Draft version of the Paper presented in the ***International Water Conference, Berlin*** *during 12-14 September 2007.*

Hyderabad's Water Issues and the Musi River
Need for Integrated Solutions

By
Ramachandraiah, Chigurupati[1]
Vedakumar, Manikonda[2]

Abstract

As Hyderabad has grown in size and is emerging as a global megacity, its growing water requirements have been met by undertaking long-distance water projects over the years. The local water resources have been neglected. Despite an improvement in the total volume of the water supply recently, intra-city inequity continues to be an issue that has not been adequately addressed by the policy makers. As a result, people in poor areas are falling victim to water-borne diseases. Non-implementation of the environmental laws and haphazard planning and growth of Hyderabad city have reduced the Musi river to a sewer drain carrying the domestic and industrial waste generated in Hyderabad city adversely impacting on the river ecology. The government's approach to the conservation of Musi has not considered the wider catchment area of the river. This paper argues that the future water security of Hyderabad city lies in an integrated management of the entire catchment area of the Musi river and a number of water bodies that are still existing in and around the city.

Introduction

Hyderabad urban agglomeration (HUA), the capital city of Andhra Pradesh State in India, has a population of about 6 million. With an area of about 778 square kilometres, the HUA consists of the Municipal Corporation of Hyderabad (MCH), Secunderabad Cantonment and the ten surrounding municipal towns as important components. The HUA has registered a decadal growth rate of about 43 per cent, 67 per cent and 28 per cent during seventies, eighties and nineties respectively with much of the spatial expansion in the last two decades occurring in the peripheries. Very recently in April 2007, much of the HUA has been constituted into a single urban local body, Greater Hyderabad Municipal Corporation (GHMC). It is the sixth largest city in India, closely behind Bangalore. In recent years, the city has emerged as an important information technology centre in India and has acquired a global image in this field.

Being located in an undulating topography of the Deccan Plateau of the Indian subcontinent, Hyderabad city and its environs were blessed with a number of natural and man-made water bodies locally known as *Cheruvus, Kuntas* etc. These water bodies acted as water storage reservoirs for irrigation, drinking and groundwater recharge, and have been an inalienable part of the urban ecology of the city. Gradually, while some lakes

[1] Fellow/Reader, Centre for Economic and Social Studies (CESS), Begumpet, Hyderabad-500016, India. E-mail: crchandraiah@gmail.com
[2] President, Forum For a Better Hyderabad (a coalition of civil society organizations and individuals), Hyderabad. E-mail: betterhyd@yahoo.co.in www.hyderabadgreens.org

were encroached and replaced by concrete buildings, several others got severely polluted with the domestic and industrial effluents. With the loss of water bodies and the consequent decline in groundwater table, long-distance and expensive water projects are being undertaken to provide water to the city.

The crisis of water shortage in the city has been more evident since mid-1980s with the citizens getting municipal water supply on alternate days. Increasing number of bore wells and the decline of groundwater table has resulted in the bore wells now being dug up to over 800-1000 feet in several areas as many old bore wells are drying up. Due to increasing population in HUA and the slow expansion of water board coverage area the people are increasingly resorting to groundwater usage. The recently approved Water, Land and Trees Act (WALTA) has not made any impact in urban areas. Under the Act, it is compulsory to seek and get permission from MRO (Mandal Revenue Officer) before digging any bore well. It is also prohibited to draw water from below 500 feet of ground. To meet the growing demand, people of all sections of the society frequently flout both these requirements.

Water Sources and Water Supply

The main sources of surface water are Osmansagar, Himayatsagar, Manjira Barrage, Singur Dam and Krishna water (Table 1). Osmansagar was built in 1920 across Esi, a tributary of Musi river, and Himayatsagar was constructed in 1927 across Musi. Before these two reservoirs were built Hussainsagar and Mir Alam Tank (built in 1562 and 1908 respectively) supplied drinking water to the city till 1930 or so. Over the years, the latter two got polluted and are no more used as drinking water sources.

