



## Discussion Paper Series

## The Peri-urban Water Security Problématique: A case study of Hyderabad in Southern India

**Anjal Prakash**

The recent Census of India (2011) throws some very interesting facts on the process of urbanisation in India. For the first time since Independence in 1947, the absolute increase in population is more in urban than in rural areas. The level of urbanization increased from 27.81% in 2001 to 31.16% in 2011 and the proportion of rural population declined from 72.19 per cent in 2001 to 68.84 per cent in 2011. With the increase in urban areas, there is a pressure on basic infrastructure including access to water for both urban and periurban locations. Most Indian cities have formal water supply only for few hours a day and only in limited areas. The big question is - where are the rest of the water requirements coming from? For much of India's 'water history', the focus has been on large scale surface water projects to provide access focusing more on irrigation and neglecting sources within the city and in the periurban areas. Over time an enormous informal groundwater market has arisen in several cities to bridge the demand-supply gap. This water demand, therefore, is met through supplies of water through informal water markets. Water is sourced from the periurban regions which are usually richer in surface and groundwater. This paper focuses on the change process as witnessed by periurban areas with a case study of the southern Indian city of Hyderabad. Due to a large influx of population mainly due to expansion of the city as an Information Technology (IT) hub, the periurban areas have been losing out on water access to the more powerful urban population with high paying capacity. This paper presents an overview of a trend that is leading to immense water insecurities due to a combination of issues –urban growth induced water scarcity; myopic planning that is not based on available environmental resources; lack of recognition of community water rights and lack of regulation for the protection of diminishing surface water resources.

This is one of a series of Discussion Papers from the Peri Urban Project of SaciWATERS.

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## The Peri-urban Water Security Problématique: A case study of Hyderabad in Southern India

Anjal Prakash

### Introduction

The 2011 provisional Census of India reports an annual growth rate of urban population of 2.76 per cent which is almost the same (2.73 per cent) as reported in 2001. The urban population of India stands at 377 million with 31.16 per cent of the total population living in urban locations. The decadal urban population growth rate during 2001-2011 is 31.8 per cent which is 1.8 times of the combined urban and rural growth and 2.6 times of the rural population growth. Therefore the absolute increase in urban population is more than the increase in the rural population in India. According to the Census 2011, for the first time since Independence in 1947, the absolute increase in population is more in urban areas than in rural areas. The rural-urban distribution stands at 68.84 per cent and 31.16 per cent respectively in 2011. The level of urbanisation increased from 27.81 per cent in 2001 Census to 31.16 per cent in 2011 Census and the proportion of rural population declined from 72.19 per cent in 2001 to 68.84 per cent in 2011 (Chandramouli, 2011). What is more surprising is that the number of towns has increased from 5,161 in 2001 to 7,935 in 2011 adding 2,774 'new' towns. These trends show that India is increasingly urbanizing. The latest figures corroborate the fact that due to various socio-economic factors like population pressure and poverty, the urban regions have seen a large influx of population from rural areas and this has led to the rapid growth of new urban centers.

So how is urban India accessing its water resources? The consequence of increasing urbanisation is an unprecedented pressure on the urban infrastructure and resources. Increasing urbanisation coupled with a rise in consumption mean a higher calorie intake that presents a new challenge for water resources. Access to water in urban India at present is already severely constrained. Most Indian cities have formal water supply only for few hours a day and only in limited areas. So where are the rest of the water requirements coming from? As India is increasingly urbanizing, the municipal corporations are not able to cope with the rising water demand for various reasons. For much of India's 'water history', the focus has been on large-scale surface water projects to provide irrigation and neglecting sources within the city and in the peri-urban areas. Over time an enormous informal groundwater market has arisen in several cities to bridge the demand-supply gap. Water for these informal water markets is often sourced from the peri-urban regions which are usually richer in surface and groundwater.

The peri-urban areas are witnessing change in two ways. First, they cater to the rising urban economic class that is ready to pay for constant water supply through the sale of water fueled by an informal water tanker economy. Second, peri-urban areas and their citizens are at the receiving end of the waste water produced by cities, and suffer the consequences in the form of polluted rivers, industrial and domestic waste and a damaged urban ecosystem. This paper documents this process in urban waterscapes through the case study of a city – Hyderabad, located in the Deccan plateau in South India. The city once had a rich urban water infrastructure which has been severely affected in the post liberalization period. During this period the city has been shaped by a different pattern of development, which has been induced by the growth of the Information Technology (IT) sector. In this process of economic change, the peri-urban areas in Hyderabad have lost out on water access to the more powerful middle-class population residing in the urban core with a higher capacity to pay for these resources.

Therefore, the first issue is the transfer of scarce resources from the periphery to the core and in social terms from marginalized social groups residing in the peri-urban areas to privileged classes in urban locations. Further, there is a reverse transfer of environmental costs in terms of waste water to the periphery. Rice (2007) discusses the theory of unequal exchange that refers to the increasingly disproportionate utilization of ecological systems and externalization of negative environmental costs, consequentially, declining utilization opportunities and imposing exogenous environmental burdens within the periphery. The theory provides a framework for conceptualizing how the socio-economic metabolism or material of the core may negatively impact more marginalized areas. The author highlights that capital accumulation is fundamentally rooted in alteration of ecological systems and its exploitation that shapes both the social relations of production and the form and integrity of ecological systems. The second issue is that the state that has shifted towards 'market driven' growth and promoted the growth of export oriented and 'new' industries such as the IT sector above all other priorities. In this context, an important question asked here is – how is the state dealing with the challenges of urban water supply? Is the growth of informal water market and water transfer a sign of a failure of governance to deal with the present scenario? An understanding of the issue of "governance failure" can be used to analyse the institutional dimensions of urban water supply provision to poor households. For instance, in a study of Jakarta, Bakker (2007) focuses on the failures that create disincentives for utilities to connect poor households and for poor households to connect to utilities concluding that the debate over the relative merits of public and private provision has

diverted attention from the pressing issue of governance reform in public utilities especially for water supply.

