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

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Point for discussion this month **Pressure on Urban water bodies**

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Eternal Words

Water is the basis of life and the blue arteries of the earth! Everything in the non-marine environment depends on freshwater to survive.

~Sandra Postel, "Sandra Postel, Global Water Policy Project," Grist Magazine 26 Apr 04

More than one-half of the world's major rivers are being seriously depleted and polluted, degrading and poisoning the surrounding ecosystems, thus threatening the health and livelihood of people who depend upon them for irrigation, drinking and industrial water

~ Ismail Serageldin, Chairman of the World Commission on Water for the 21st Century- Water Forum, Netherlands, November 30, 1999

It is really important to solve the problem of rational utilization and distribution of water supplies. I dare say, the shortage of fresh water is the major ecological problem of this moment.

~ Mikhail Gorbachev, President of Green Cross International quoted in Peter Swanson's Water: The Drop of Life, 2001

Dear Readers,

Wish you again pollution – free waters for your health, growth and wealth! Because in this month, we religiously celebrate World Water Day on 22nd March. I say religiously because it has become a ritual for all government and non-government organizations to organize some awareness programmes on water quality and quantity. We have included a special article of Sandeep Joshi on how the haphazard urban growth with lots of backlog of good governance has pressurized the Pune's waters. Actually one should understand that it needs more of technoscientific than politico-administrative management decisions.

Cover photograph is of beautiful Ganga River in Allahabad. Dr. G. D. Agarwal, now known as Gyan Swaroop Sanand ji started "*Ganga Tapasya*" – fast unto death elimination of pollution from Ganga River and maintaining its natural flow from 14th Jan. 2012 onwards. He was teacher of chemistry in Kanpur's Indian Institute Technology (IIT) and Member Secretary of Central Pollution Control Board (CPCB) – a prime regulatory authority of Government of India. An academician and government officer of his stature when takes ultimate step of "*Ganga Tapasya*", one must realize the seriousness of Ganga pollution problem. Government of India has announced Ganga River as National River. It has to be given a status of national flag. Nobody should dare to disgrace Ganga River by putting gutters – sewers in the river.

SERI and Green Infrastructure joined hands with Ganga Sewa Abhiyanam under the guidance of Swami Avimuktेश्वaranand ji for eliminating pollution of five drains at Rasoolabad ghat in Allahabad – an organization working dedicatedly for Ganga River. Dr. G. D. Agarwal is a technical brain behind the scientific movement of the organization.

We are pleased to mention that a ceremony was organized at Udaipur to celebrate successful two years of Ministry of Urban Development recognized Ecological Restoration Project of Ahar River. Green Infrastructure felicitated all the dignitaries, scientists, engineers, citizens who were associated with the project. We got the assurance from them that the system will sustainably maintained by them for next ten years.

