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Shallow Lakes in Urban Areas: Ecological Restoration of Lakes in Thane City.

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ARSTRACT

Thane city historically known for the existence of the several shallow lakes is one of the most industrially advanced districts of the state of Maharashtra today. They are in existence earlier than 1881 and each one of them has a significant cultural and social significance associated with it. Water being the lifeline of communities and the prime determinant of the sustainability, settlements in the past were located in the proximity of easily accessible water resources. With the technological advancement in the field of centralized water supply systems, settlements are no longer confined to smaller clusters around water bodies. Hence over a period of time due to the demands of urbanisation, development has slowly crept up to the banks of these lakes thereby converting the once sprawling water bodies in to mere water tanks which are prone to degradation through development pressure, eutrophication and solid waste disposal Recently, the Thane Municipal Corporation (TMC) has taken tremendous efforts to revive the natural resources of the region and improve the environment in totality. One of the initiatives is the Lake Conservation Programme.. The program not only included cleaning and bioremediation of the lakes but also took steps for creating lakes as the hub of economic activity, thereby providing an indirect source of livehood for many people. This programme has been a collaborative effort of all sections of the society, including elected representatives, technological service providers, local educational institutions, Non Governmental Organisations and citizens for the redevelopment and restoration of lakes. Thane Municipal Corporation.has also partnered with the Central Government of India through The Ministry of Environment and Forest (MoEF) and State Government through the Mumbai Metropolitan Development Authority. The paper highlights the success as well as critically examines the failures of the initiatives taken to conserve the lakes.

Keywords: water conservation,urbanization,ecological restoration,detrimental impacts, integrated development,public private partnership,sustainability,urbanization.

INTRODUCTION

The strategic location of Thane region and the availability of the major infrastructural facilities within Thane region have made it one of the most industrially advanced districts of the state of Maharashtra. Though there has been immense economic growth little efforts have been made to conserve the rich and natural resources of the region. On the contrary, all the urban expansions and rampant construction activity in the region during the past two decades have had a negative impact on water systems as the site developments have ignored the local environmental and hydrological considerations.

The region receives up to 2000mm of rainfall annually. The total landscape of the region is unique because of its close proximity to the creek, river and the high altitude ranges with many natural and manmade water bodies. Surface depressions were used as a source of water conservation by the ancient civilizations, in the absence of nearby river course. On recognition of its assured potential, they started constructing earth structures to increase the storage capacity. These lakes also provided an intermediate storage in minimizing the surface runoff and floods. Malgujari tanks, Talav and Lakes were constructed and maintained by the Kings and jahagirdhars in Maharashtra.

Today, in the urban environment, they are seen as source for preservation of ecological elements (plants & living beings) and fresh air grounds. However, over a period of time due to the demands of urbanisation, development has slowly crept up to the banks of these lakes thereby converting the once sprawling water bodies into mere water tanks which are prone to degradation through development pressure, eutrophication and solid waste disposal.With no natural ecological processes the lakes had become almost dead.

There has been an attempt in recent times by the Thane Municipal Corporation to revive the dying lakes through bio-remediation techniques.These techniques involved exhaustive lake specific studies only concentrating on the microlevel lake ecology.It was observed that despite of several measures taken to purify the shallow water bodies ,problems due to ingress of waste water, solid waste disposal and

intensified urban landuses in the lake vicinity, problems related to lake and water conservation continued to multiply . Though the Thane Municipal Corporation had undertaken the task it was becoming increasingly difficult for the Corporation alone to handle the ever increasing pollution levels in the water bodies despite of help from technological service providers at a heavy cost.

The task of environmental conservation of the lakes was a mammoth one. It was at this point of time that the Municipal Corporation took the decision of involving the public themselves in the program. Public participation at various levels was sought. This unique program of ecological restoration of these shallow water bodies through maximum public private partnerships of various kinds has not only increased the public awareness but has led to the overall conducive social and physical environment for the sustainability of the lakes. At the same time higher land values and high density development and other problems of rapid urbanization continue to be a major challenge for the lake conservation program. This paper discusses in detail the efforts made, research findings and the emerging partnerships for the 'Lake conservation and management Program" in the city of lakes in the Mumbai Metropolitan Region.