The paper presents an overview of a trend that is leading to immense water insecurities due to a combination of issues –urban growth induced water scarcity; myopic planning that is not based on available environmental resources; lack of recognition of community water rights; and lack of regulation for the protection of diminishing surface water resources. This paper is divided into three sections. Section one dwells on the concept of the peri-urbanisation process and its impact on environmental resources such as water. Section two provides a snapshot of urbanisation trends in India and Hyderabad. It focuses on water security issues in urban and peri-urban Hyderabad as a result of rampant urbanisation problems. Section three concludes this paper and provides a framework for the peri-urban water security problématique.

### 1.1 What are peri-urban areas?

Ideally, a peri-urban area is a confluence of rural and urban. It is a transition zone which is neither rural nor urban in its characteristics and outlook. The literature about the definition of peri-urban areas provides a geographical construct or defines it from a social relations perspective. The sharp distinction between urban and rural assumes that the livelihoods or the inhabitants can equally be reduced to two main categories: agriculture based in rural areas and manufacture and services based in the urban centres. Even where activities can be described as either urban or rural and are spatially separated, there is always a continued and varied exchange of resources between urban and rural areas. The sectoral interaction consists of rural activities taking place in urban areas and services taking place in rural areas, or even the peri-urban flows to and from rural industries that are spatially concentrated around urban areas (Tacoli, 1998). Peri-urban areas are thus characterized by uncertain land tenure, inferior infrastructure, low incomes, and lack of recognition by formal governments (Hogrewe et al, 1993). So, providing only a place based definition does not give a complete picture of what peri-urban areas are like. The incongruence in the urban and rural definitions is also a reflection of the diverse geographic contexts of these places. Rural is not only defined relative to its urban counterpart, but also relative to the specific political-economic, ecological and social-cultural context in which such spaces emerge (Lerner and Eakin, 2011).

Narain (2010) argues that peri-urban is better understood in terms of its characteristics; a mix of agricultural and non-agricultural land uses, flows of goods, services and resources between villages and urban centers and a social profile that is very heterogeneous and in a state of flux. As noted by Narain (2010: 1) 'all these impact upon the local natural resource base, creating particular environmental and natural resource management problems that are often beyond the scope of urban or rural governments alone and require innovative ways of being addressed'. The literature on peri-urbanisation process attempts to define 'mixed' rural-urban interfaces, and to construct a new understanding of social reality which undermines the notion of rural livelihoods being separate from urban. Lerner and Eakin (2011) portray the peri-urban space as a 'space' in itself, enveloping dynamic interactions between population and the landscape and their associated land uses and livelihoods. They support the notion that there is a vibrant flow of agricultural goods and ecological services both within peri-urban zones and between peri-urban and urban core areas.

### 1.2. Understanding peri-urbanisation from an environmental perspective

The expansion of urban and peri-urban areas poses many challenges, especially in South Asia. As the city expands, it poses many threats to the peri-urban spaces and may also bring in benefits. To understand this further, the peri-urban interface is looked at from the perspective of the linkages and flows of goods and services between urban and rural areas. These flows could be of human or material resources. Increased job prospects in menial and semi-skilled work areas; peri-urban agriculture that caters to urban populations such as growing vegetables; and rising land prices could provide benefits for the peri-urban residents. However, this paper focuses on understanding peri-urban areas from an environmental perspective.

Shaw (2005) documents the environmental dimension of spreading urbanisation by focusing on the problem of increased solid wastes in the peri-urban areas of India and examined the role of governance and local initiatives and their capacities to cushion these impacts. In particular, she documents the peri-urban interface and its environmental vulnerability in the context of solid waste management discussing the reasons for the environmental neglect of peri-urban areas. Shaw focuses on the issue of governance, social capital and the role of local-level initiatives through two case studies of Chennai and Kolkata documenting the success of local-level initiatives in providing a basic waste management service in one and the lack of success in another case study. Yet, they are also a study in contrast, both in terms of their civic status and the outcomes of local level initiatives to improve the existing situation. Marshall et al (2009) shows that environmental degradation, natural resource conflicts, health concerns and social injustice are particularly acute in the peri-urban situation. Failure to address these apparently peripheral issues not only results in a plethora of missed opportunities to benefit from rural-urban synergies but also fails to address a key flash point undermining the ability to improve environmental integrity and social equity and poverty in growing cities in South Asia. However, deeper insight into these peripheries, which are subject to ambiguity, informality and illegality in the context of formal planning processes, can elucidate alternatives to dominant

planning and management trajectories.

Using the results of a comparative three-year research project in five metropolitan areas including Chennai in India, Allen et al (2006) reviews a range of practices in accessing water and sanitation by peri-urban poor residents and producers. They observe that neither centralized supply policies nor the market were able to meet their water needs. The peri-urban poor have no option but to pay market prices for water and often for sanitation. The authors outline a conceptual distinction between “policy-driven” and “needs-driven” practices in the access to peri-urban water and sanitation services. The case studies show that this access is mainly needs-driven and informal rather than the result of formal policies. The key to structural improvements in water and sanitation lies in the recognition of these practices and their articulation to the formal system under new governance regimes. Waste disposal and consequent contamination in peri-urban areas are areas of concern. Refuse dumps and sewage treatment plants in the peri-urban areas pose problems for local residents: smell and potentially disease-carrying vectors such as flies, mosquitoes, and rodents; and contamination of soil and groundwater by leachate. Rivers flowing through major urban areas commonly emerge with a heavy pollution load and peri-urban residents downstream of cities are thus forced to drink and utilize contaminated water (Simon, 2008).