Thank you,
Chief Editor

Pune's Waters – Murkier Picture of Urban Pressure

- Sandeep Joshi

Introduction

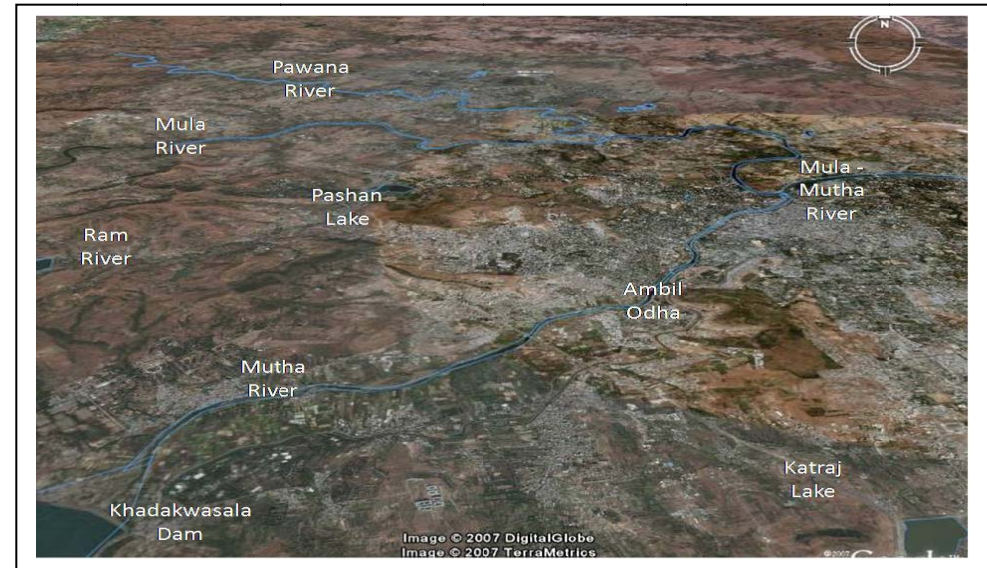
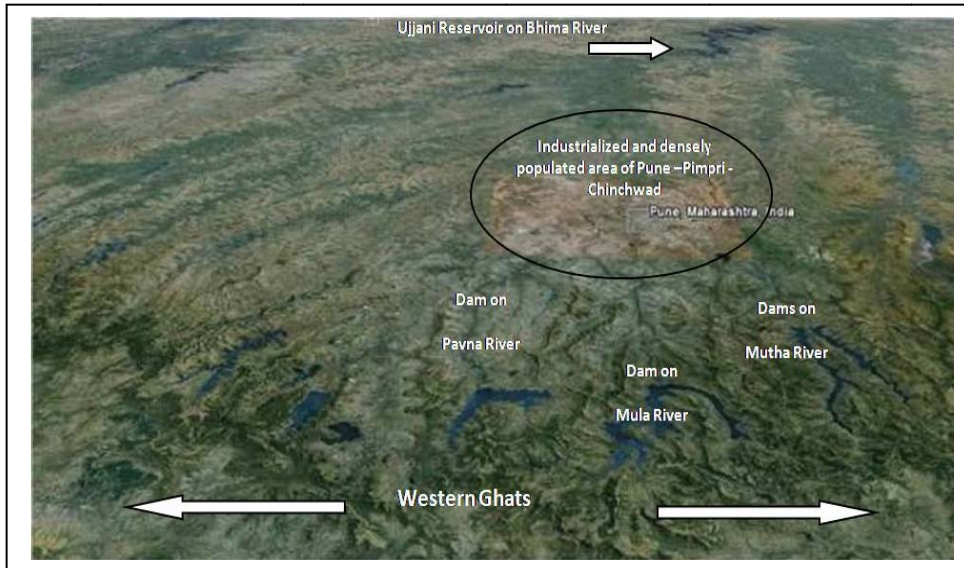
Water is the most fundamental natural elixir of life. It is also the stimulator of the socio-economic and cultural development. It is a renewable resource. But its seasonal availability, spatial and temporal variability calls for implementation of conservation and management strategies to meet challenges emerging out of rising water demands. Sustained water supply is a problem in all growing cities like Pune.

Actually, Pune's water supply is critical because of unplanned and mismanaged water resources. Deputy Chief Minister has ordered Pune Municipal Corporation to construct a dam exclusively for drinking purpose, which has led to fear of imminent water scarcity in the ever-expanding Pune city.

Puneities are currently facing the following problems –

- Disagreeable view and worst aesthetic values along 7 rivers in and around the city
- Obnoxious odours due to anaerobic conditions of river water
- Rapid diminution of traditional, cultural and spiritual values related with river and urban people
- Hydromodification of streams, rivers and lakes by concretization, pipeline waterwork, reduction in flood plain etc.
- Destruction of the riverine ecosystems, habitats, and reduction in biodiversity of oligotrophic waters
- Health hazards; the deteriorated river water quality has potential threat to existing water flora and fauna, as well as health of the human beings

Among the major problems, incessantly increasing water use in the urban catchment and enhanced siltation due to changes in land use patterns often lead to alteration of hydrology of the streams, rivers and reservoirs. On the other hand release of untreated or partly-treated effluents from urban and industrial sectors together with pollution load from chemical-intensive agriculture has an overall negative environmental impact on ecological health of water resources as shown in the following fig.

