GPIs) in the Ganga river basin. This inventory of GPIs has been done for prioritized monitoring. GPIs are industries discharging pollution load of BOD 100kg per day or more and/ or handling hazardous chemicals. Pollution load being discharged to River Ganga and major tributaries from 211 priority drains (> 1 MLD discharge) is assessed on half yearly basis with regard to consent condition imposed by respective State Pollution Control Board. The GPIs are also inspected on annual basis for compliance verification of the pollution norms and process modification, wherever required through third party technical institutions of repute. This has led to improvement in compliance by industries. Improvement in technology to reduce effluent have led to improvement in compliance. A modern integrated Common Effluent Treatment Plant (CETP) of 20 MLD at Jajmau, Kanpur is in progress addressing the long pending problem of pollution of Ganga from Tanneries. The idea of shifting of industries have been tried out in some of the cases but this has several constraints. It is also more difficult in certain traditional clusters wherein large number of small industrial units exist. There are guidelines for certain categories of industries for not to be set up close to habitations etc. What is really required is strict enforcement of compliance to standards and industries to assume more responsibility on their own.

36. What are your views on the interlinking of rivers?

Response: Interlinking of River (ILR) programme is of national importance and has been taken up on high Priority. Hon'ble Minister for Water Resources, RD & GR is monitoring the progress of ILR from time to time. The mission of this programme is to ensure greater equity in the distribution of water by enhancing the availability of water in drought prone and rain-fed area. The overall implementation of Interlinking of Rivers programme under National Perspective Plan would give benefits of 35 million hectares of irrigation, raising the ultimate irrigation potential from 140 million hectare to 175 million hectare and generation of 34000 megawatt of hydropower, apart from the incidental benefits of flood control, navigation, water supply, fisheries, salinity and pollution control etc.

37. What is the best strategy to manage such a densely populated river basin like Ganga, which is socio-culturally associated with millions of Indian?

Response: The best strategy as per current scenario would be integrating all basin approach initiatives in a holistic manner. These include all programmes and projects related to rejuvenation of River under one umbrella/organization. The multi sectoral nature of challenges and appropriate strategies and interventions to meet these

challenges effectively and also in a time bound manner needs convergence of efforts. The Cooperative federalism structure would include the centre, state and cities working together with the public as part of decision making. The civic bodies at the city level can be crucial in providing guidance, management and opportunity for balance in use of the water resources available to them. In addition to government structures, river basin management will have to integrate the efforts of communities, societies, NGOs, action groups, startups and individuals taking relevant initiatives as well. Furthermore, it is also important to re-connect people with river. People visit rivers for several purposes. These visits should be pleasant with a host of different attractive amenities. Some of the initiative that NMCG has taken in this regard include improving amenities, community outreach, development of Ganga Vichar Manch, Ganga Praharis, Ganga Mitras, Ganga Task Force with ex-serviceman, Ganga Utsav, Ganga Run, rafting expeditions, among others. Youth and students are special drivers of these campaigns and help in creating awareness. A major innovative step by *Namami Gange* is launch of **Ganga Quest**-an online quiz competition to increase the knowledge at individual level about river Ganga during 22nd April till 22nd May.

38. Does India have any plan to create detailed digital maps, using LiDAR or satellite imageries, giving exact details of the river basin and the tributaries all along?

Response: NMCG and Survey of India (SoI) have collaborated to generate high-resolution DEM & GIS ready database for part of River Ganga. The maps are being produced with vertical accuracy better than 50 cm, contour of 1.0 m, ortho-photos with 25 cm ground sampling distance or better. The maps capture outlet/vent of sewerage and other discharge from all dwelling units, industrial, commercial and all type of other institutions; public network; crematoria; ghats; RFD; solid waste disposal sites; STP/ETP/CETP; etc. NMCG is also working with Survey of India for LIDAR/Drone mapping of springs in Tehri Garhwal and source mapping of springs through Isotope study through IIT Roorkee & National Institute of Hydrology. The cultural mapping of natural, built and intangible heritage by INTACH; Biodiversity mapping by WII, Fisheries resource mapping by CIFRI are also on GIS enabled datasets. NMCG has also sanctioned projects to reputed institutions such as NEERI, IITs, NGRI for assessment of water and sediment for study of special qualities of Ganga water, reconstruction of Ganga through corona images, Microbial mapping, heli-survey for paleo channels for aquifer management etc.