Table 1. Main Water Supply Sources for Hyderabad

Source	Osman-sagar	Himayath-sagar	Manjira Phase-I	Manjira Phase-II	Manjira/ Singur Phase-III	Manjira/ Singur Phase-IV	Krishna water scheme
Year of Commissioning	1922	1927	1965	1981	1991	1994	2004
River	Musi	Esi	Manjira	Manjira	Manjira	Manjira	Krishna
Name of the Impoundment	Osman-sagar	Himayath-sagar	Manjira Barrage	Manjira Barrage	Singur Dam	Singur Dam	Nagarjuna-sagar*
Distance from Hyderabad (Km)	15	8.6	58	59	80	80	130

Source: www.hyderabadwater.gov.in except for the last column (accessed in March 2005).
Note: First phase of Krishna Water Scheme has been completed and the 2nd Phase was started in September 2005.
* Already existing.

It may be noted from the above Table that with the passage of time, the city has been drawing water from longer distances. The second phase of Krishna project, when completed, is estimated to bring 90 mgd more into the city and total quantity may reach 320 mgd (million gallons a day), making daily water supply a distinct possibility. As of now there seems to be no infrastructure to store the water brought from the Krishna water scheme. There are plans to construct 12 new reservoirs of 100 mld (million litres per day), including eight in the old city, and lay pipelines to take Krishna water to all areas. The new reservoirs will enable the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) store the huge volume of water. The board currently has 80 reservoirs with storage capacity of 200 mld.[3] The government of Andhra Pradesh has plans to supply water round the clock to the entire city in the six months or so.[4]

The Census data for 2001 reveals that while tap is the principal source of water supply for 93 percent of households in MCH area, the corresponding figure is only about 60 percent and below in the several surrounding municipalities. The location of the tap is outside the premises for a substantial proportion of households in several municipalities. For many families that depend on hand pump, the source is located outside the premises. The municipalities in the HUA are among those facing several acute water shortage in Andhra Pradesh (Ramachandraiah, 2003).

From Osmansagar and Himayatsagar there has been a decline in water supply over the years due to reduced inflows and, for the first time in about 80 years, Osmansagar and Himayatsagar dried up in 2003. When full, these two sources were supplying 45 Mgd to the city. Himayatsagar has dried up again in November 2004 while the Osmansagar became dry in April 2005. A study found that there has been a progressive decline in the percent of rainfall converted into inflows into these two reservoirs during 1961-1996 even though the rainfall pattern has not changed much. These two water bodies reached their full reservoir levels more times (10 times by Osmansagar and 11 times by Himayatsagar) in the first 18 years of 1961-96 compared to the second half of the period (only 5 times by Osmansagar and 6 times by Himayatsagar). Based on this trend, it was concluded that these two reservoirs may dry up completely in future: Himayatsagar in 2036 and Osmansagar in 2040. Even if they do not dry up, they will receive mostly polluted water resulting from the increasing urbanisation of the catchment area and would cease to be the sources of drinking water, unless proper remedial measures are taken (Venkateswar Rao and Srinivasa Rao, 1998). Despite copious rains in Hyderabad and its surroundings during July-September 2005 and 2006, the inflows have been very less into these reservoirs. This is due to construction of check dams and other encroachments in their catchment areas. The total water in these two reservoirs thus accounts for only 1 Tmcft (Thousand million cubic feet) as against their storage capacity of 7 tmcft.[5]

[3] *The Hindu*, Hyderabad, 19 December 2006.
[4] There has been speculation in the media recently, based on some moves of the government, that water from Godavari river is going to be transported to the city through the Pranahita scheme instead of taking up the Phase III of the Krishna water project.
[5] *The New Indian Express*, Hyderabad, 19 September 2006.