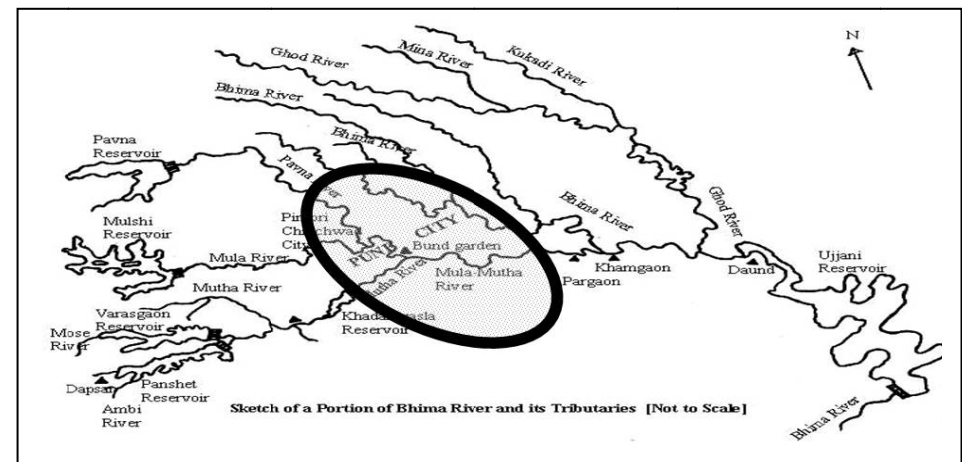


Water Quality of Pune's Rivers

In a decade, water quality of 7 rivers of Pune - namely Mula, Mutha, Pawana, Indrayani, Ram, Ambil and Nagzari deteriorated over the period of time with respect to two critical parameters - Dissolved Oxygen (very important of life in water body) and Fecal Coli forms (very important for indication of human pathogens). Dissolved oxygen in the above mentioned rivers reduced to zero from last 7 years in non-monsoon period and fecal coliforms have increased ten thousand times from zero to more than millions in the river waters. Risk of water borne diseases has increased several times in the downstream of Pune city (among the million population using Ujjani's water for drinking purposes).

In addition, Nagzari River—on the banks of which lies Kasba Peth—has been reduced to channelized gutter and yet has no mention in the Development Plan of the City. Now, Ambil and Ram Rivers are facing the same fate due to ineffective observation of environmental and town planning rules and acts. Even a second order tributary, Devnadi, in Baner Area, faces extinction. In Pune Metro area, the construction and infrastructure projects are on a spree of disturbing the urban watershed and converting small rivers into channelized, concretized sewerage lines or closed pipelines. Organic pollution is mostly attributed to upstream urban growth of Pune - Pimpri - Chinchwad where untreated sewage is thrown into the rivers before the Ujjani Lake.

Toxic industrial pollution has damaged the ecosystem severely downstream in Mula, Pawana and Bhima rivers: about 5 tons of metals in soluble form are released in the water bodies. Wastewater discharge (untreated or partially treated) into the rivers carrying water to Ujjani Lake has almost doubled in last 10 years. That is, in 2000, wastewaters discharged from Pune-Pimpri-Chinchwad and industries were about 700 MLD but in 2011, it is about 1500 MLD. There is also a severe problem of leachate from unscientifically developed and managed solid waste dumping sites viz. Urali Devachi, Moshi etc.





Cylindrical chambers of sewage passing through the bed of the channelized Devnadi

Sewage pipe directly discharged into the river which affects the water quality of river

Effects of Polluted Rivers

Pune's water footprint is growing day by day with increasing concentration of COD and total coliforms in rivers. The river stretch from the entry into Pune till Ujjani dam has been notified by Ministry of Environment and Forests till Ujjani dam (distance is about 200 km), meaning that the water is not suitable for human consumption. From Urali Kanchan, river water is lifted for Purandar Irrigation Scheme. Mula-Mutha River meets Bhima after Rohu. Then, the COD increases suddenly near big towns only.

