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

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Point for discussion this month **Hydromodification of rivers and lakes**

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Eternal Words

Why should man expect his prayer for mercy to be heard by What is above him when he shows no mercy to what is under him?

~Pierre Troubetzkoy

When you defile the pleasant streams
And the wild bird's abiding place,
You massacre a million dreams
And cast your spittle in God's face.

~John Drinkwater

Dear Readers,

Mantra of development is to have more and more electricity to cater the needs of modern urbanization and industrialization. Agriculture can be natural any moment but reversal of urbanization and industrialization will not be possible because economy and market has treaded beyond any reversal, retreat, or U – turn as far as energy use is concerned.

Therefore, hydro-energy being the cheapest source of energy, streams are being modified, impaired severely leaving no water for downstream ecosystems. Cover photo shows such one of hydromodification and training of river. No doubt, we need energy, but at the same time ecosystem to cater some essential services also which needs to be addressed properly.

Developing cities in India having huge investments in modernization to the tunes of \$2 trillion in next 30 – 40 years should have properly designed charter to maintain the healthiness of city's water and environmental resources. In this issue, Pallavi has given an account on Devnadi a very small tributary becoming extinct under developmental pressure. People's groups are working to give its glory back.

Hydromodification is the curse if it is not tackled properly to retain the watershed properties of region to be developed under city development plan (CDP) or for hydro-electricity projects. Sandeep Joshi's article gives a planner's view in dealing with hydromodification issues using ecosystem approach. Ecological evaluations and solutions need to be integrated with the project outputs and costs based on project life cycle (PLC). Therefore, it will give us guidelines for the restoration costs to be incurred with project implementation costs in equitable proportion.

SERI has supported the programme on river pollution control being organised by National Women's Organisation on Jan. 30th, 2011 on the death anniversary of Mahatma Gandhi who always believed in apt utilization of natural resources.

Thank you,
Chief Editor

Hydromodification: How sustainable is it?

- Sandeep Joshi

Pollution of streams, lakes, estuaries, aquifers, and other water bodies caused by runoff is inadequately addressed not only in India but in other developing countries including developed countries like the USA as documented by the EPA. Though significant treading has been done in mitigating the impacts of pollution from point sources, some aquatic ecosystems remain impaired due to complex pollution problems caused by non-point (or diffused) sources (NPS) of pollution. These problems include flow as well as morphometric and geomorphologic changes, increased erosion, siltation, sedimentation, deterioration of aquatic habitat structure, reduced dissolved oxygen, loss of fish and other aquatic animals, and worsened water quality due to increased levels of nutrients, metals, hydrocarbons, bacteria and other constituents. The major cause of these problems is "hydromodification".

Hydromodification is defined as the alteration of the geo-morpho-hydrologic characteristics of coastal and non-coastal waters (modified from USEPA, 1993). It in turn causes deterioration of ecological health of water resources. Examples of hydromodification in streams and lakes (Lotic-lentic water systems) include desilting, dredging, training, straightening, and, in some cases, complete stream relocation or diversion etc.

Retaining walls constructed along the non-monsoon lean water course of Mutha river in Pune is a typical example of hydromodification. Natural streams in its urban watershed are being concretized to enhance the acceleration of flushing of monsoon water into the river undertaken by the local corporation authority to tame the flows in Pune city. How much is it going to help? Or is it going to help at all? The brunt of such activities was borne by the civic chiefs themselves in their residential areas also. In some studies, it is observed that in Pune and other metropolitan areas, the funds are being used to convert natural stormwater drains into sewage conveying gutters which, in turn, during the monsoon pose a great threat to human health.

Some other activities of hydromodification include construction in or along streams or lakes, construction and operation of dams and impoundments, desilting, dredging, and land reclamation activities like the cases of Akshardham temple and Common Wealth Games Village constructed in Yamuna river's flood plain in New Delhi. It caused sustained flooding for a long duration in Delhi this year which caused severe loss to properties in the city.

Some indirect forms of hydromodification, such as erosion along streambanks or shorelines, are caused by the introduction or maintenance of structures in or adjacent to a waterbody such as riverfront development for recreation purpose or protection of water abstraction or discharge facility for thermal power stations. Many upland activities like agricultural activity in the riverbed or floodplain during the non-monsoon period, construction of new settlements, embankments etc. change the natural physical and chemical properties of the waterbody which significantly affects the population, agro-systems and ecosystems downstream.

Hydromodification activities can be grouped into three categories:

Channelization - channel modification including straightening, widening, deepening, and clearing streams of debris and sediment. Channelization and channel modification projects are mostly comprised of flood and sediment control, swift drainage, navigation, infrastructure protection, sand mining, bank instability, habitat, recreation, and flow control for water supply. Channelization has a very significant role in NPS pollution by increasing the instances and release of pollutants. It can also cause higher flows during storm events, which potentially increases the risk of flooding and severe damage downstream.

Dams (25-feet or more in height or have an impounding capacity of 50 acre-feet or more) are artificial barriers on waterbodies that impound or divert water and are built for a variety of purposes, including flood control, power generation, irrigation, navigation, and to create ponds, lakes, and reservoirs for uses such as livestock watering, municipal water supply, fish farming, and recreation. While these types of dams are constructed to provide these benefits to society, they are known contribute to NPS pollution for example Ujjani Reservoir 200 km downstream of Pune city receives all the urban and industrial discharges.

