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*With you in Pursuit of Sustainable
Management of Finite Water Resources*

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Point for discussion this month **Action plan for restoration of Mother Ganga**

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Eternal Words

"If you are missing out on the natural joy and wisdom of life, it is because you have been taught to ignore it....Reconnecting with nature consists of bringing into your consciousness a sensory way of thinking and relating with which you are born."

- Michael J. Cohen.

A human being is part of the whole, called by us "Universe," a part limited in time and space. He experiences himself, his thoughts and feelings as something separated from the rest - a kind of optical delusion of his consciousness. This delusion is a kind of prison for us, restricting us to our personal desires and to affection for a few persons nearest to us. Our task must be to free ourselves from this prison by widening our circle of compassion to embrace all living creatures and the whole [of] nature in its beauty.

- ~Albert Einstein, 1950

Dear Readers,

Ganga River is life-economy-health-heredity-future of population not only in riparian states but the entire country through providing food, energy and transportation. It has endowed ecosystems, hydrologic cycle of Indian sub-continent from millions of years after formation of Himalayas. There are three major river basins - Sindhu (extreme northwest), Ganga (Indian Plains) and Brahmaputra (Extreme Northeast) are bordering Indian subcontinent plate which pushed the Eurasian plate after disastrous collision. The event must have been spectacular just like Lord Shiva's Tandava Nritya.

Photograph of Ganga given on cover page is taken during the demonstration work for restoration of dirty nallahs draining pollution into Ganga River at Rasoolabad Ghat, Allahabad on insistence by Dr. G. D. Agarwal - a well-known Ardent Ganga Premi under the auspices of Ganga Sewa Abhiyan in 2011. It was a successful experiment facilitated by Hindu Dharmguru who respects the spiritual blessings of Ganga Ma. The Ecological Restoration Project for Rasoolabad 5-stream complex at Allahabad was designed by SERI and developed and maintained by Green Infrastructure for two years.

Sandeep Joshi's article "Ecohealthcare for Ganga" explains the philosophy of "Caring" and not "Engineering" will be more useful for restoring the Ganga River's health and the concept, initiatives, outcomes will be useful for other polluted stretches of rivers in the Indian sub-continent which can to inclusive growth of Indian people corroborating to emergence of India as a developed nation.

Friends, this is the last issue of 8th volume, so we thought that it would be appropriate to discuss ecohealthcare of Ganga since the new Prime Minister of India is keen to restore Ganga River with the help of people from all walks of life including dharmgurus, NGOs, CBOs, administration, scientists, engineers, academicians, students and common man. All the best for the efforts!

Let's discuss many more relevant issues in subsequent volumes! We are thriving on your well-wishes.

Thank you,
Chief Editor

Ecohealthcare for Ganga

- Sandeep Joshi

Preamble

We Indians learn to revere and worship Ganga as a goddess, as sacred from our childhood. Ganga River is a life-line, a symbol of purity, wholesomeness and virtue for countless people of India. Millions of devotees flock to the river to take aachman (mouthful with holy water) or a holy dip to free themselves of sins. There is famous fable of Ganga descending to Earth unlocking Shiva's hair. Beliefs that Ganga is a purifier par excellence attracting millions of people.

Ganga is a perennial river from the Himalayas and flowing through many states before its confluence with Bay of Bengal. Water of Ganga was once perceived as sacred, but not anymore now due to increased numerous human interventions. Immaculate Ganga water is replaced by polluted waters at various locations. All forms of pollutants including domestic sewage, industrial effluents, mortal remains of human beings are thrown into the river.



Ganga Basin in India is 861404 sq.km (out of total 1086000 sq. km) a little more than one-fourth (26.3%) of the country's total geographical area. It is the biggest river basin in India, covering the entire states of Uttarakhand, Uttar Pradesh (UP), Bihar, Delhi, and West Bengal and parts of Punjab, Haryana, Himachal Pradesh,

Rajasthan, Madhya Pradesh, Chhattisgarh and Jharkhand. It is bordered on the north by the Himalayas; on the south by the Vindhyas and Chhotanagpur plateaus; on the west by the Aravallis and on the east by the Brahmaputra ridge.