Many villagers noticed that the hazardous gases (including methane, hydrogen sulphide etc) erupting from Ujjani Lake many times in the year indicating the deteriorated ecological health of the water body. Author presented his studies in Austin, US in Nov. 2011 that accumulated pollution in Ujjani Lake annually generates about 50000 tons of methane gas. Villagers (of about 200 villages) along the polluted stretches of rivers in Ujjani Basin downstream of Pune city are compelled to drink tubewell water which has high concentration of hardness (a cause of kidney stone). Concentration in the tubewells / wells along ranged from 400 - 800 mg/L while the drinking water standard for hardness is 300 mg/L. It is also observed prevalent brittleness of bones, dental problems, and anaemic conditions among the children and aged groups.

There is an austere lack of awareness and knowledge about the long-term impacts of such urban-industrial-agricultural processes and their innate impending effects to trigger social conflicts and economic losses.

Water Resources Development and Management

The restoration and sustainable maintenance of river and lake water bodies in and around urban centres need an innovative approach using ecosystem and ecological cycle principles in modern urban systems. An Urban System with Ecological Security (USES) is essential to ensure the good water quality downstream of the city. USES is a new concept evolved while studying the pollution of Pune's rivers to assure the ecologically live aquatic systems in the modernised city discharging waste streams into natural water bodies.

Water resources development and management in Upper Bhima Basin make it one of the rigorously developed river basins in the country. Most of the rivers and their tributaries in the region, irrespective of their sizes, have been impounded and total water sector development has reached a saturation point. This situation in turn makes the basin susceptible to water stress due to failure of monsoon or alterations in raining patterns linked with global warming and climate change. Good basin management underlines continuous improvement of basin governance that integrates institutions, policy, participation, science, technology and funding. Improvement of the state of lakes can be realized by promoting IL²BM, with long-term and strong political commitment.

Immediate actions needed

1. Cleaning of ghats on rivers and lakes, control on use of plastic materials and bags, provision of dust bins, permanent, dedicated staff for cleaning of river banks and maintaining the sufficient river flow round the year
2. Regular detailed monitoring and analysis of river water quality at every kilometre by involving local people

Recommendations

1. Upstream metros - Pune and Pimpri-Chinchwad must recognize the natural and constitutional right of downstream people to clean and pure water for drinking, livestock and agricultural applications.
2. Immediate actions to clean up 200 nallahs in Pune/Pimpri-Chinchwad through adoption and public participation to convert dirty Nallah into clean water stream
3. Demonstration of Governance Environmental Accountability and Responsibility (GEAR) by allocating funds to purification of rivers through taking up Nallahs to eradicate pollution as foremost task

4. Adoption of downstream village (victims of pollution) by upstream Pune/Pimpri-Chinchwad cities (polluters) to cater their drinking water requirements

Ecoplanning for the treatment of Wastewater in Ujjani Basin

Presently, the wastewater generation from the Pune – Pimpri Chichwad urban and industrial sectors is estimated as to the tune of 1600 MLD and their development trend is that the cities will double up wastewater generation in next twenty years. Then the energy requirement would be 3000 MW just to treat wastewater with conventional systems.

If this happens, with the energy crisis reaching new heights today, how will the required electricity be made available for the future waste-treatment systems? This conundrum suggests a need to look at waste management from the point of view of energy availability and to develop strategic action plans to use the ecosystem approach in the future. The corporaters should refer to the comprehensive Basin Management document by Sandeep Joshi and Vinod Bodhankar, “Citizens Paper on Concepts of Sustainable Development in River Basin”, to evolve strategy and action plan for Integrated Lentic and Lotic Basin Management (IL²BM).

Issues of Rivers in Pune

- Current “development-without-foresight” model of ad-hoc development based on limited lentic and lotic system vision ignoring the need for equitable sharing of benefits by entire population.
- Neglect and ignorance on the part of urban local bodies and state governments in regard to seriously implementing/updating policies, laws and development plans with respect to catchment area development.
- Selective implementation of catchment area protection instruments serving partisan interests and thereby catering to establishment-privatization and local political interests.
- Inappropriate existing city and regional plans are unable to protect forests and streams, in the catchment.
- Ruthless destruction of forest tree cover in lentic and lotic catchment area that compromises the carrying capacity of rivers. This is “hydro-ecological-imbalance of catchment area” without accountability and with continued incremental ecological and financial losses.
- Encroachment on urban watersheds, resulting in severe impairment of ground water recharging processes.