There has been an in improvement in the water supply position in the city in general with more water being brought into the city with the Krishna water project. This improvement has happened in those areas which already have piped connections and sufficient water storage facilities. The low-income and slum areas, which do not have such facilities, have not witnessed any significant improvement. Irregular supply of water in terms of duration (once in three or four days instead of alternate days), low pressure, inadequacy and poor quality are some of the problems regularly faced by such areas. Intra-city inequity in water supply as an issue has not been addressed by the policy makers. As a result, people in such areas fall victim to water-borne diseases. Analysis of data for 34 diseases in the Ronald Ross Institute of Tropical Diseases, popularly known as Fever Hospital, in the city reveals that a large number of visits/admissions of patients is caused by water-borne diseases. This is a major referral hospital for infectious diseases for the poor and low-income people. Of the 34, 14 diseases, especially diarrhea, malaria, enteric fever and viral pyrexia/fever, are accounting for over 90 percent of the morbidity cases and even a higher share of deaths. The cases of gastro-enteritis have come down after 2001 but diarrhea cases are increasing. Diarrhea and viral pyrexia/fever are the two major causes of hospitalization of the poor in the city. It may be noted that both these diseases are related to lack of clean drinking water, poor sanitation and low resistance (Prasad and Ramachandraiah, 2007).

Osmansagar-Himayatsagar and GO 111

In view of the importance of Osmansagar and Himayatsagar for drinking water needs of the city, the State government issued a Government Order (GO No. 111) in 1996 prohibiting certain activities in their catchment areas.[6] The HMWSSB constituted an expert committee to suggest ways and means to monitor the quality of water in these reservoirs. After detailed discussions and field visits the expert committee submitted two reports making certain recommendations for the protection of the two lakes. After the first report the GO Ms.No.192 dated 31 March 1994 was issued prohibiting various developments, within 10 km radius of the lakes. The State Government, after careful examination of the second report of the committee, issued GO No.111 dated 8 March 1996 by modifying the earlier GO. Based on satellite maps, an area of about 140 sq.km was recognised as a 'dangerous zone' in their catchment areas.[7] It is reported that the catchment areas have shrunk to the extent of 80 per cent for Osmansagar and 70 per cent for Himayatsagar.

The GO No. 111 stipulates prohibition of industries, major hotels, residential colonies and other establishments that generate pollution in the catchment of these two lakes up to 10 km. from full tank level. Eighty-four villages falling within the prohibited area have been identified and their names are notified in the GO. However, the GO permits residential developments in the zones identified and earmarked for residential purposes, subject to certain conditions, to protect water flowing into the lakes. Two such important

[6] Government Order No. 111, dated March 8, 1996, Municipal Administration and Urban Development Department (II), Government of Andhra Pradesh. This was an amended version of the then existing Order No. 192 dated 31 March 1994.
[7] *Andhrajyothi* (Telugu Daily), Hyderabad, 23 July 2003.

conditions are to restrict the floor space index (FSI) to 1:0.5 and to keep 60% of total area as open spaces in the notified 84 villages. The HUDA has been directed to take action for classification of 90% of the catchment area as recreational and agricultural which is inclusive of horticulture and floriculture. The HMWSSB has been directed to periodically monitor the levels of different fertilizers and pesticides residues carried into the lakes and review the results once in 6 months.

The AP Pollution Control Board (APPCB) has been asked to make further study of the existing industries in the upstream and downstream of the lakes and take appropriate action as per the existing laws. The Zilla Parishads of three districts in which the catchment area falls (Ranga Reddy, Mahaboobnagar and Medak), the Panchayat Raj Department, the Irrigation Department and the Social Welfare Department were directed not to take up any building works, check dams, lift irrigation works and storage reservoirs across the streams (*vagus*) in the catchment area flowing into these lakes. Unfortunately, none of the organisations and departments has acted upon various measures to protect the two lakes. The HMWSSB has failed to monitor the quality of water in the lakes and review the results every six months. The APPCB has not bothered to carry out a study of the industries and initiate action against the polluting industries in the catchment area. In utter disregard to the precautionary measures of the GO, the district collectors are permitting the change of landuse and the Industries Department is exempting the industries from the provisions of the GO (Rama Rao, 2004).

In a judgment of far reaching importance on 1 December 2000, the Supreme Court of India prohibited setting up of water polluting industries within 10 km radius of these two water bodies in view of their importance in meeting the drinking water needs of Hyderabad. The Court applied the 'precautionary principle' to protect these two water bodies, and ordered the closure or shifting of the existing polluting industries within their 10 km radius.[8] The Supreme Court further held that access to clean drinking water is a fundamental right under 'right to life' in Article 21 of the Constitution of India and that the State is duty bound not only to provide adequate drinking water but also to protect water sources from pollution and encroachment.