Land use changes are one of the striking features of peri-urbanisation that changes water access. A study of Saharanpur City in India on the loss of agricultural land due to urbanisation revealed that there has been rapid conversion of agricultural areas to non-agricultural uses. Vast amounts of land had been acquired through different means. The urban expansion had destroyed fertile agricultural land which could not be recovered, and, in sum, the area under observation was losing its agrarian characteristics (Fazal, 2000). There is a close relationship between land and water use and therefore, any alteration between land uses has direct implication for water and other environmental resources. For example, filling up water bodies for urban acquisition is a common phenomenon across south Asian countries. Narain (2010) documents the disappearance of village water ponds, that were natural water harvesting structures, known as Johad, from the periurban landscapes of Gurgaon in Haryana, India. Janakarajan et al (2006) documents the case studies of Delhi and Chennai from an urban water conflict perspective. The case of Delhi addresses conflicts linked to water access and to the compensatory strategies associated with it. The study of Chennai looks at the most critical conflict, opposing the city and the peri-urban villages, as continuous water transport, in order to supplement the city's drinking water needs, has drained water resources in peri-urban villages. Understanding the peri-urbanisation process therefore requires an examination of what happens to the environmental resources when urban expansion takes place.

The cases above show that the peri-urban issue can be looked at from the conceptual framework of the flow of environmental services from urban to peri-urban and vice versa. In most of the cities of India and South Asia, cities have expanded without sufficient water and sanitation infrastructure. Therefore, drinking water is sourced from the peri-urban areas through public or private tanker supply while urban waste is directed towards the peri-urban areas in terms of sewage and waste water. So the city expands by appropriating the environmental resources of the peripheral areas.

### 1.3 Challenges for environmental governance of urban and peri-urban areas

One of the major challenges for better environmental governance in urban and peri-urban areas is the lack of coordination between different line departments. Environmental resources such as forest, land, water bodies etc. fall in different official categories each managed by different departments. There is virtually no coordination between different departments in sharing data, nor is there a common platform for discussing issues and a coordinated action for governance. The cities are managed by municipalities while the peri-urban areas are managed by panchayats in the Indian case. In many mega cities, the urban development authorities have a jurisdiction over peri-urban areas but in the planning and management of environmental resources, there is hardly any evidence of good governance. In many cases, it brings in more conflict than cooperation. Narain (2009) provides evidence of the unique governance challenges faced by peri-urban areas that require collaboration between urban and rural authorities. Providing evidence from Gurgaon district in Haryana state in India, Narain showed conflict between the urban and rural authorities. The case illustrates how HUDA (Haryana Urban Development Authority) bought grazing lands from the village panchayat of Basai and did not pay compensation to panchayat. For other developmental issues also, there is an increased tension between the panchayats and the urban development authority.

The working group on urban strategic planning for the 12th five year plan of the Government of India provides some interesting observations and recommendations on governance. It observes that the urban planning system needs to be restructured to ensure the integration of physical and socio-economic planning, transportation and land use planning. It also recommended the promotion of participation by the people in the planning and development processes in the light of the 74th Constitution Amendment Act, 1992, which envisioned greater democratic decentralization and power to the people. The report further observes that the urban planning process must combine spatial planning with socio-economic and financial planning, and transportation planning with land use and environmental planning to be more responsive to the changing needs and demands of the citizens. Urban planning in India is a state subject and under the 12th Schedule of the 74th Constitutional Amendment Act, the subject of urban planning, including town

planning has been mandated for the third tier – Municipal Corporations and Municipalities. The subject of regional planning, however, falls in the domain of the State Governments. While the Act envisages that the District and Metropolitan Planning Committees consolidate plans for the component urban and rural bodies, they send the “draft” District and Metropolitan Plans to the State Government. The implication is that these plans are to be integrated with the State Plans. As per the Constitutional mandate, the District and Metropolitan Development Plans have to ensure coordinated spatial planning, sharing of natural and other resources, integrated provision of infrastructure and environmental conservation. These are areas which require guidelines so as to synchronise bottom-up and top-down approaches (Government of India, 2011: 6-7).

## 2.1 Urbanisation Trends in India and Hyderabad

India's urbanization process is considered slow as compared to other parts of the developing world as about only onethird of India is urbanized in 2011. However, projections of the future rise in population in urban and rural areas show that there would be an accelerated growth in urban areas in next two decades. The 2011 Census of India shows an increase in the urban population from 27.8 per cent in 2001 to 31.2 per cent (Census of India, 2011). The future prediction is that this share is likely to increase up to 40 per cent by 2030 (McKinsey Global Institute, 2010). The decadal urban population growth rate is shown in the table Table 2.1 that shows that about 44.34 per cent of people were added in just two decades. Increasing urbanisation will require heavy investment in infrastructure in urban areas, especially water, sewerage, public transport and low cost housing.

Table 2.1: Urban Population in India (in million)

	1991	2001	2011	Addition during 1991-2011
India [Total]	846.4	1028.7	1210.2	363.8
Rural	630.6	742.6	833.1	202.5
Urban	215.8	286.1	377.1	161.3
Share of Urban Population (%)	25.49	27.81	31.16	44.34

Source: Census of India, 1991-2001

The number of towns in India increased from 5,161 in 2001 to 7,935 in 2011. Almost all of this increase reflects the growth of 'census' towns (which increased by 2,532) rather than 'statutory' towns (which increased by only 242) (Planning Commission, 2011). 'Statutory' towns are towns with municipalities or corporations whereas 'census' towns are agglomerations that grow in rural and peri-urban areas, with densification of populations, that do not have an urban governance structure or requisite urban infrastructure of sanitation, roads, etc.' (Planning Commission, 2011:108)

## 2.2 The growth and expansion in Hyderabad and its surrounding areas

Hyderabad was established in the 15th century. In 1947 it was declared as part of Andhra Pradesh, a state within the Indian Union. In the mid 1990s, when a Structural Adjustment Programme was introduced by the Government of India, the industrial development of the city was reoriented towards advanced telecommunications, information processing and associated technologies.