Thane City: City of Lakes

Thane district is a belt of land between the Sahyadri range and the Sea. Except in the northeast where much of it rises in large plateus, the country is a series of flat low-lying rice tracts broken by well marked ranges of hills. Kanheri and Yeur hills together form the dense forest of Sanjay Gandhi National Park (S.N.G.P.) in the Mumbai suburbs. Parsik hill runs along the east coast of Thane creek from Mumbra to Belapur. The study region is located in between these Yeur hills on the west and Parsik hills on the east fig. 1. Ulhas River forms the northern boundary of the region. High hills on one side and submersible marsh along Thane creek and Ulhas riverbanks have peculiarly divided the terrain. River Ulhas flows east west and joins sea at Bassein creek forming northern boundary of the region. Thane creek connects Ulhas River from south separating Mumbai and Thane cities from the main land.Maximum height of the Yeur hills is around 450 meters whereas height of Parsik hill is restricted to 300 meters.Thane city is nestled between the Yeur hills on the west and creek on the east. Many lakes were formed in the areas due to this naturally undulating topography. Historically Thane is known as city of lakes It has 35 lakes covering an estimated area of 6,70,000 sq. feet. These lakes vary in size and shape and are between 0.5 hectares to six hectares maximum in area. Most of the lakes are rain fed and are not used for supplying drinking water to city. However they have significant ecological and economic features. Many of the lakes are not only major revenue generators for the city fisherman but are also the hub of economic activity, providing an indirect source of livelihood for many citizens.

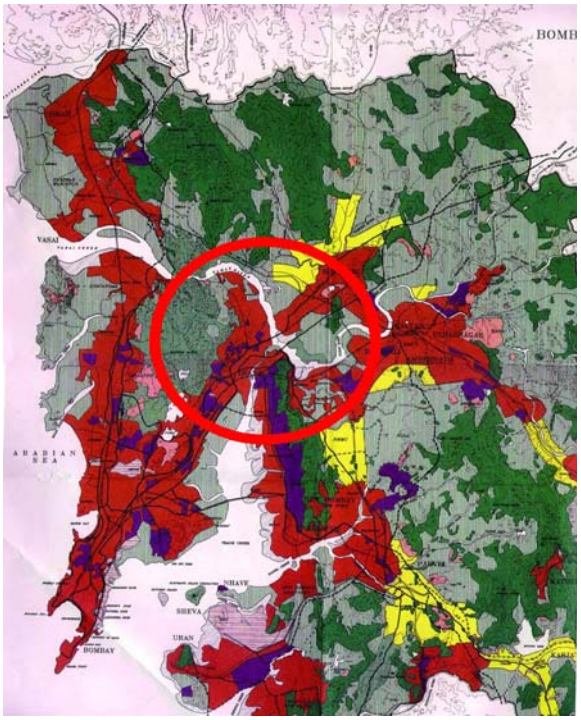

Figure 1. Location map

Unfortunately over the years, most of these lakes have suffered gross neglect. common problems in lake in Thane city have been eutrophication, excessive growth of weeds , hyacinths, siltation and sedimentation ,breeding of mosquitoes, foul smell, odor etc. which in turn cause adverse water quality, making the lake unfit for drinking, bathing ,washing or even recreational activity fig. 2. The other major problem was the decline in the carrying capacity and the receding lake area due to heavy siltation and sedimentation resulting in meager one meter effective depth in some cases.

Figure 2. status of one of the larger lakes in the city before the lake conservation program

Emerging Concept of Public Participation and Partnership in the Effort Towards Conservation and Restoration of Lakes In Thane.

Concerned over the degrading water quality in lakes the Thane Municipal Corporation initiated a comprehensive lake conservation programme by Bioremediation technology with the assistance from Ministry of Environment and Forests New Delhi.The basic objective of the lake conservation and management program is to maintain the ecological and economic significance of the lake in the city of Thane This implied restoration of lakes which are important freshwater ecosystems performing important functions.

Environmental issues and particularly the issue of restoring the lakes of the city were becoming increasingly multi-faceted and could not be addressed within the boundaries of one organization. New political and organizational actors had appeared. And it was realized that, in many cases, other approaches to the delivery of services to the public including privatization, contracting out, public-private partnerships were simply more effective than purely efforts from the local bodies.With this in mind the comprehensive program was designed to include participation from the public at various levels in different forms.Participation from Local Educational Institutions, residents associations, non governmental organizations as well as from advanced technology service providers was sought.

The Thane Municipal Corporation has achieved success in attaining both these objectives through the concept of partnership.

Details of the Initiatives taken by Thane Municipal Corporation.

In the year 1998, Thane Municipal Corporation undertook the cleaning and bioremediation of Kacharali Lake.