Decline of Other Water Bodies

A number of historic water bodies built by the Qutub Shahi rulers (1534-1724 AD) and later by the Asaf Jahi rulers (1724-1948 AD) in and around Hyderabad city have been shrinking in size. Ibrahimpatnam Cheruvu, built in 1850 covering an area of about 1300 acres originally, has dried up for the first time in 1993 and again in 2000. Two water bodies, Satam Cheruvu and Jamalikunta, near the historic Golconda fort, are facing threat due to construction of a golf course. Nandi Muslaiguda Cheruvu in the old city has shrunk from the original area of 15 acres to 10 acres due to encroachments and reduced inflows of water. It was observed that some of the water bodies like Chalmakunta, Irlakunta, Mallaiahkunta, Yamkunta, Kanukunta and Garlonikunta have been converted

[8] In June 2007, the government of AP initiated measures to relax the provisions of the GO No. 111 instead of strictly enforcing the stipulations and protect these two water bodies. The influence of the real estate lobby is known to be behind this move of the government.

into residential land use. The 100-year old Errakunta in Secunderabad has been reduced to a mere 2 acres or so from its original area of about 26 acres.[9] The four water bodies in the Uppal region (Ramanthapur Pedda Cheruvu, Chinna Cheruvu, Uppal Nalla Cheruvu, and Pedda Cheruvu) are facing severe threat to their existence due to encroachments.[10] Two prominent localities in the city are known by the names of the disappeared water bodies: Nallakunta and Masab Tank (Ramachandraiah, 2004).

One of the consequences of the encroachment of water bodies was seen in the unprecedented floods in the city in August 2000 due to a 24 cm rainfall in 24 hours. When the city witnessed heavy rains, the narrowed/encroached water courses/bodies could not carry rainwater thus inundating large areas in the vicinity. Low-lying areas down the Hussainsagar, though occupied by middle and upper middle class people, experienced worst ever flooding. In these navy boats had to be used to traverse in the flood waters. Flood water levels reached up to the first floor level in some apartment complexes.

Pollution of Water Bodies

In addition to encroachments, pollution of lake waters by untreated domestic sewage and toxic industrial effluents has been going on over the years. Many lakes which provided drinking water earlier no longer serve the same purpose. While there were six very old industrial areas in the Hyderabad city corporation limits (Azamabad, Musheerabad, Sanathnagar, Kavadiguda, New Bhoiguda, and Lalaguda), eleven new industrial estates came up around the city in course of time.[11] Many of the industrial estates are located in the foreshore areas of the lakes. Continuous discharge of untreated industrial effluents into the water bodies has turned them into 'toxic ponds' almost devoid of any life.[12] Some of the important rivers/streams polluted by the industrial effluents are Bollaram, Isakavagu, Nakkavagu, and Manjeera (upstream of Nakkavagu confluence). Due to seepage and infiltration from these polluted water bodies/drains and other waste dumps, the groundwater and drinking water sources in the area are highly polluted (Kishan Rao, 2001: 24-26). In a study done for HUDA, it was found that 18 water bodies were identified as the most polluted while 67 were polluted to a lesser extent. Of the 38 lakes identified as potential sources of drinking water, bacteriological and chemical tests revealed that the water of only 6 lakes was in a usable condition.[13]

---

[9] *Vaartha* (Telugu Daily), Hyderabad, 21 June 2002.
[10] *Vaartha* (Telugu Daily), Hyderabad edition, 11 June 2002.
[11] These industrial estates are 1. Jeedimetla, 2. Balanagar, 3. Chandulal Bardari, 4. Medchal, 5. Moulali, 6. Nacharam, 7. Cherlapalli, 8. Uppal, 9. Katedan, 10. Autonagar, and 11. Gagan Pahad industrial development area (EPTRI, 1996: 63).
[12] Some of the important polluted lakes/cheruvus are: Kazipalli cheruvu, Gandigudem cheruvu, Nagulal cheruvu, Kistareddypet cheruvu, Muktakanta cheruvu, Aminpur cheruvu, Bollaram cheruvu, Saki cheruvu, Muthangi cheruvu, Isnapur cheruvu, Chitkul cheruvu, Lakadaram cheruvu, Pedda cheruvu, Yerdanur cheruvu, Gummadidala tank, Bonthapalli tank, Jinnaram cheruvu, Kalateleal cheruvu, and Digwal cheruvu etc. (Kishan Rao, 2001).
[13] *Andhrajyothy* (Telugu Daily), Hyderabad, 23 July 2003.