Hyderabad became a node in the global web of technology enabled economic flows and linkages and, in turn, this made Ranga Reddy district (in which Hyderabad is located), the most developed district of Andhra Pradesh. With a population of 7.7 million as per the 2011 census, Hyderabad is currently ranked as the fourth largest Indian city by population. The Hyderabad Urban Agglomeration (HUA) consists of the Municipal Corporation of Hyderabad (MCH), 12-peripheral municipalities, Secunderabad Cantonment, Osmania University and other areas. In recent times, the 12 surrounding municipalities have been assimilated and the Greater Hyderabad Municipal Corporation has been formed. The growth rate of population in these three components within the Hyderabad Urban Agglomeration (HUA) is shown in the table 2.2.

Table 2.2: Urban Population Growth in Hyderabad

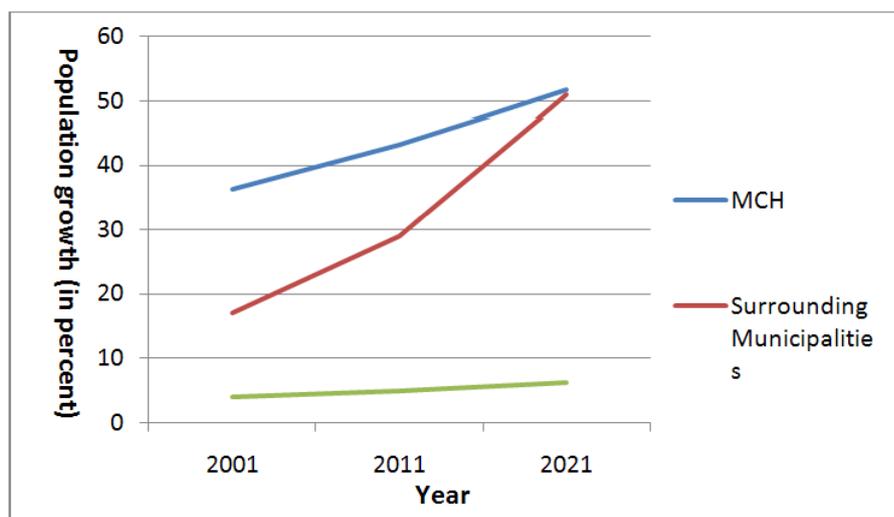
Area	1981-1991	1991-2001
MCH	45.24	19.02
Surrounding Municipalities	160.53	71.72
Others	39.13	25.00

Source: Census of India, 1991-2001

A future projection of population for the HUA is shown in the graph 2.1. This graph reveals an interesting trend, whereby the population of the surrounding municipalities will grow very rapidly and is expected to touch the population of the main corporation. This indicates that growth and development has been happening and will continue to happen in the surrounding areas of the main city. These areas, also recognised as peri-urban areas, have become nodes of development in recent years and the real estate

sector has boomed largely in these areas. If the level of urbanisation between these three components of the agglomeration is compared, the graph below would reveal some interesting figures.

Graph 2.1: Projected Population figures (in '00,000) for components of Hyderabad Urban Agglomeration (2001-2021)



Source: Calculation from data in GHMC Hyderabad City Development Plan, undated

### 2.3 Water Supply in Hyderabad

The irony of the present situation is that Hyderabad city has been searching for different sources of water supply but has neglected its traditional water bodies in terms of saving the lakes of Hyderabad. Historically, Hyderabad derived its water supplies from 'tanks' and groundwater tapped through shallow dug wells. At the beginning of the twentieth century, the seventh Nizam of Hyderabad, H.E.H.Osman Ali Khan, commissioned the

Table 2.3: Source Wise details of Water Supply in Hyderabad, 2011

Source	Year Commissioned	Withdrawals (in MGD)
Osman Sagar	1920	25
Himayat Sagar	1927	15
Manjira Barrage (Phase I & II)	1965 & 1981	45
Singur Dam (Phase III & IV)	1991 & 1993	75
Krishna Project	2004 & 2007	180
<b>Total from all sources</b>		<b>340</b>

Source: JAW, 2011.

construction of two reservoirs approximately 8 km upstream of the city: the Osman Sagar on the Musi river and the Himayat Sagar on the Esi (Mudiraj 1934 quoted in Ceilo, 2010), both tributaries to the River Krishna. The city had Hussain Sagar as its water source from 1592 to early 1900s. Due to pollution in the catchment area, water supply from Hussain Sagar was stopped. From Hussain Sagar the source was moved to Himayat Sagar and Osman Sagar in 1920s (10-15 km from the city). By late 50s the gap between demand and supply again forced government to start identifying newer sources. Hyderabad started accessing water from Manjira River (60-80 km from the city) in different phases – 1965, 1981, 1991 and 1993). With increasing population and demand for drinking water, scarcity became the norm. After commissioning studies by expert committees the government decided to draw water from Krishna River near Nagarjuna Sagar dam (120 km from the city). This project was initiated in 2002 and was to be completed in three phases. Out of the three planned phases two phases have been completed (in 2006 and 2009) after which the government decided to scrap the third-phase. The then government justified it with an explanation that the demand for water from Krishna River is very high in its basin while availability is low whereas, the River Godavari has a lot of water, which is not being tapped. It was proposed to bring additional water from river Godavari upon completion of Chevella-Pranahita irrigation project (JAW, 2011). The present sources of water supply in Hyderabad city are presented in Table 2.3