Bioremediation lies in restoration of ecological balance between the microphytes, macrophytes, algae & micro organisms, which can be maintained even under minor disturbance. When the natural ecosystem is disturbed, we need a specialized consortium of natural micro organisms, start the corrective action, degrade the organic deposits, eliminate, eutrophication and restore the equilibrium of the lake. The process of bioremediation is carried out using specially prepared, naturally occurring, non-pathogenic microbes.

Function of Bioproduct is as under:

- Biodegradation of organic waste.
- Eliminate scum & algae.
- Eliminate fuel Odour.
- Improve water quality.

Kacharali Lake revival was completed in March 2000.TMC also successfully developed Kacharali lake as good recreational spot. The lake conservation programme initiated by TMC can be broadly classified into four stages namely conceptualization, planning, implementation and monitoring. At each stage of the project appropriate partnership initiatives were undertaken by the TMC. It involved the active co-operation with local educational institute, technology providers, NGOs, CBOS and citizens. The local educational institutions participated in the form of providing technology, and undertaking continuous monitoring of lake water to ensure sustainability. Before implementation stage a model action plan was drafted keeping the guidelines received by MoEF and technical inputs provided by local technical institute and technology providers.

After successful implementation of this project and appraisal from various sectors of society, Thane Municipal Corporation initiated Bioremediation for 10 more lakes in Thane City with the from monitory assistance from MoEF, Delhi in the year 2004. Consequently TMC took the initiative to carry out Bioremediation of one of the other major lakes situated in the dense urban areas the Ghosale Lake with support from Mumbai Metropolitan Region Environment Improvement Society.

Innovative arrangements during Ganapati festival

One of the major sources of pollution in the lakes in Thane is the annual ritual immersion of idol of Lord Ganesha in the lakes, creek & river. During the Ganapati festival, on the 2^{nd},5^{th},7^{th} and the 10^{th} day , every year approximately 9000 sarvajnik ganesh utsav mandal (Community groups dedicated for lord Ganesh) and 24000 individuals worshiped the idols at their respective places. Every year about 35000 - 40000 Ganesh idol immersions took place at different locations scattered all over corporation area. About 17 lakes & 8 creek sites were traditionally used as immersion sites. Most of the idols are now days prepared from plaster of paris which contain gypsum ,calcium ,sulphur ,phosphorous and magnesium while the colour contain toxic compound of mercury ,lead and cadmium. With increase in population growing trend towards bigger and bigger idols resulted in severe stress on lake ecology.

In the year 2004,concerned at the damage to the aquatic ecosystem the TMC made efforts to quantify and estimate the impact of Ganapati Visarjan on the water quality of the lakes in the city and shared the scientific findings with the public.

In order to prevent the pollution of these water bodies in the lake TMC made innovative arrangements of creation of artificial pond near the lake.Several NGO like Hariyali ,Jagg,& Jidnaysa, various departments ,social organizations ,public dignitaries and students from various colleges also played a part in creating awareness amongst the public about the alternative sites and convincing the devotees to make use of the prepared ponds for the

idol immersion.With alternative sites for idol immersion and separate provision of nirmalaya (flowers used during religious rituals)disposal,pollution directly into the water bodies was controlled (Fig. 3).

Figure 3. Artificial ponds in the lake vicinity.Alternative sites for Ganesh idol immersion

The preparation of the Ecologically integrated lake development management plan

This was another such initiative by the Thane Municipal Corporation to restore these lakes w.r.t their catchment and watershed. There was a need to understand the formation of the lakes in terms of their physiography and geohydrological linkages in order to ensure their ecological sustainability.Architectural and Environmental Planning experts from educational institutes worked on the preparation of the ecologically integrated base map for the city. Recommendations were made on the basis of the research findings. Physiographic determinism was employed as a tool to evaluate the extent of the negative impact on the environment, by superimposing the various physiographic features on the land use plans and simultaneously extracting and de-layering to establish the intrinsic suitability of land for various land uses. The study dealt with various issues of ecology on one hand and developmental issues on the other. Extensive use of a Geographical Information System (GIS) is made for the analysis and information envisioning like producing an ecological base map of the area.

Recommendations and development guidelines from this study report have helped in the overall understanding of the issues related to the city lakes and need for systematic and sustainable ways of ecological restoration of the lakes rather than concentrated efforts for mere beautification of the lake surroundings.

Mobilization of fund on the part of the corporation by taking the approval from the General body of the corporation.

As per MOEF direction it was essential to contribute @ 30% of the total project cost by parent organization .Accordingly, necessary sanction were obtained from the General Body of TMC.