The pollution control board has been ineffective to a large extent in penalizing the polluting industries despite the provisions of the Environment Protection Act, 1986, the Water Act, 1974 and the Air Act, 1981. Rampant corruption and the industrialist-politician-bureaucrat nexus have played havoc on water bodies. The industrial lobby is so powerful that a sitting judge of the Andhra Pradesh High Court was transferred overnight for giving closure orders to the highly polluting industries in Patancheru area.[14]

The HUDA has initiated a lake conservation programme with the assistance of Royal Netherlands government under the Green Hyderabad Environment Programme (GHEP). 87 lakes have been identified for conservation based on their pollution levels. They are grouped into Category-I or highly polluted lakes, which number 18. The remaining lakes are put into Category-II or moderately polluted. Three major lakes in the highly polluted category - Safilguda, Saroornagar and Langer Houz – 'have been cleaned up and are being conserved with a green belt around'.[15] Sewerage treatment plants (STPs) have been set up in these lakes for treating sewage before being let into their waters. A study undertaken by the National Remote Sensing Agency (NRSA) for the HMWSSB has identified 38 water bodies in and around the twin cities as potential drinking water sources, which would mean an additional supply of 17 million gallons per day.[16]

A notification by the HUDA[17] gives particulars of 169 lakes of 10 hectares and above, covering an area of approximately 90.56 sq.km. While 62 lakes are fully owned by the government, 25 are under private and 82 are under partly by government and private ownership. As per this notification, the entire area falling within the full tank level must be kept free from any type of constructions, irrespective of the ownership or any land use or master/zonal development plans that may have been previously notified. Further, a buffer belt of 30-metre width on all sides of each lake must be kept free of any type of construction in the interest of prevention of pollution to the lake and allow free flow of water into the water bodies.

The WALTA clearly states (in Section 23) that the concerned authority 'may notify water bodies like lakes, village ponds and minor irrigation tanks along with nalas (water course or drainage course) as heritage bodies and conservation areas to prevent conversion of their intended use and the authority shall take all measures to permanently demarcate the boundaries….as per the memoirs of lakes/tanks/ponds/nalas… and shall take measures to evict and prevent encroachment'. Further, as per Sections 19.1 and 23.3 of this Act, the

---

[14] Justice Jeevan Reddy described this area as 'mini Chernobyl' and was about to issue closure order to Voltas (a pesticide unit owned by a powerful group), along with 12 other industries. The counsel (advocate) for Voltas asked for an additional day to produce evidence in their defense. By the next day, Justice Jeevan Reddy was transferred to Allahabad High Court (Gujarat) and was relieved even before the hearings started (Kishan Rao, 2001: 46).

[15] Conference brochure of the international workshop on '*Urban lakes: Conservation and Management*', June 16-18, 2003, organised by the HUDA at Hyderabad.

[16] 'NRSA identifies 38 drinking water sources', *The Hindu* Internet Edition, 28 August 2002. GoAP (2002) *Andhra Pradesh Water, Land and Trees Act* (Act No. 10 of 2002). Andhra Pradesh Gazette Hyderabad: Government of Andhra Pradesh.

[17] Notification No. 3195/PR/H/2000 dated 4 May 2000 (*Deccan Chronicle*, Hyderabad, 6 May 2000).

groundwater resources shall not be contaminated in any manner by anybody and undesirable wastes including liquid wastes shall not be dumped in the water bodies (GoAP, 2002: 18-20). The implementation at ground level is, however, discouraging.