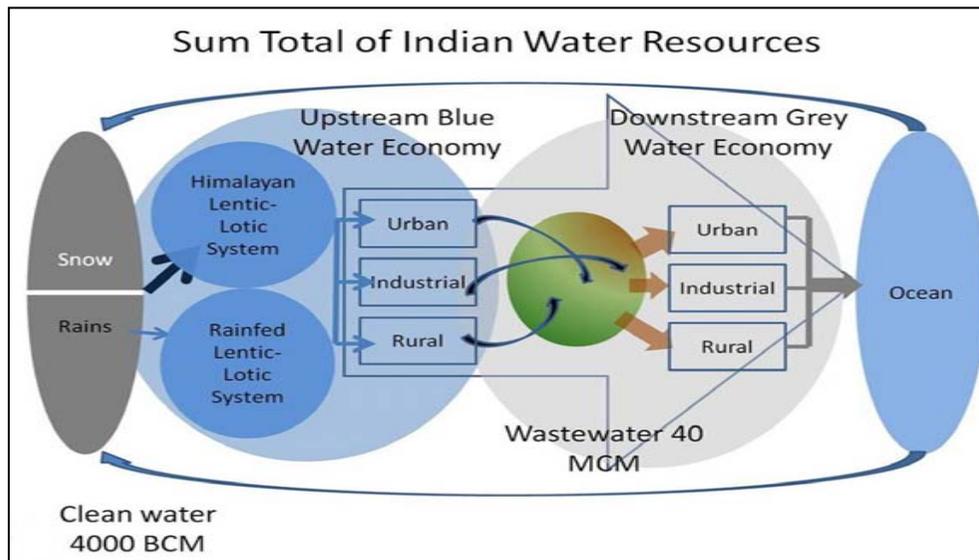
Ganga is formed at Devprayag - a confluence of Bhagirathi originating from the Gaumukh 3892 m high and Alaknanda from Satopanth and Bhagirathi Kharak 3880 m high in the Himalayas of Uttarakhand State. It flows for a total length of about 2525 km up to its outfall into the Bay of Bengal through the former main course of Bhagirathi-Hooghly. The principal tributaries joining the river are Yamuna,

Ramganga, Ghaghra, Gandak, Kosi, Tons and Sone. Yamuna – the longest tributary - has major tributaries like Chambal, Sind, Betwa, and Ken in rainfed region.

Cancer of Pollution

Ganga's basin accounts for one-fourth of the country's water resources. It is home to about 400 million Indians. Ganga river is edged by 29 class I cities, 23 class II cities, 48 towns, and thousands of villages. Sewage, industrial effluent, runoff from sugars, distilleries, chemical fertilizers and pesticides, municipal solid waste, animal carcasses and human corpses find their way to the river. In fact the Ganga water quality is critical in middle stretch. It is unfit for bathing and drinking. Discharge of untreated sewage from urban centres is a major cause of river water quality degradation. Total wastewater generation from 222 towns in Ganga basin is 8250 MLD, out of which 30% is directly discharged into the River, 55% disposed into tributaries and 15% is disposed on land or low lying areas. Due to ineffective state-of-the-art STPs much of the wastewater reach to river or agriculture fields untreated. Deterioration of the river sets in motion at Rishikesh. Ganga river water has brown or black in colour from Narora to Varanasi during the non-monsoon period. So, the upstream population enjoys blue water economy and downstream is compelled to earn from grey water due to untreated discharges into the water resources as shown in the fig. 1.

Figure 1 Economy of water cycle



(Sourced from Sandeep Joshi's paper, 2014)

Pollution of Ganga has increased since the days of first Ganga Action Plan initiated by the late Prime Minister Rajiv Gandhi in 1986. Now new Prime Minister Narendra Modi, Transportation Minister Shri. Nitin Gadkari, Minister of Water Resources Sushree Uma Bharati, Environment Minister Shri. Prakash Javadekar have taken task to rejuvenate polluted stretches of river within time span of 3 years. Shrinking glaciers, number of dams, barrages, canals and pollution cause threat to the ecological health and life of the river. Uttar Pradesh itself is responsible for about 50% of the pollution as compared to riparian states.