Towards Operation & maintainance.

The municipal corporation initiated the partnership with the private sector viz. BOT operators (Build Operate and Transfer) through competitive bidding process. The operators thus selected for the respective restored lakes take care of the operation and maintaince of these lakes as per a detailed memorandum of understanding. Boating and fishing rights were given to them. Funds received as premium from principle operator are utilized for incidental repairs and the improvement of schemes.

Public and educational material developed /used for public awareness programs:

Hoarding at strategic sites, advertisement in news paper regarding project action, communication through TV/radio, stickers having various slogans for lake conservation were used extensively to communicate the messages. In addition to this exhibitions with the theme on lakes “Know your lakes” were organized in the city on World Environment Day.

Capacity building: Improvement of Managerial, administrative and technical capability of staff

The lake conservation program initiated by TMC basically comprised of departmental efforts along with the involvement of local educational institute & other technology providers. This interaction was basically in the form of sharing know-how and managerial administrative practices between the two. This resulted in the enhancement of technical know-how among the staff of TMC. This interaction between TMC and the technology provider enriched the managerial &administrative capacity of staff of TMC. Thane Municipal Corporation has formulated Lake Management cell comprising Engineers from Public Works Department, Town Planning Dept &Scientists from pollution control Depart under the chairmanship of City Engineer of TMC.