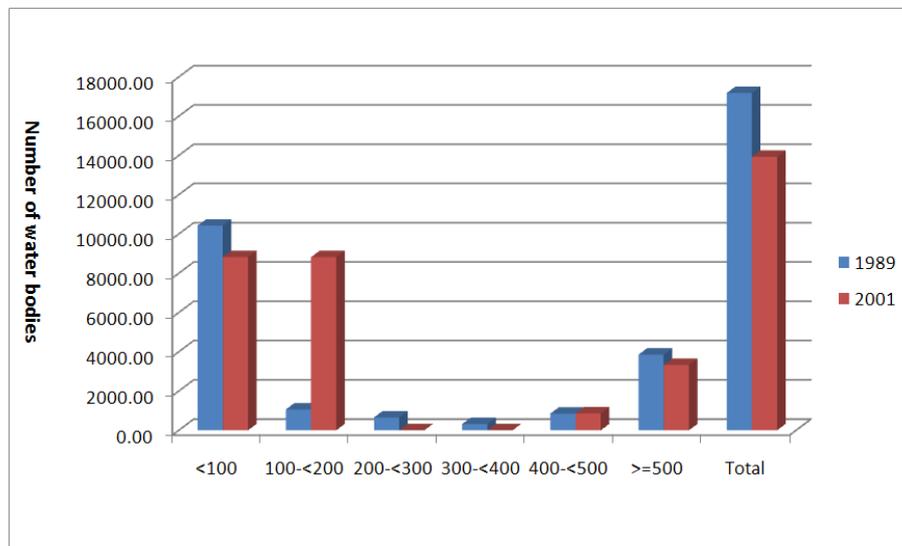
The table 2.3 shows that as the Hyderabad city's demand grew, it appropriated on the water which was earlier entitled for agriculture. Hyderabad not only captured the resource, but also in large measure appropriating the infrastructure and institutions for its management. However, farmers have not silently accepted the transfer of 'their' irrigation water to the city. While in the case of the Krishna they stridently contested the transfer, in the Manjira they pursued institutional options including the establishment of two formal water-sharing agreements. Hyderabad experience shows that mediation is possible in this transfer

and that cities may consider water sharing arrangements as a compromise through which opposition against, and negative impacts of, increases in urban water supply can be softened (Celio et al, 2010). This paper does not suggest that maintaining the city's lakes will be the ultimate source of water supply but in large cases, these lakes are recharging groundwater through which people are accessing their drinking water needs. The table above shows that the reliance of the city on water sources at a distance is growing. Saving lakes and using them for water supply would solve some part of the problem. In any case, this eternal search of water does not supply water to about 40 per cent of the population, many of whom live in poorer locations.

### 3.1 Disappearing water bodies in Hyderabad: A result of haphazard growth

Hyderabad is known popularly as the city of lakes. Within the Hyderabad Metropolitan Development Authority's (HMDA) boundary itself, there are about 3,086 small, medium and large lakes. Out of these, 368 are major irrigation tanks whereas 2,684 are small tanks, and 29 erstwhile tanks under the authority of the Municipal Corporation of Hyderabad (MCH). For the remainder, data is not available (Jairath, 2011). However, most of these lakes are in a state of decline or have disappeared. In this context, a study was carried out in and around Hyderabad city, covering an area of about 7,800 km<sup>2</sup> to identify the impact of expanding urbanisation process on water bodies of the Hyderabad city using 1989 and 2001 satellite data. The results of the study showed a reduction in water bodies both in the total area as well as in the number of lakes. Around 19 per cent of water bodies disappeared in eleven years which account for 3,245 ha of land, formerly under water (see graph 3.1) (Prasad et al, 2009).

Graph 3.1: Change in areas of water bodies between 1989-2001



	< 100	100-< 200	200-< 300	300-<400	400-<500	>=500	Total
1989	10428.80	1061.77	657.44	319.86	854.08	3856.73	17178.68
2001	8820.79	8820.79	0.00	0.00	862.53	3326.49	13933.74

Source: Prasad et al. 2009.

Note: Figures in hectares. The first column shows the size class of the lake.<sup>1</sup>

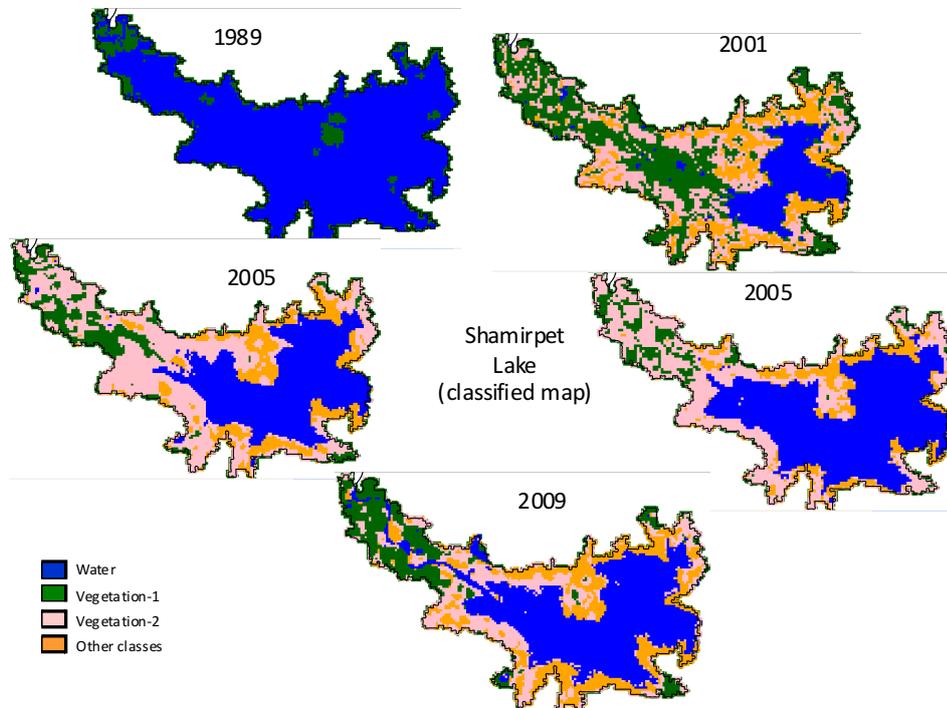
Ramachandraiah and Prasad (2004) have studied the impact of the urban growth of Hyderabad on its water body. Their study analyses the transformation of lakes as common property resources into private property, one of the reasons for their secular decline. For example, Hussain Sagar Lake has not been used as a drinking water source since 1930 though it was originally constructed to supply drinking water. The lake area has shrunk from about 550 hectares to about 349 hectares (nearly 40 per cent decline) due to encroachments by both private and public agencies over the years. Evidence based on satellite data reveals that the Lake has shrunk by about 300 acres in the last 25 years. In addition to encroachment, the lake water became polluted severely due to the continuous discharge of untreated domestic sewage and toxic industrial chemicals for several years.