Dams alter the flows, which ultimately affect the water quality (changes in temperature or dissolved gases) and biological habitat (disruption of spawning or altering of plant and benthic communities) before and after the dam.

Barriers that are six-feet or less in height, regardless of storage capacity or barriers that have a storage capacity at maximum water storage elevation of fifteen acre-feet or less regardless of height are not termed as dams.

Streambank erosion is the wearing away of material in the landward area along non-tidal streams and rivers. Streambank erosion results due to force of flowing water in a river or stream overcoming the ability of soil and vegetation to hold the banks in place. Eroded material is carried downstream and re-

deposited at the bottom or on the bends in the waterway. Shoreline erosion occurs in large open waterbodies. Human activities along or adjacent to the streambanks or shorelines may increase erosion and other non-point sources of pollution. As runoff increases upstream, more erosion results on the banks downstream.

NPS pollution results from the accelerated increase in erosion of streambanks and shoreline caused by increased flow rates associated with urbanization in a watershed. The soil adjacent to these eroding streambanks is unnaturally carried away and then deposited in undesirable locations. Shorelines erode more severely because of poorly planned and implemented shoreline protection projects located nearby. Habitats can be buried and wetlands can be filled. An apt example would be Devnadi, a small tributary of Mula River in Pune, which is getting filled up with materials and sewage effluents from the surrounding areas.

Hydromodification is becoming one of the leading sources of impairment of our streams, rivers and lakes. Much of the pollutants responsible for impairment of the health of waterbody are received from diffuse sources like urban runoffs, geomorpho-hydrologic modifications, agricultural runoffs, and atmospheric deposition of contaminants. The major reasons (partially or not supporting one or more uses) are nutrients, toxicants, organics, inorganics, sediment, pathogens (bacteria), metals, pesticides, oxygen-depleting materials, and habitat alterations.

What is needed to minimize the impact of hydromodification?

1. Ensure that the planning process for new hydromodification projects addresses changes to physical and chemical characteristics of surface waters
2. For existing projects, ensure that operation and maintenance programs use any opportunities available to improve the physical and chemical characteristics of surface waters
3. Prevent or correct detrimental changes to in-stream, riparian, shoreline, stagnant waterbody habitat from the impacts of both proposed and existing hydromodifications
4. Prevention of sediment from entering surface waters during the construction or maintenance of dams
5. Prevention and protection of downstream contamination
6. Protection of quality of surface waters and aquatic habitat in reservoirs and in the downstream portions of rivers and streams
7. Protection of streambanks and shorelines from erosion
8. Institutional measures that establish minimum setback requirements or measures that allow a buffer zone to reduce concentrated flows and promote infiltration of surface water runoff in areas adjacent to the shoreline

SAVE DEVNADI

- Pallavi Patil

Pune lies in the watershed of Mula-Mutha Rivers, with numerous small streams and rivulets meeting these rivers. One such rivulet is Devnadi in Baner, which flows for a mere 20 km, before meeting the river Mula. Source region of Devnadi lies at the foot of the NDA hill-complex. In the Baner-Pashan area huge residential complexes are coming up in an area which was originally a scrub forest and grassland. Dr. Anupam Saraph and his members of Baner Area Parliament are working to save the stream Devnadi from hydromodification.

In case of Devnadi, the PMC, under the JNNURM programme, has plans to start channelizing the entire stretch of Devnadi. This means that the naturally undulating rivulet will be converted into a drain, and also totally eaten up by pipes, with a road above it, at stretches. The passage of Devnadi from under the Mumbai-Pune Expressway is completely blocked by construction debris and the service-road parallel to the Expressway passes right across the river, without any provision for the river to flow naturally. Also observe the sewage pipe passing right through the bed of the river, with cylindrical chambers protruding above ground.

The Engineer of the PMC said that the vertical walls have been built on the sides of the river for “demarcating” it and to “protect” it from encroachment. But it is observed that many buildings along the rivulet have been constructed right next to the water channel, without leaving the mandatory 10 meters stretch on both sides. Channelization would be good for them and such other law breakers. There seems to be ignorance of the guidelines issued by the Supreme Court of India regarding riparian ecosystems & restoration of rivers. The Supreme Court has issued various guidelines to corporations regarding riparian systems, but these instructions are not being followed by properly at all.

All the rivers and lakes in the urbanized areas need full attention like that given to patients in the ICU/ICU. But the concerned authorities are failing to systematize the actions within the stipulated time schedule and goals to restore the quality of water bodies. So, take any city - you will find most of the water bodies in urban watershed polluted and unfit for any use unless the quality is restored. It seems that government authorities invoke the ‘ownership’ of resources only when royalty has to be amassed with gross ignorance of the responsibility of maintaining them clean and free of contamination. This is nothing but the exploitation of environmental resources contrary to the theme

of NEP2006 which states that livelihood should be through conservation of environment and not through exploitation.

So, there is a need to define and implement policy for the maintaining the sanctity of rivers by every concerned government departments, agencies, and corporations. This will prove to be useful for healthy environment not only for the few elite but for the poor junta also. Let us together respond to the knock on the door of the opportunity to control yesterday’s and today’s river-pollution for tomorrow’s sustained growth, development, economy and generation ...



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