

WATER MANAGEMENT IN AN URBAN ENVIRONMENT

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INTRODUCTION

India is one of the more fortunately placed countries in the world in so far as the overall water availability is concerned. However, the variations in the physiographic and climatic conditions of our sub-continent were overcome by our forefathers who developed marvelous indigenous systems to manage the water available in their area in a very effective manner. In rainfall abundant areas a system of tanks was established to store the water available during the monsoon, to cater to the demands during the dry periods. A sense of ownership as sons of the soil fuelled the ideas of conservation of natural supply through observation and participative discussions with the sole objective of improving the all-round productivity.

To-day, the economical and social factors have led to the neglect of the ancestral system of storing and conservation resulting in frequent occurrence of devastating floods and drought in various parts of our country in spite of having at our disposal, much more information, resources and technology. The urban environment emphasis is on an integrated approach to water management for poverty reduction, environmental sustenance and sustainable economic development in world because water has the potential for both disease causation and prevention. Available water is under tremendous stress due to growing population, rapid urbanization, increase in per capita consumption, industrial growth and other demands for maintaining ecology. The pressures on our land and water resources are continuously increasing with rise in population and urbanization. Water management in the urban context demands sustainable development and efficient management of available water resources. The need of the hour is to concentrate on developing environmental management programme for sustainability of natural resources

URBAN ENVIRONMENT PROGRAMME

The environment programme should be planned based on the following objectives:

- To improve the monitoring of the environment state of the drainage basin as a holistic unit, focusing on water quality, ecology and social development.
- To improve the dissemination and accessibility of environmental information on intra- and inter-linking of water bodies crossing administrative boundaries.
- To improve awareness and capacity of the drainage basins in urban area and the riparian rights of government and the people to address trans-boundary and basin-wide environmental issues.
- To ensure that environmental issues are planned and implemented with a view to minimizing negative environmental impacts.

Thus, the urban environment programme should address the key issues facing environmental management of the urbanized river basin by introducing a wide range of support services for its sustainability.

SUSTAINABLE DEVELOPMENT OF URBAN WATER ENVIRONMENT

The sustainable development programme of land and water resources in the context of urban environment should be addressed under the following themes:

- **Environmental Monitoring and Assessment:** This includes water quality monitoring; ecological health monitoring; household social and economic monitoring and analysis, and; communication of trends and results. This programme should provide timely and reliable data to relevant stakeholders on trends and changes of the environmental conditions in respect to land and water resources integration.
- **Environment Decision Support:** This should address the needed environmental decision support tools focusing on activities such as the development of trans-

boundary and regional impact assessment and strategic environmental assessment systems, as well as ecological risk assessment, environmental conflict management and other topics and tools relevant for regional planning, management and policy development. Ultimately this programme should strive to continuously improve environmental policy and planning to ensure the sustainable use of water and its related resources.

- **People and Aquatic Eco-System:** This should focus on how people use, benefit from and are affected by changes in aquatic and related eco-system. The relevant stakeholders should be provided with current data on the aquatic resources of their area along with the livelihood status of its residents.
- **Environmental Knowledge:** This programme should aim at developing conceptual models of the river basin ecology. The stakeholders should be made aware of the Knowledge gap on the basin ecological functions.
- **Environmental Flow Management:** Assessment of environmental flows together with development and management plans, will ensure that longer term impacts are anticipated and objective analysis are performed contributing to sustainable development through mutual co-operation of all. This should concentrate on working towards improving the management of water flows and maintaining the ecological balance of water and related resources.
- **Climate change and adaptation:** The implementation processes through piloting, formulating and launching of climate change and adaptation policy frameworks. The strategies to predict the future impacts of climate change on the hydrological regime, ecosystems and people of the area are very important.

TEAM WISDOM

The term “TEAM WISDOM “contains the notion that teamwork is an individual skill and not a group skill. Becoming skilled at doing more with others that should be ensured to sustained

development in the emerging knowledge economy. The five themes to be followed in the teamwork with individual skills were:

1. Taking personal responsibilities for productive relationships;
2. Creating powerful partnership;
3. Aligning individuals along a shared purpose;
4. Trusting just right;
5. Developing the collaborative mindset.

Thus water and land related resources require the shared responsibility of the individual skills of the group to ensure that work gets well done. The objectives to be achieved through Team Wisdom are:

1. Balance supply-demand through socio-economic and hydrologic approach;
2. Ecosystem through hydro-physio-chemical-biological-statistical approach;
3. Management boundaries through joint management of planner-policymakers-politicians-scientific-technical-stakeholders and fund generators.
4. Alternatives through implementation of "FIVE R'S" (Reduce, Remove, Re-cycle, Re-use, Recharge) through powerful partnership among industrialist- pollution control authorities-stakeholders.
5. Water and economy relations through collaborative management of technocrats and bureaucrats.
6. Communication through taking personal responsibilities for creating awareness through capacity building
7. Education towards understanding the system sensitivity and complexities through a participative approach of Trans-disciplinary leaders to motivate the students.
8. Innovative practices through student's competition for sustaining the land and water resources with the involvement of interdisciplinary group.