A study by SaciWATeRs and the International Institute of Information Technology (IIIT) completed in 2011 examined the decline in the water holding capacity of the Shamirpet Lake starting from 1986 to 2009. The area of the lake was 469.25 ha in 1989 which was reduced to 208.65 ha in 2009. Figure 2.1 provides the pictorial representation of the reduction in water holding capacity of the lake. This lake is an important source for irrigation for about 10 villages. Historically, there is a farmer's organisation which has managed

<sup>1</sup> For example <100 means lake which is less than 100 hectare.

the water distribution for irrigation from the Shamirpet Lake. However, this governance body is almost dysfunctional as there is hardly any water which gets released for irrigation. Farmers complain about increasing dependence on groundwater irrigation which is costly as compared to surface irrigation. Also the area is witnessing an increased fluoride problem in groundwater due to excessive withdrawal.

Figure 3.1: Status of Shamirpet Lake in Peri-urban Hyderabad, 1989 – 2009



Source: SaciWATERs and IIIT Study, 2011.

### 3.2 Importance of lakes and reason for decline

So why are lakes important in an urban environment? Adequate supplies of clean, safe fresh water are fundamental for human survival and well being whether one lives in urban or rural areas. Lakes provide an important function in allowing for the harvest of rainwater. As noted by the United Nations Environment Programme: "From the human perspective, the runoff or drainage of water from the land surface is the most important source of fresh water. It also is the primary mechanism by which water on the land surface flows into large downstream rivers and lakes, and eventually into the oceans. The water runoff from the Ganges-Brahmaputra and Mekong drainage basins comprises a high proportion of the total annual water runoff from Asia".

South India has a unique system of rainwater harvesting through cascades of tanks for irrigation and drinking water needs. Many big tanks were built by the Qutub Shahi rulers (1534-1724 A.D.) and later by the Asaf Jahi rulers (1724-1948) in and around Hyderabad city. Some of the big tanks built during those periods are Hussain Sagar, Mir Alam, Afzal Sagar, Jalpalli, Ma-Sehaba Tank, Talab Katta, Osman Sagar and Himayatsagar etc. (Rekha Rani, 1999 quoted in Ramachandraiah and Prasad, 2004). Most of the big tanks were constructed by the former rulers or ministers whereas the minor tanks were built by zamindars. The Hussain Sagar was built in 1575 by Sultan Ibrahim Kutb Shah at a cost of about Rs. 2.5 lakhs. When full, the water-spread covered an area of about 8 miles<sup>2</sup> and it was the source of water for the Residency and suburbs north of Musi river (Imperial Gazetteer, 1909: 34, 118 quoted in Ramachandraiah and Prasad, 2004). All these lakes are linked with each other in a watershed and form cascading systems. For centuries, these lakes were insurance against droughts and floods at the same time. Mosse (2003) documents the ancient and complex tank irrigation systems of a coastal plains region in South India. South Indian irrigation systems especially in Andhra Pradesh, Tamil Nadu and Karnataka have evolved as an intricate system of water harvesting, distribution and management for centuries. Showing the interplay between social and political organization and the ecology of water flows, Mosse (2003) brings forth the centrality of water resources to the organization of a pre-colonial warrior state in which power and the control of resources were decentralized. He goes on to explore the conflicts and contradictions that emerged within this social system of water use under colonial rule. His historical and social analysis of water as a medium of political and social relations challenges narrow economic interpretations of common property resources. Mosse (2003) also indicates the importance of water in the idioms and organizations of power, whether of kings,

colonial bureaucrats, or development institutions.

Most of these lakes were part of urban commons which are in a state of decline. The decline is happening at three levels. First, the cascading effect of these lakes have been broken down due to the feeding channels being blocked by unauthorized constructions and a lack of understanding of how the overflow of one lake was linked with the filling of all the lakes along a plateau and urban watershed. Second, these lakes become open ground for disposing of garbage and diverting household wastewater from the nearby area polluting the available freshwater. Third, there is a large scale encroachment due to land transfer from common to private control that is choking the lakes further. The lakes were one of the best means of harvesting water and sustaining water security for the larger population who are outside of the formal water supply systems in Hyderabad. In most of the cases, people outside the formal water system are the people living in fringe areas in the periphery or the urban poor living in squatter settlements. So the water for the residents of Hyderabad is now increasingly being fed by tanker supply from the peripheral areas.

The case of Mallampet in peri-urban Hyderabad elaborates this further. This is one of the many villages from where the tankers operated by private entrepreneurs extract water. The village has about 500 households, with about 50 acres of agricultural land left but only a small portion of it is actually being cultivated. Some villagers have sold their lands and have bought lands near Narsapur. The primary reason indicated for change in the livelihood pattern is the cost of labour in agriculture. According to the village headman, "If industry pays Rs 150/day and agriculture pays only Rs 80/day, the labourer prefers to work in the industry". The primary source of water in the village comes from 15 bores that have been dug all over the village that are up to 400 ft deep. If lakes are full, the water table tends to be high and with 8 hours of electricity, water can be easily pumped and distributed to all the households for their personal uses and there isn't much scarcity. In 2010, the lakes were full because of good rains. The first bore was dug in 1987, which later dried up and due to pollution of the water from the surrounding industries; new bores had to be dug later. In 2005, some more have been dug due to increasing demand for water in several other parts of the village along with new storage facilities and new pipe connections. To maintain this as well as a treatment plant which has been set up, Rs 2 is collected monthly from each household. The village seems to be self-sufficient, but the illegal extraction of water has been a source of worry for the panchayat. For agricultural purposes, there are separate bores installed by villagers. But because of right to water tied to right to land, many of the villagers who have a bore dug in their lands for agriculture are actually selling water to private tanker companies who in turn are selling it to the industries nearby. Each villager makes about 150-200 from each tanker and the tankers visit the village almost 15 times in a day to abstract water. The villagers are finding this more profitable than agriculture itself. Some villagers are also buying manjira water in big tanks from surrounding villages which get the supply and are selling it to the village community at Rs 10-15 (approx) for 20 litres. Many of the bores located near the lakes, tend to get further polluted especially during the monsoons, when the entire drainage water from the villages flow into these lakes (Prakash, Narain and Singh, 2011).