39. Why are projects that exploit, encroach and pollute the rivers planned, promoted, supported, funded, and continued?

Response: The government plans for projects with multiple insights on strategic planning, financial constraints, infrastructure development requirements and a view to better manage resources. There may be direct and indirect positives linked to the project which many not be visible at first but prove their worth in the long run. There may also be trade-offs. For example, construction of dams may be seen as detrimental to the ecological flow of the river, but the same are essential in providing valuable energy/water requirements. That said, city governments are being sensitized to the value of flood plains. Cities along the rivers have been in existence for many centuries. Development pressures has left the cities burdened with encroachments and irresponsible construction. NMCG understands

that an integral part of overall river ecology and their protection is important for health of the river, keeping the flood plains regulated and construction free. Brown field development and peri-urban areas are being monitored for development. Flood-plain demarcation for Ganga from Haridwar to Unnao to identify no development zone and regulatory zone has been initiated.

40. *Post Covid-19 lockdown of the country has improved our river water quality, due to shut-down of most commercial and industrial establishments. Can we conclude that these are mainly responsible for water pollution?*

Response: The nationwide lockdown, imposed on mid night of March, 24, 2020, to curb spread of COVID 19 has been witnessing overall ecological improvements including the condition of rivers. The river Ganga already had high value of Dissolved Oxygen (DO) meeting the norms through its length has witnessed further increase in the same. Similarly, Biological Oxygen Demand (BOD) has also reduced. Nitrate concentration has also reduced. The Sewage generation and treatment has continued. NMCG has added additional capacities in cities along Ganga and all these STPs were closely monitored for their effective operation. In fact, new STPS got commissioned at Haridwar, Rishikesh and Muni ki Reti recently insuring complete treatment of sewage generated. At Haridwar, 6 sewerage infrastructure projects have been sanctioned at a cost of Rs. 476.73 Crores creating new treatment capacity of 100 MLD. At Rishikesh, 2 sewerage infrastructure projects have been sanctioned at a cost of Rs. 165.23 crores creating 26 MLD treatment capacity. At Muni-ki-reti, a 12.5 MLD STP has been sanctioned at a cost of Rs. 80.45 crores. There has been absence of industrial wastewater discharge, zero human intervention and increased fresh water flow due to intermittent rains and no requirement of the same in agriculture at this time. Reduced activities at Ghats and entrainment of solid organic waste into the river may also have contributed to better water quality. These factors have contributed to better health of rivers and the message is that it is possible to see rejuvenated rivers if we create and operate the required infrastructure and regulate our behaviour on our own without such extreme circumstances.

41. *Pollution and ecological damage is predominantly as a result of urban development. How will we get the cities to stop pollution? City governments and state governments should be held accountable for not cleaning up their act. How will NMCG succeed where NRCD failed?*

Response: There is no doubt that growing urbanisation, often without adequate planning with ecological considerations have brought in much pressure upon rivers and water bodies in urban areas. Often the need to have proper waste disposal system does not get the required priority and the victim in this process is the natural systems-waterbodies, rivers etc. This is also driven by ever increasing resource constraints and inadequate capacity. The larger issue is that of improving urban governance. Hence, if we only intervene by way of constructing STPs etc, it may not yield lasting results. *Namami Gange* is attempting to connect different aspects and build a comprehensive understanding and interventions. A key component of a city’s planning process is its capacity to develop resources through the urban local bodies (ULBs). In India, water being a state subject, it falls on the city governments to better manage its resources at an urban level. Water