9. Conflict through inculcating sensitivity, stability, responsibilities for implementing the just right principles to reduce conflict and improve shared responsibility.
10. Integrated use of surface and subsurface waters with appropriate conservation techniques through community participation to protect and preserve the water resources.

HYDRO-ECOSYSTEM OF URBAN AREAS- CASE STUDY OF CHENNAI

The hill to coast concept of the Chennai Metropolitan city is projected here to erase the past mis-concept. Chennai was considered as a city which was topographically flat, with less rainfall leading to water scarcity. These negative impressions about Chennai Metropolitan area aroused due to the administrative boundary division.

Hydrologically, the Chennai Metropolitan should be considered as a single unit comprising of hills, three types of lakes, rivers, groundwater and sea. The distance from Hill to coast is ranges from 15km to 160km. The lakes are classified as Source lakes, dynamic lakes and deposition lakes. A minimum of ten source lakes are situated around the circumference of each hill, with its system of lakes representing the dynamic and deposition lakes. The source lakes are pure and store the overland flow occurring from its upstream areas. The middle dynamic lakes collect the surplus flow of the source lakes and also from its own catchment. These middle lakes are termed dynamic as they recharge the groundwater resources in its downstream areas. The deposition lakes are located before the coastal areas and are receive the waste waters from its upstream areas and utilize it for sustaining its eco-system. These lakes are connected by micro-drains, which play an important role during the monsoon season. The deposition lakes are well connected to the sea through creeks and rivers. The rivers are fed by the tank system along its reach. The nature beautifully proportionate here precipitation to the lakes, river and groundwater. In the processes she sustains all the living beings that are dependent on her.

IMPACT OF URBANISATION ON THE HYDRO-ECOSYSTEM

The growth of urban city results in an increase of population. This in turn leads to an increase in building density to provide shelter to the increasing population. The people first settle near the coastal areas and slowly move to the upstream areas of the hydrologic unit. Thus the growth of the urban city is in the opposite direction to the natural hydrologic regime. The downstream flooding of the natural hydrologic regime is considered as a flood hazard. The immediate action of the downstream settlement is to dispose off these flood waters to the sea as rapidly as possible. This was the first intervention of the human activities against the natural hydrologic regime.

The growth of population pushed the settlements in land leading to encroachment of water bodies. The areal extent of the water bodies got reduced. The water in the lake got polluted due to dumping of waste and sewage. The reduction in quantity and quality of the water bodies led to deterioration of the entire hydrologic unit.

Further, the increase in population led to a demand for water which resulted in transfer of water from suburban to interstate transfer of water. This has led to conflict resolution for sustaining equity in water supply.

The transfer of water from long distance and distributing it to the city resulted in the pollution of water leading to health impact. Therefore treatment of water became necessary leading to use of chemicals.

In addition the groundwater is heavily exploited from the well fields located below or within the tank system and also on the floodplains of the rivers. The impact of these activities has led to dry riverbeds and sea water intrusion.

The increase in demand for housing, industrialization and transportation facilities of metropolitan city led to an increase in the imperviousness area resulting in an increase in the flood flows. Thus flood control measures to protect the damages to human, livestock and property led to disposal of flood to the sea.

To-day the concentration of high rise buildings within a reduced areal extent has led to a tremendous pressure on the natural hydrologic regime leading to a climatic change.

The impact of urbanization in the form of water resources demand, pollution, floods and climatic changes have affected the natural hydrological cycle which in turn have affected the human health due to unhygienic conditions.

CONSERVATION AND REMEDIAL MEASURES

In an order to effectively use and conserve limited water resources, supply oriented measures such as better use of existing supplies and development of new supplies have to be taken up. Various technique of environmental management described above should be incorporated for conservation and remedial measures in the form of;

1. Rainwater conservation;
2. Effective use of surface runoff;
3. Improving groundwater storage, and;
4. Soil water conservation.

The present technology limits water resources to confining itself within the channels and pipes and below ground to protect itself from pollution and exploitation by human beings. Thus, the natural hydrologic system is completely altered.

SUMMARY

The WATER RESOURCES IN THE URBAN CONTEXT is more of a socio-economic approach instead of a technical approach. The creation of an environmental oriented knowledge base is required to sustain the resources. Therefore, innovative techniques with a joint management approach are the need of the hour.

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