In sum, the three main reasons for the disappearance of these lakes are –rapid urbanisation and expansion of city without much of environmental planning; increased land prices due to urban expansion and so common water bodies are easy targets; and the collusion of land mafia, the role of politicians and bureaucrats in changing land use and transferring them to builders.

#### 4. Conclusion

This paper, via a case study of Hyderabad, has demonstrated how increasing urbanisation has had an impact on the peri-urban areas in terms of diminishing environmental resources. Hyderabad city had a unique social ecology that was based on harvesting rainwater through numerous lakes and ponds. These lakes that were built around 500 years before and during the Nizam rule were an essential part of the growth of the region as they not only provided drinking water to urban and rural locations but were also used for irrigation and a host of other livelihood activities. These lakes recharged groundwater and provided much needed protection against floods and droughts due to their cascading system and were managed through a decentralised management system under the Nizam rule with strict rules and laws against those violating the norms. In the Post-independence period there was a sharp decline in the maintenance of these tanks. A study conducted by SaciWATERS and IIIT for 1989-2009 using Geographical Information Systems and satellite images have shown a sharp decline in the area of water bodies in Hyderabad bringing about water insecurity for a large population. Official estimates show that only 60 per cent of Hyderabad is covered by formal water supply mechanism and the rest of the city is accessing water by informal means.

In conclusion, this paper tries to understand the Problématique of water insecurity in peri-urban locations from a triadic framework of the disruption of natural water flow, increasing groundwater overdraft and rural-urban water flow. This framework is important to understand the issue from a south Asian perspective and in the particular case of Hyderabad city in southern India. Rampant urbanisation and haphazard planning has disrupted natural water flow. Hyderabad city provides a classic case where this natural water flow has been disrupted – first, due to a lack of understanding and protection of the cascade of lakes and, second, because of the financial rewards involved in the appropriation of water bodies and the lack of State regulation to punish encroachment and appropriation.

The second aspect of this Problématique is the groundwater overdraft. Hyderabad's location in a semi-arid region has historically determined that life is sustained not by a river but by wells, tanks and lakes. The loss of these water bodies due to urban sprawl is a critical factor in the lowering of water table and the resultant water crisis being faced by many localities in the city. The drying up of the lakes has adversely impacted on the recharging of groundwater with the water table sinking sharply in recent years (Ramachandraiah and Prasad, 2004). The third aspect, which is linked with the above two points, is the issue of rural-urban water flow. Areas which are not covered by formal drinking water supply and have no other source of water rely heavily on a tanker water economy. The tanker water comes from the water rich peri-urban areas and this market has been growing over the last two decades. During summer, when water demand increases, there are reports of conflict between water sellers as this mechanism operates in a fashion that the water selling intermediaries are rewarded to a greater extent than the actual water seller who is usually a farmer in the peri-urban location.

### References:

Bakker, K. Kooy, M.; Shofiani, N.E. & Martijn, E.J. 2007. Governance Failure: Rethinking the Institutional Dimensions of Urban Water Supply to Poor Households. *World Development*, 36(10), October 2008, pp. 1891–1915.

Bakker, K. 2007. The “Commons” Versus the “Commodity”: Alter-globalization, Anti-privatization and the Human Right to Water in the Global South”, *Antipode*, 39(3), June 2007 pp. 430–455.

Celio, M.; Scott, C.A. & Giordano, M. 2010. Urban–agricultural water appropriation: the Hyderabad, India case. *The Geographical Journal*, 176(1), March 2010, pp. 39–57.

Census of India. 2011. Size, Growth Rate and Distribution of Population. Available at: [http://www.censusindia.gov.in/2011-prov results/data\\_files/india/Final%20PPT%202011\\_chapter3.pdf](http://www.censusindia.gov.in/2011-prov%20results/data_files/india/Final%20PPT%202011_chapter3.pdf) [Accessed on 7 April 2012].

Chandramouli, C. 2011. Census of India 2011: Rural Urban Distribution of Population. Registrar General & Census Commissioner. New Delhi: India Ministry of Home Affairs.: Available at: [http://censusindia.gov.in/2011-provresults/paper2/data\\_files/india/Rural\\_Urban\\_2011.pdf](http://censusindia.gov.in/2011-provresults/paper2/data_files/india/Rural_Urban_2011.pdf). [Accessed on June 8, 2012]

Fazal, S. 2000. Urban expansion and loss of agricultural land - a GIS based study of Saharanpur City, India., *Environment and Urbanisation*, 12(2), October 2000, pp. 133 – 149.

GHMC, Hyderabad City Development Plan. . Available at: [www.indiausp.org/files/spatial\\_planning/Vishwanath.pdf](http://www.indiausp.org/files/spatial_planning/Vishwanath.pdf) [Accessed on: November 29, 2010].

Government of India. 2011. Report of the Working Group on Urban Strategic Planning. 12th Five-year Plan Steering Committee on Urban Development & Management. New Delhi: Ministry of Housing and Urban Poverty Alleviation, Government of India.

Hogrewe, W.; Joyce, S.D. & Perez, E.A. 1993. The Unique Challenges of Improving Peri-Urban Sanitation. WASH Technical Report No. 86 prepared for the Office of Health, Bureau for Research and Development, U.S. Agency for International Development under WASH Task No. 339. Washington D.C.: U.S. Agency for International Development.

Jairath, J. 2011. Blue Murder and Plunder. Article appeared in the Annual Number of Forum for a Better Hyderabad. Hyderabad: . pp. 115-116.

Rice, J.. 2007. Ecological Unequal Exchange: Consumption, Equity, and Unsustainable Structural Relationships within the Global Economy, *International Journal of Comparative Sociology*, 48(1), February 2007 pp. 43-72.