There are about 200 Central and State laws to protect environment in India (Sinha, 2001: 47). As per section 24 of the Water (Prevention and Control of Pollution) Act, 1974, poisonous, noxious or polluting matter shall not be discharged, directly or indirectly, into water bodies, sewers or on land. Similarly, under sections 7 of the Environment (Protection) Act, 1986 'no person carrying on any industry, operation or process shall discharge or emit or permit to be discharged or emitted any environmental pollutant in excess of such standards as may be prescribed' (Divan and Rosencranz, 2001: 653, 676). The government of India's (GOI, 1992) policy statement on abatement of pollution declares four guiding principles with the objective of integrating environmental considerations into decision making (*Ibid.*: 36): (i) prevention of pollution at source, (ii) adoption of the best available technology, (iii) the polluter pays principle, and (iv) public participation in decision making.

The Musi River and Hyderabad City[18]

The River Musi emerges from Anantagiri hills in Vikharabad district situated at 661 metres above mean sea level. The river flows for 70 km before reaching the reservoirs of Osmansagar & Himayatsagar, which are constructed on Esi (its tributary) and Musi respectively as discussed earlier. These reservoirs were constructed after the devastating floods in 1908 during the regime of Mir Osman Ali Khan, the VII Nizam. The technical inputs for their construction were provided by Sir Mokshagundam Visvesvarayya, a renowned civil engineer. Osmansagar has a storage capacity of 110 mcm (million cubic metres) a watershed of 738 sq. km. The Himayat Sagar has a storage capacity of 84 mcm a watershed area of 1311 sq. km.[19]

From these reservoirs the river continues to flow east through Hyderabad city. Downstream of the city, the river has 24 diversion weirs, locally known as *kathwas*, the first being Uppal Kathwa. The total irrigated land under these irrigation structures was planned to be 25000 acres, but this has increased dramatically to 87000 acres owing to increasing volume of sewage that enters the river from the urbanised area of Hyderabad. At about 216 km from its origin, a larger reservoir was constructed across the river in 1963 at Suryapet where another river, Aleru, joins the Musi. About 30183 acres of land is estimated to be irrigated under this reservoir. The Musi joins the River Krishna at Wazirabad, 40 km down from Suryapet. That makes the total length of Musi to be 256 kms.

The River Musi divides Hyderabad city into the south and the north. The city was founded on the banks of this river by Md. Quli Qutub Shah, the fourth rule of the Golconda kingdom. The river has a gradient of 2 metres per km within the city.

[18] Most of the information on Musi is taken from a study done by Vedakumar (2007).
[19] The earlier discussion relating to the Osmansagar and Himayatsagar, and the GO No. 111is very much part of the overall scheme of things related to the Musi river.

Conservation of Musi has assumed relevance only in recent years. Until the 1960s, Musi River was looked at from the point of view of a river flowing through the city of Hyderabad and as a water source (in the form of reservoirs built on its tributaries). It is interesting to note that Musi is also a hub for the city as the Interstate Bus Terminal is located on an island in the river.

In India a river is a common property resource of the people and thus it is the responsibility of the State to protect water resources. Since the government functions and exercises its duties with the help of various departments, the onus of conserving, management of Musi falls on the following departments: Irrigation, Revenue, Musi, Town and Country Planning, Department (TCPD), Hyderabad Urban Development Authority (HUDA), Municipal Corporation of Hyderabad (MCH), Forest Department, Agriculture, Industries, APPCB, Rural Local Bodies, Urban Local Bodies etc. The responsibility, however, also lies on the part of the society at large. The multiplicity of organisations can become a major obstacle for efficient coordination and handling of issues of a natural resource like a river that flows through several administrative divisions in a state. The government systems have become behemoth and independent and isolated in the case of some issues and therefore leading to a lack of integrated policy formulation, implementation and monitoring systems. The end result is the loss of environmental quality and inefficiency in the functioning of the system and social discords.