bodies within city boundaries, ground water resources and rain water are under the purview of a city municipal corporation for development, rejuvenation and use. In order to steer a city’s development towards keeping these water resources safe, capacity building of ULBs is essential with a call for strong legislature and guidelines. Basin approach for river conservation should be adopted which will be more natural and collaborative framework. NMCG is not only working on pollution abatement but also to ensure maintaining water security in the entire Ganga basin, with policies and programs on demand side management, floodplain protection, conservation of wetlands and springs, improving ground water through aquifer recharge, reuse and recycle, improving water use efficiency, urban river management plan. NMCG has initiated a project with NIUA to develop an integrated river-centric management plan which the cities themselves will have to prepare based on an expansive but dynamic framework. Multiple capacity building and behavioural change programs have also been undertaken with states and city ULBs. NMCG’s institutional framework also provides a provision for the states to interact on a common platform. There are provisions for State and District Ganga Committees to be formed which gives a clearer roadmap for development and rejuvenation.

42. *Since Mahakubh is coming again in Haridwar, it will be taking its toll on the quality of Ganges water. What are the recommendations to effectively manage the world's largest peaceful gathering?*

Response: A Prayagraj Mela Authority, a permanent body has been constituted to oversee the mela for which the divisional commission of Allahabad serves its chairperson while the district magistrate and inspector general of police as the vice -chairpersons. It is the hard work of multiple state and city authorities that in Year 2019 at Kumbh, we saw hundreds and thousands of people take a dip in the holy water of River Ganga, but were also dedicated to ensure that minimum impact and cleanliness are maintained in their religious offerings to Mother Ganga. NMCG also supported the sanitation initiative during Kumbh 2019, by sanctioning a financial assistance of Rs. 116.6 cr. for the construction of 27500 toilets, 20000 urinals, 16000 dustbins and lining bags. An additional Rs. 16.68 cr. had been sanctioned for 'Paint My City' and other such activities to connect people with the city and the river. Bioremediation projects had been sanctioned to check polluted flows in 53 drains. The efforts in ensuring cleanliness of water and improving overall sanitation were appreciated by the visitors. This year too, the preparations will be comprehensively undertaken, with maximum attention to minimizing impact on River and floodplain.

At Prayagraj, *Namami Gange* has sanctioned host of projects to mitigate pollution from the city and add value to the flood plain. 10 Sewerage infrastructure projects have been sanctioned at a cost of Rs. 2,985.3 Crores creating new treatment capacity of 191 MLD, rehabilitation capacity of 80 MLD and a sewer network of 775.89 km. Industries are regularly monitored to reduce pollution.

A trash skimmer has also been stationed to catch floating materials on the river surface. Project has been sanctioned for 21 Ghats at Prayagraj to be cleaned regularly. Afforestation and biodiversity related activities have been taken up to revive the floodplain and aquatic life. Under a combined project with Department of Drinking water and sanitation, all villages along Ganga have been declared ODF.

43. For riverfront development projects, can we completely eliminate the use of concrete and stick to only natural materials?

Response: It is a noble goal to be completely using natural materials for riverfront development projects but may not be feasible in all circumstances. Sometimes, site conditions may also need to use other suitable materials. What perhaps needs to be done is to maximise eco-friendly materials and design elements in RFD projects. NMCG in association with WRI has developed a guidance note for environment friendly, climate adaptive and socially inclusive urban river front planning and development. This guidance note can be downloaded from the NMCG website.

44. Many policies, schemes, programmes prevail in the governance system and most of them aren't known to the public, even to the professionals in the field of development. Can something be done to address this?

Response: Majority of schemes, programmes and project details at a centre and state level are available on respective government's website. The Ministry's also bring out Annual reports of progress which are also accessible. There may also be online databases developed for a particular information set. However, strategic and sensitive data are generally not available in public domain. These may be accessed through separate requests to the concerned departments. Our endeavour is to share most of the available information, reports, status notes etc on website and also disseminate through social media. We are also developing a Ganga Knowledge Centre and a portal to disseminate easily and collaborate to get new ideas and inputs.

45. Are the points, which led to change in the Ganges water quality because of the COVID-19 crisis, identified? It will be very important to identify the hotspots which were polluting Ganges and Yamuna and control those in future.