Janakarajan, S.; Llorente, M. & Zérah, M.H. 2006. Urban water conflicts in Indian cities. Man-made scarcity as a critical factor. IN: Barraqué, B. & A. Guilbert, T. (Eds). *Urban Water Conflicts. An analysis of the origins and nature of water-related unrest and conflicts in the urban context*. Paris: UNESCO, pp. 91-111.

Joint Action for Water. 2011. Water Distribution in Hyderabad: A Case for Better Management. Briefing Paper Series No 3. Joint Action for Water. Hyderabad. Available online at: <http://jointactionforwater.org/sites/default/files/Briefing-Paper-on-Water-Distribution-Final.pdf>. [Accessed on April 28, 2011]

Lerner, A. M. & Eakin, H. 2011. An obsolete dichotomy? Rethinking the rural–urban interface in terms of food security and production in the global south. *The Geographical Journal*, 177(4), December 2011, pp.

311–320.

Marshall, F.; Waldman, L.; MacGregor, H.; Mehta, L. & Randhawa, P. 2009. *On the Edge of Sustainability: Perspectives on Peri-urban Dynamics*. STEPS Working Paper 35, Brighton: STEPS Centre.

McKinsey Global Institute, 2010. *India's Urban Awakening: Building Inclusive Cities, Sustaining Economic Growth*. McKinsey and Company. Available at: [http://urbanindia.nic.in/programme/uwss/MGI\\_india\\_urbanisation\\_full\\_report.pdf](http://urbanindia.nic.in/programme/uwss/MGI_india_urbanisation_full_report.pdf). [Accessed on June 12, 2012].

Mosse, D. 2003. *The Rule of Water: Statecraft, Ecology and Collective Action in South India*. New Delhi: Oxford University Press.

Narain, V. 2009. Growing city, shrinking hinterland: land acquisition, transition and conflict in Peri-urban Gurgaon, India", *Environment and Urbanisation*, 21(2), October 2009, 277-301.

Narain, V. 2010. Peri-urban water security in a context of urbanisation and climate change: A review of concepts and relationships. Peri Urban Water Security Discussion Paper Series, Paper No. 1, SaciWATERS: Hyderabad.

Narain, V. 2010. Water Security in Peri-urban South Asia: Adapting to climate change and urbanisation. Scoping study report of Gurgaon. SaciWATERS: Hyderabad. Available at: . [Accessed on April 28, 2012].

Prakash, A.; Singh, S. & Narain, V. 2011. *Changing Waterscapes in the Periphery: Understanding Peri-urban Water Security in Urbanizing India*. India Infrastructure Report 2011: Water Policy and Performance for Sustainable Development. New Delhi: Oxford Publication, PP. 162- 173.

Prasad, P.R.C.; Rajan, K.S.; Bhole, V. & Dutt, C.B.S. 2009. Is Rapid Urbanisation Leading to Loss of Water Bodies? *Journal of Spatial Science*, 2(2), March 2009, pp. 43-52.

Ramachandraiah, C. & Prasad, S. 2004. *Impact of Urban Growth on Water Bodies: The Case of Hyderabad*. Working Paper No. 60. Hyderabad: Centre for Economic and Social Studies.

Rishi, P. & Anant, P. 2006. Dying Johads in India: Recapturing the Potential through Participatory Behavioural Analysis. *E-Water – Official Publication of European Water Association (EWA)*. Available at: [www.ewaonline.de/journal/2006\\_02.pdf](http://www.ewaonline.de/journal/2006_02.pdf). [Accessed on: June 9, 2012].

Shaw, A. 2005. Peri-Urban Interface of Indian Cities: Growth, Governance and Local Initiatives. *Economic and Political Weekly*, 40(2),, Jan. 8-14, 2005, pp. 129-136.

Simon, D. 2008. Urban Environments: Issues on the Peri-Urban Fringe. *Annual Review of Environment and Resources*, 33, July, pp. 167 – 185.

Tacoli, C. 1998. Rural-urban Interactions: A Guide to the Literature. *Environment and Urbanisation*, 10(1), pp.-147-166

## Water Security in Peri Urban South Asia: Adapting to Climate Change and Urbanization

Working primarily on water security issues in Peri-Urban South Asia, across India, Bangladesh and Nepal, the project's main concerns are the rapidly changing peri-urban landscapes due to urbanisation and implications for water security in specific locations in the larger context of climate change. As an action research project, working across four locations in South Asia, it will serve as a basis for capacity-building at the grass roots level to address concerns of the poor, marginalised and other vulnerable communities to water security and seek to understand the dynamics of adaptation in the specific locations, for action and policy agenda at the regional level. It will build their capacities to cope with climate change induced water in-security.

[www.saciwaters.org/periurban](http://www.saciwaters.org/periurban)

### Coordinating Institution:

The project is being coordinated by **SaciWATERS**, Hyderabad, India. SaciWATERS focuses on transforming water resources knowledge systems, key ideas being an interdisciplinary approach to understanding water resources issues, from a pro-poor, human development perspective, with an emphasis on exchange, interaction and collaboration at South Asia level.

### Partner Institutions:

**Bangladesh University of Engineering and Technology (BUET)** is the oldest and leading university in Bangladesh in the area of technology. IWFM is a premier institute for the advancement of knowledge and development of human resources in water and flood management.

**Nepal Engineering College (NEC)** was established in 1994, as a non-profit organization under private sector initiative, to function as center for advanced learning in engineering and allied sciences. It has been offering the Interdisciplinary Water Resources Management (IWRM) Program since the beginning July, 2007 under the support of Crossing Boundaries (CB) Project funded by Government of the Netherlands.

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This project is supported by Canada's **International Development Research Centre (IDRC)**. IDRC is one of the world's leading institutions in the generation and application of new knowledge to meet the challenges of international development. For nearly 40 years, IDRC has worked in close collaboration with researchers from the developing world in their search for the means to build healthier, more equitable, and more prosperous societies.

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