Shrishti Eco-Research Institute, Pune

- Displacement of poor and marginalized communities from their ancestral lands, depriving them of livelihood due to skewed catchment area development. The record and performance of their resettlement and rehabilitation is abysmal.

Following actions are needed -

- Scoping of lentic and lotic catchment area development, policy and planning to include river culture, river science, river engineering, river technology with objective evaluation of sustainable livelihood and growth of every stakeholder, including man, ecosystem and lentic and lotic body.
- Demarcation of lentic and lotic catchment area using modern indigenous technologies and human resources with public participation for definitive mapping uniformly shared across every related ministry, department, planning division, media and citizens’ society.
- Continued compilation, verification, and documentation of information about developmental processes significantly altering the lentic and lotic catchment area.
- Integrated water resources conservation and management for achieving the water balance by implementing afforestation, rainwater harvesting, water recharge, and pollution treatment to avoid inter basin transfers and linking of rivers.
- Efficient administrative and techno-professional institutional mechanism to involve the entire lentic and lotic catchment area populations and organizations in catchment-friendly lifestyle.
- Review and modification of existing policies, definitions, laws, rules, regulations and guidelines for catchment conservation, protection and development measures.
- Responsibility and accountability of existing state and local self governments in time bound implementation of industrial siting, and township locations.
- Strengthening of auditing system for evaluation of lentic and lotic -catchment area development projects/initiatives by ensuring involvement of societal wisdom and people’s participation
- Treatment of violation of rules and regulations of notified and protected lentic and lotic -catchment-areas and components as criminal offence.

Suggested Solutions

Solutions to achieve ecological health and water balance within the lentic and lotic catchment area, leading to protection of livelihood and to sustainable growth are given as below -

Urban residential and commercial complexes like apartments, colonies, hotels, shopping malls, multiplexes, hospitals and institutions like schools, colleges, government offices etc can avail the advantages of green channels in and around the premises. Sewage ecotreatment units – vertical ecofiltration systems as green channels along the city roads can be developed. Then it will ease the problem of energy required for sewage conveyance to the outskirts of city for the centralized treatment. It will resolve the issues like rehabilitation of communities affected due to excavation for and construction of sewage pipelines.

Basic Principles of Ecological Restoration of Water Body

- Catchment area treatment using Ecosystem Approach – decentralised treatment of point sources of pollution using Ecotechnological systems.
- All the existing residential and commercial complexes will use zero electricity and low maintenance natural systems to treat their liquid wastes.
- Ecotechnological processes – like bioremediation with phytoremediation, bio-oxygenation and treatment units will be comprised of horizontal filtration – Green Bridge – developed by SERI, metal screens if required and bio-cells etc.
- Use of floating materials to convert into floating gardens – green plants and their root systems are used as living systems for pollution absorption (Phytofiltration, phytoextraction and phytooxygenation).

Advantages

- Availability of pollution-free water for non-consumptive use
- Clean water for agriculture reducing the accumulation of toxic metals into crops and grains, thereby improving the production efficiency, quality and price
- Increased biodiversity
- Improvement in groundwater quality over a period of time
- Control of nuisance insects and odour
- Improvement in healthy environmental conditions for the population in the adjacent areas
- No failure of system due to breakdowns and non-availability of electricity
- Site for the ecological tourism and education

Glimpse of felicitation programme organised in the remembrance of green bridges installation by SERI and Green Infrastructur, Pune in association with Jheel Sanrakshan Samiti (JSS) on 28st Feb, 2012 Udaipur, Rajasthan (I)



From left Er. Anil Mehta, Dr. Tej Razdan, Dr. Sandeep Joshi, Mr. Talesara (President, UCCI), Mr. Jagat Mehta (President of JSS, Mr. Arvind Singhal (Founder of Singhal Industries), Mr. Ramesh Chaudhari (Green Bridge restoration project UCCI Representative)



Wel come of Sandeep Joshi by UCCI



Mr. Jagat mehta ji was inaugurating CD on Ahar River restoration