Response: The nationwide lockdown, imposed on mid night of March, 24, 2020, to curb spread of COVID 19 has been witnessing overall ecological improvements including the condition of rivers. The river Ganga already had high value of Dissolved Oxygen (DO) meeting the norms through its length has witnessed further increase in the same. Similarly, Biological Oxygen Demand (BOD) has also reduced. Nitrate concentration has also reduced. The Sewage generation and treatment has continued. NMCG has added additional capacities in cities along Ganga and all these STPs were closely monitored for their effective operation. In fact, new STPS got commissioned at Haridwar, Rishikesh and Muni ki Reti recently insuring complete treatment of sewage generated. There has been absence of industrial wastewater discharge, zero human intervention and increased fresh water flow due to intermittent rains and no requirement of the same in agriculture at this time. Reduced activities at Ghats and entrainment of solid organic waste into the river may also have contributed to better water quality. These factors have contributed to better health of rivers and the message is that it is possible to see rejuvenated rivers if we create and operate the required infrastructure and regulate our behaviour on our own without such extreme circumstances.

46. *Should citizen-river connect not be given priority in making the holy Ganges regain its pristine glory? If Indian Council of Medical Research is considering testing of Ganga Jal for treating COVID-19 virus, should people connect not be given more importance by making them realize its importance?*

Response: It is certainly necessary to give priority to Citizen River connect. River Ganga is revered throughout India and has many cities as spiritual centres. The religious connotations along with economic and environmental importance are not lost to people. Praying to Goddess Ganga on one hand and polluting her waters to carry filth and waste from cities, however, is a paradox. People’s belief in the river is such that minimal interventions can lead them to reconnect to the river. The first step in the right direction would be to connect them with the river visually. Ecologically constructed ghats and riverfronts are a way to achieve that objective. The second would be to make them a part of the cleanliness process. NMCG recognizes and shares the vision through ‘Jan Bhagidari’, the backbone of our mission. We believe that students to adults, everyone should be actively involved in Swachhata & water conservation activities. *Namami Gange* is open to any and all efforts big or small; each will have a high impact in the long run. The third would be to sensitize the generations on the degenerative effects of pollution. Behavioural change programmes and efforts like the Ganga Utsav, Ganga Vichar Manch, Ganga Prahari, Ganga Mitra, and Ganga task force run by NMCG, celebrate the mighty Ganga and bring people closer through citizen action.

47. *Due to improper management of river, floods do come too. So, as a practical scenario, which flood is more dangerous between urban and rural flooding? Also, which floods are easy to control?*

Response: The way river is a natural system, floods too are. The natural system required to respect flood plains and not to encroach for construction and settlements. However, over a period, these have changed and hence when floods come damage is more as houses, fields are close to river or in flood plain. As more densely populated habitations are in urban areas, a flood is likely to cause more damage to property and even be threat to life. Rural flooding can inundate larger areas, damage fields, submerge houses and also cut off communication. The situation could be dangerous and harmful in both cases. We have to select a combination of engineering and ecological solutions to mitigate damages due to floods. This plan should also consider the impact of climate change on flooding events.

48. *Isn't the government's mission to protect rivers and streams from exploitation, encroachment and pollution? Why does it appear to do exactly the opposite?*

Response: The government plans for projects with multiple insights on strategic planning, financial constraints, infrastructure development requirements and a view to better manage resources. There may be direct and indirect positives linked to the project which many not be visible at first but prove their worth in the long run. There may also be trade-offs. That said, city governments are being sensitized to the value of flood plains. Cities along the rivers have been in existence for multiple centuries. Layer upon layer of development has left the city burdened with encroachments and irresponsible

construction. NMCG understands that an integral part of overall river ecology and their protection important for health of the river, keeping them regulated and construction free. Brown filed development and peri-urban areas are being monitored for development. Flood-plain demarcation for Ganga from Haridwar to Unnao to identify no development zone and regulatory zone, has been initiated.