Ecohealthcare policy

India needs a very all-inclusive "Ecohealthcare" policy deriving axioms from water culture, ecology, engineering and economy to ensure conservation, sustainability through protection of the freshwater resources from encroachment, exploitation and pollution. Interrelationships and interactions of ecology, science, health and engineering should be the basis for planning, policy and action plans for sustainable management of rivers and lakes of India.

Sourced natural freshwater is used to cater the needs of urban-rural populations and businesses. Wastewaters discharged from such modern human establishments are unfit for any consumptive or non-consumptive or economic uses. Therefore, such wastewaters should be regenerated through employing various mechanisms to make them usable at very affordable prices. Quality of water is to be maintained when the water is returned to the natural environment.

Aquatic Ecosystem Health Hospitals: Curative Institutional Mechanism

Cleanliness, care and action for environment quality are the keys to individual's own health. There is pressing inevitable need to design the waste management, recycling and reusing systems to attain desired environmental quality and healthy habitat. So, the governance or project planning and actionable implementations are to be prioritized on the basis knowledge to yield the outcomes as desired. There is exigency to reform the institutional mechanism to improve the quality of water resources by eliminating pollution loads to improve ecological health for public health. All the rivers and lakes in the urbanized areas of India need full attention like patients in the ICU/ICU.

India has ample of preventive and regulatory mechanisms to punish defaulters with ineffective implementation as observed in NEP 2006. It seems that restoration of quality of water, air, soil, control and recycling of wastes are burdensome for the existing governance system of the country. A fresh well-organized professional team having insight of environmental processes can restore the ecological health of deteriorated water bodies with meticulously defined corrective designs and actions. Curative institutional mechanism for improving environmental health has to be

based ecosophy – ecological philosophy like medical philosophies, services and practices. There shall be state run or sponsored or private ecological institutions in all river basins like hospitals which will take care of environmental health projects, implement them with demonstrable achievements and successes. Costs shall be charged to or recovered from the concerned polluting industries or Urban Local Bodies. These Government or Private ‘Aquatic Ecosystem Health Hospitals’ (AEHH) can seek the help of specialist water professionals in planning, designing waste treatment processes, monitoring vital parameters of processes, trouble shooting and improving energy efficiency in restoring and conservation of quality of freshwater resources and aquatic ecosystems..

The AEHH will have –

1. Eco-Design Centre – Ecological operation connoisseurs (Green Surgeons) will design the restoration project with its time-bound action plans with some flexibility for geo-climatic variations and ecological changes in time and space. They should have knowledge of catchment, flow kinetics, ecological processes, chemistry and microbiology of aquatic ecosystems. They will be responsible for designed and desired outcomes through synchronization of various processes.
2. Diagnostic Lab – Specialists having knowledge of water chemistry, microbiology, hydrology, biodiversity, riverine and riparian structures, flow kinetics can interpret the monitoring and analytical data from Characterization Lab to design the corrective actions and to derive the effectiveness of corrective actions.
3. Treatability Lab – Specialists will try to standardize the concept design practically by conducting treatability experiments.
4. Characterization Lab – Environmental Analysts will use various techniques and equipment to characterize the rivers and lakes for chemical, hydrological, microbiological, biological parameters.
5. Implementation Groups – These groups comprising engineers and landscape architects will implement the time bound design and action plans under the guidance of connoisseurs and specialists.
6. Environmental Administration and Finance Group – This group will support and assist all above connoisseurs, specialists and experts to carry ecological operation in time and as desired to deliver the expected results. This group of economists, sociologists, environmental psychologists, administrators and managers will facilitate the finances from the respective polluters.

7. AEHH Management Council will have representatives of various concerned local-state-central government departments and reputed NGOs in addition to dean and departmental heads of Eco-design Centre, Diagnostic Lab, Characterization Lab, and Environmental Administration and Finance Group.

AEHH will have supreme goal of ensuring ecological health of the water bodies in urban and industrial areas and thereby making sure the protection public health and facilitation of economic progress. The attempt shall be made to reduce the time required for decision making, administrative delays, political deviations, and financial constraints. Organizational chart of AEHH is shown in following fig. 2.

Fig. 2 Organizational Chart of AEHH