Water (or lack of it) in Musi

It is not know exactly when Musi dried up as a river. But interviews with people and information collected from secondary sources indicate four major reasons which have led to no water flowing in Musi:

1. Degradation of the catchment of Musi in the upstream in Vicarabad area.
2. Impounding of water by the Osmansagar and Himayatsagar, and degradation of their immediate catchment areas.
3. Changes in the drainage pattern of Hyderabad urban region affecting free flow of water into the Musi from various directions.
4. Disruption of the interlinkages of the numerous water tanks in the region (numbering more than 1000) and their encroachments overtime, which were otherwise feeding the river.

Till about two decades ago the Osmansagar and Himayatsagar were overflowing into the main river during the monsoons. In extreme cases flooding would occur and the river would actually get washed up. As discussed earlier, these two reservoirs are not reaching their FRLs even in the years of normal rainfall.

The major reasons of the deterioration of the catchment of the two reservoirs are:

- Building of thousands of check dams within the catchment area despite the GO No.111.
- Indiscriminate plotting of the catchment area by the real estate players

- Changing landuse and changing agricultural practices like converting fallow lands to agriculture, and shift from rainfed crops to irrigated crops etc.
- Quarrying in the catchment area is known to have diverted some of the feeder channels.

There is hardly any water flowing into the Musi. The water flows downstream very quickly during rainy seasons. Water can be seen only at the *kathwas* or at the reservoir at Suryapet. Whatever the water that is found in the riverbed in the form of a small stream is actually the seweage/drainage from Hyderabad city. Large parts of the urbanised area does not have underground sewer systems. Either the settlements have septic tanks which are not the preferred system of disposal from a long term perspective or the sewer lines are combined with the storm water lines. Thus many natural storm water drains have been actually carrying domestic sewage into the river. Compounding to the problem immensely are the industrial effluents which are treated only partially and retain harmful trace elements which enter the food chain. The CETPs (Common Effluent Treatment Plants) are a typical case of a system getting away with murder due to official connivance. The two CETPs present in the Hyderabad urban agglomeration have not been functioning to their capacity.

Several villages downstream of the city along the Musi irrigate their fields with the water (ie. a cocktail of industrial effluents plus domestic sewage) from Musi river. Such "water" is diverted from the kathwas into the village irrigation tanks which in turn is used for cultivating crops. Several such village tanks are perennial in nature i.e. they are never dry due to the regular flow of the cocktail from Hyderabad. Underground water in such villages is polluted beyond acceptable standards. People from several such villages travel as much as 10-15 km to reach the outskirts of Hyderabad city to collect drinking water in plastic cans.

As per information provided by the HMWSSB, about 80% of the water used by people is released back as sewage, which flows back into Musi everyday. In the absence of the properly conserved catchment areas and lack of proper rainfall in the region, the only water that can flow through Musi is this sewage. The task is to treat this sewage properly and let it out into the river. The problem about industrial effluent will still remain. According to HMWSSB sources the total industrial effluent generated is 87 mld. This contains toxic compounds posing a great threat to the people using Musi river "water" for whatever purpose: fisher people, fodder and vegetable growers living downstream, washer people. The citizens of Hyderabad city are the main consumers of the agricultural produce and vegetables grown with such "water". This is how the villagers downstream of Hyderabad pay back to the city dwellers for the pollution caused to them![20]

The lone sewage treatment plant (STP) at Amberpet is woefully inadequate and is known to treat only 20% of the sewage in the city that too at a very primary level. The ecological destruction of Musi is very much linked to the callousness of the state and city governments in not expanding the capacity of the Amberpet STP and also in not setting

[20] As remarked by a villager cultivating vegetables with such "cocktail" in Edulabad village downstream of the Musi.

up new STPs along with the growth of the city. The "Save Musi" project taken up recently by the state government involve setting up of six new STPs at several points along the Musi's stretch in the city. If properly implemented, this would go a long way in "washing" the river of its accumulated pollution. The other aspects of the project relating to road development along Musi may lead to disfigurement of the skyline along the river and may also lead to displacement of many low-income families as per the views expressed by the civil society groups. They further argued that, instead of taking up only urban stretch of the river, the entire catchment of the river should be taken up for conservation and development.[21]

Conservation/Beautification of Musi.