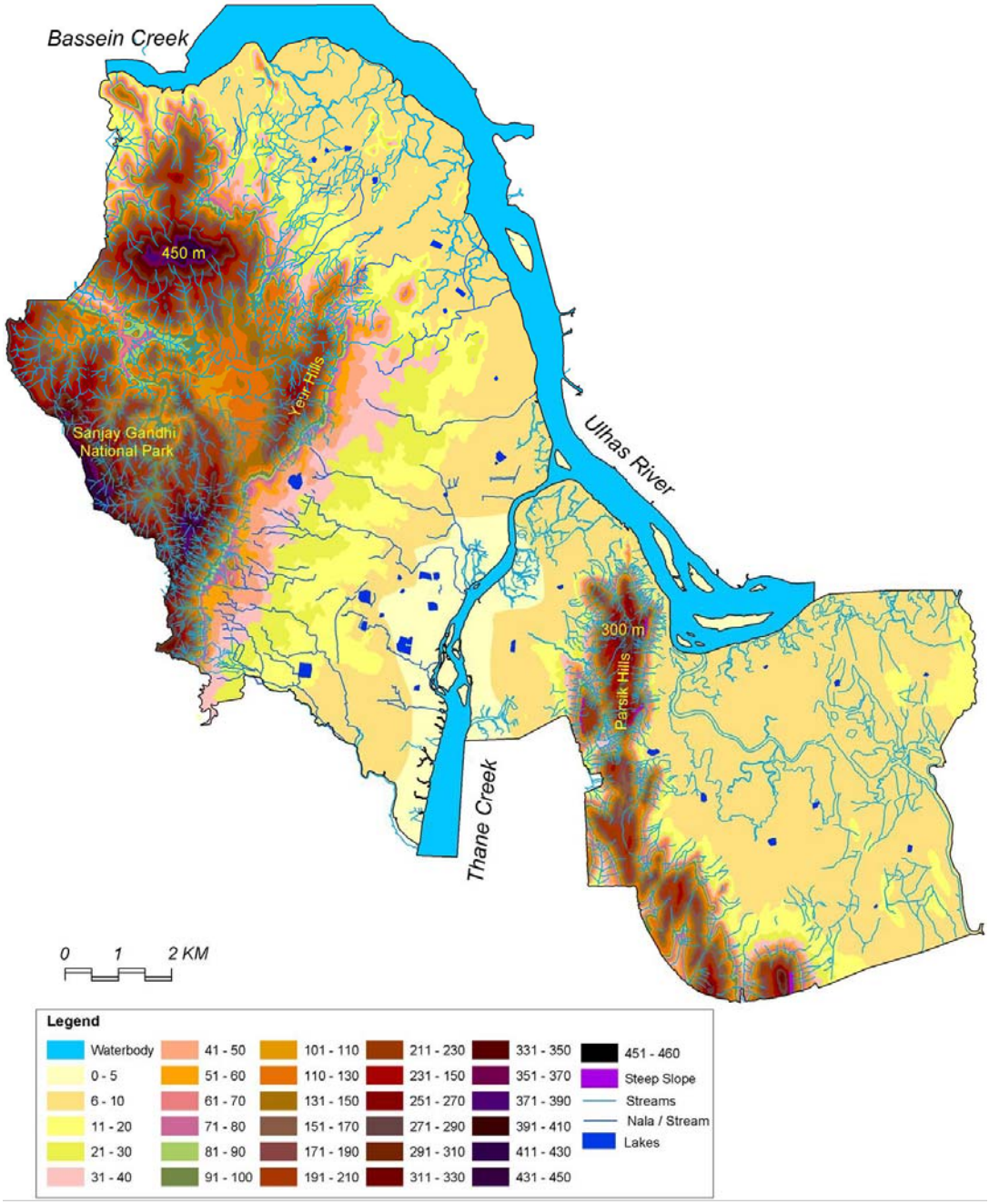

Figure 4. Ecological base map for the lakes in the city.

Legal procedures:

While implementing the lake conservation program suitable resolution measures were also initiated by TMC in following areas.

- Resolution on 30% contribution towards funding requirement
- Resolution for creation of separate budget head for the reserve fund obtained owing to premium received from BOT operators for operation & maintaince of lakes.
- Resolution for leasing the lakes to BOT operators
- Resolution for prevention of idol immersion in lakes of city
- Resolution of creating mahaghat for idol immersion and other recreational activities under lake conservation program.

Policy initiative undertaken

- Prohibition of running of kerosene /diesel boats in water bodies
- Involvement of local educational institution

for the continuous up gradation of technological base of lake conservation program.

IMPROVEMENT BROUGHT ABOUT BY INITIATIVE OF PARTNERSHIP

Environment awareness in the society

The success of the lake conservation program through partnerships has helped in creating significant environment awareness among the elected representatives and the public at large. This was manifested in the overwhelming response to the alternative idol immersion arrangement provided by TMC in the current year.

Dissemination of the latest technological trends in local educational institutions.

The concept of involving colleges & its students in the lake conservation programme led to a wide spread of various technologies, thereby turning an academically oriented educational system into a practically oriented one.

Socio –cultural benefit to the society

The presence of so many lakes with congregational / recreational areas around them in city has over the years enriched the socio-cultural scenario of the city historically also as well as it continues to shape the social environment positively even today. All the lakes sites in the city are extensively used by all the age groups of the population at all times of the day. These sites have always offered the citizens the much required breathing space physically as well as psychologically.
(Figure 5.Situation before and after intervention)

LIMITATIONS OF THE PROGRAM AND NEED FOR FURTHER STRENGTHENING

Though much has been achieved,the sustainability of the program would require sustained efforts from all the sectors of the society. Due to immense urbanisation and ever increasing population the lake environs are undeniable showing the negative impacts of such rapid development. In this case upgradation, restoration as well as beautification works need to be undertaken urgently by theThane Mumnicipal Corporation. The dire condition of the lakes can only be improved once their ecology is restored.The TMC now proposes to undertake the complete restoration of the lakes through three phases:
Phase 1: Ecological restoration of the lake,

Phase 2: Beautification of the lake and its surroundings,

Phase 3: Provision of Lake Amenities with the first phase scheduled to commence 2008

This will be implemented through similar partnerships at all levels. With the implementation of the Lake conservation and management program the socio-cultural environment will get the much needed support and boost.

CONCLUSION

The key to public-private partnerships for urban environmental management lies in the ability of local participants to induce and sustain a collaborative process involving a wide variety of organizations, groups and individuals in pursuit of a common goal. Abilities, in this sense, are both harnessed and developed in a virtuous cycle of personal and organizational development. But the impact of the broader context must be taken into account. There must be incentives for participation and a stable set of rules of the program. Patent and property rights frequently need to be defined and enforced. The capacity and independence of the judiciary can give participants more protection against arbitrary action and predatory behavior. Efforts also need to be made to limit the impact of politicization on such arrangements. In general, the risks especially for the private sector participants need to be managed carefully.

Undoubtedly effective public-private-partnerships is the key to constructive management of natural resources in urban areas. There is an increased need for sustained efforts for innovative ways to bring about this partnership. They must be designed and managed to achieve two objectives. First, they must balance the need to produce both public value and private gain if they are to be sustainable. And second, they must serve a learning function which allows participants and stakeholders to build the collaborative and technical skills which the wider community needs. Such partnerships should be seen as a space and an opportunity to create new meaning and engage in collective inquiry rather than simply as a technique to use existing skills or fix old problems. Making a systemic impact may not be the immediate task but it should be seen as an indirect but essential outcome.

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