49. *What will be government's plan after lockdown, in order to preserve the positive impact on water quality of the rivers due to closure of different industries on river banks during to the lockdown?*

Response: NMCG and Central Pollution Control Board have identified Grossly Polluting Industries (GPIs) in the Ganga river basin. This inventory of GPIs has been done for prioritized monitoring. GPIs are industries discharging pollution load of BOD 100kg per day or more and/ or handling hazardous chemicals. Pollution load being discharged to River Ganga and major tributaries from 211 priority drains (> 1 MLD discharge) is assessed on half yearly basis with regard to consent condition imposed by respective State Pollution Control Board. The GPIs are also inspected on annual basis for compliance verification of the pollution norms and process modification, wherever required through third party technical institutions of repute. This has led to improvement in compliance by industries. Improvement in technology to reduce effluent have led to improvement in compliance. A modern integrated Common Effluent Treatment Plant (CETP) of 20 MLD at Jajmau, Kanpur is in progress addressing the long pending problem of pollution of Ganga from Tanneries. Post lockdown, NMCG plans to build on these efforts through stricter enforcement, improving self- discipline and, behavioural changes

50. *Should the management for coastal rivers be different from other rivers? In what way?*

Response: An integrated approach to water resources planning at the scale of river basins and coastal systems requires complimentary but varied knowledge and datasets as rivers, coastal, and estuarine systems are influenced by a wide range of hydrologic, geologic, geochemical, social, ecologic, economic, and political factors. The boundaries of river basins are easily delineated based on topographic divides, whereas the complex and dynamic nature of coastal systems makes their delineation more problematic. There may also be a various issues which may defer for coastal rivers such as groundwater ingress, biodiversity change, and influence of islands, marshes, wetlands and beaches.

51. *Integration of Water Departments has been done at the Central Ministry level. But water being a state subject, the same is not done at the state level. Water should be brought under one umbrella to think about it in an integrated manner from policy, governance and implementation purposes. Comment.*

Response: This may need time to be accepted administratively at different states. But thinking has started. State of UP has also made a Ministry of Jal Shakti which is looking after Irrigation, Drinking water- Jal Jivan mission and *Namami Gange*.

52. Has NMCG been able to take, use and build on all the GIS work done under NRCDD? A massive river basin study on pollution abatement was done under JICA funding. That may be a good foundation as baseline information. Possibly this can be considered to build time-series data for constructive actions.

Response: Work done under NRCDD and by external agencies associated with NMCG has helped build our baseline studies. All work has been suitably incorporated in our databases. JICA assisted projects are ongoing in Varanasi and Delhi taking in consideration the recommendations of detailed study done by our associated agencies and in consultation with State and City authorities.

53. Do you agree that GOI has to change strategies for Clean Ganga i.e. other actions are also needed apart from engineering solutions alone, which we followed so far?

Response: ‘Namami Gange’ was launched in June 2015 with the aim of integrating previous and currently ongoing initiatives in holistic manner with a basin approach. It includes diverse set of interventions such as pollution abatement measures to tackle different sources of pollution such as municipal sewage, industrial effluents, municipal solid waste, non-point sources of pollution and interventions for improving ecological flows, biodiversity conservation, afforestation, improving amenities and sanitation at river banks, capacity building, research & monitoring, public awareness. The program now is not limited to works program or engineering solutions but is broad based with several nature based activities and solutions to improve ecology, flow and people river connect. With certainty of availability of finance with a dedicated budget of Rs. 20,000 Crore for a period of 5 years, program got scaled up as well as diverse. Learning from the past, need for integrating/ converging various schemes of the Government relevant for Ganga Rejuvenation had been felt in order to enhance the size & scope of interventions under overall framework of Ganga River Basin Management Plan for the integrated *Namami Gange* Mission. The Ganga River Basin Management Plan, a comprehensive document prepared by 7 IITs provides the roadmap for Ganga rejuvenation. It focusses on ‘*Nirmalta - unpolluted flow*’, ‘*Aviralta – maintain minimum environmental flow*’, and to treat river as Geological and Ecological Entity.





For any further information, please feel free to get in touch

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