Any development or redevelopment plan for Musi affects a number of people/stakeholders especially related to housing, livelihoods, and physical environment. Implementation of most of the plans prepared or being undertaken would involve eviction of people living within the banks of Musi (owners and squatters), and also those living on the banks (owners and squatters). This leads to displacement of houses which affects the work and livelihoods. It is, therefore, important to understand the ground level situation and have a consultative process for planning and implementation. Any physical intervention also has to take care of the heritage of Musi River, its embankments and the various structures located around it. There are heritage regulations which give guidelines for development and in some cases restrict development. Conserving Musi and restoring its past glory would also involve extensive heritage conservation.

Concluding Remarks

This paper brings out clearly that as the city of Hyderabad has grown in size and is emerging as a global megacity, its water resources have been neglected to the detriment of long-term water security of the people. Non-implementation of the environmental laws relating to the protection of water resources and haphazard planning and growth of the city have exerted tremendous pressure on the city's water resources: Musi river, Osmansagar, Himayatsagar, and innumerable water bodies that were built by its early rulers. With the old sources declining and the demand for water growing, the city is drawing water from longer distances.

The Musi river has been reduced to a sewer drain carrying the domestic and industrial waste generated in Hyderabad city. This has had an adverse impact on the river ecology and the villages in the downstream of the river. Even today, the government's approach to the conservation of Musi is piece-meal in nature and not integrated. The future water security of Hyderabad city lies in an integrated management of the entire catchment area of the Musi river and a number of water bodies that are still existing in and around the city.

[21] The government took up an ill-conceived Nandanavanam project in late 1990s in the name of beautification of the river. The project would have literally reduced the river into a narrow channel with the largescale filling of the river bed. It would have become a disaster in the long run. The project was given up, after wasting a good deal of money, after the floods in August 2000.

References

Divan, S. and A. Rosencranz (2001) *Environmental Law and Policy in India: Cases, Materials and Statues*. New Delhi: Oxford.

GoI, (1992) *Policy Statement for Abatement of Pollution*. Delhi: Ministry of Environment and Forests, Government of India.

Kishan Rao, A. (2001): *Patancheru-A Hell on Earth (A Saga of a People's Struggle Against Industrial Pollution)*, A.V.R.R. Memorial Charitable Trust, Hyderabad.

Prasad, S. and Ramachandraiah, C. (2007) "Health Services and Disease Profile of Hyderabad City: A Pilot Study", Report submitted to the sub-group on *Public Health in Hyderabad* to the larger project on **Megacities of Tomorrow**, being conducted by the Humbolt University, Berlin, and being coordinated by Prof. H.C. Konrad Hagedorn and Dr. Ramesh Chennamaneni.

Rama Rao, J. (2004) 'Protection Of Hyderabad Drinking Water Sources: A Note', Hyderabad (mimeo).

Ramachandraiah, C. (2003): "Urbanisation and Urban Services", in Hanumantha Rao, C.H. and S. Mahendra Dev (eds.) *Andhra Pradesh Development: Economic Reforms and Challenges Ahead*, CESS, Hyderabad.

Ramachandraiah, C. and Sheela Prasad (2004) "Impact of Urban Growth on Water Bodies: The Case of Hyderabad", Working Paper No. 60, Centre for Economic and Social Studies, Hyderabad.

Rekha Rani, T. (1999) 'Lakes of Hyderabad: Transformation of Common Property to Private Property', unpublished M.Phil dissertation, University of Hyderabad.

Sinha, S. (2001) 'Environmental Protection: Role of Constitutional Courts', in *Contribution of the Andhra Pradesh High Court in the Development of Constitutional Law*, High Court of Andhra Pradesh, Hyderabad.

Vedakumar, M. (2007) "Natural Resource Management for Sustainable Hyderabad: Musi Conservation Study Pilot Project", *Annual Number 2006-07, Forum For A Better Hyderabad*, Hyderabad, pp. 54-66.

Venkateswara Rao, B. and N. Srinivasa Rao (1998) 'Influence of Urbanisation over the nearby Catchments of the City – A case Study of Hyderabad (India)'. Hyderabad: JNT University (mimeo).