

# The Periurban Water Security Problématique: A case study of Hyderabad in Southern India

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## Abstract

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.

**Key Words:** Peri-urban, Water Security, Urbanisation, Water Supply, Water Flow

## Introduction

The 2011 provisional Census of India reports an annual growth rate of urban population of 2.76% which is almost the same (2.73%) 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 percent 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 urbanization increased from 27.81% in 2001 Census to 31.16% 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 5161 in 2001 to 7935 in 2011 adding 2774 'new' towns.<sup>2</sup> These trends

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<sup>2</sup> In the Census of India 2001, the definition of urban area adopted is as follows: (a) All statutory places with a municipality, corporation, cantonment board or notified town area committee, etc. (b) A place satisfying the following three criteria simultaneously - a minimum population of 5,000; at least 75 per cent of male working population engaged in non-agricultural pursuits; and a density of population of at least 400 per sq. km. (1,000 per sq. mile). An Urban Agglomeration is a continuous urban spread constituting a town and its adjoining urban outgrowths (OGs) or two or more physically contiguous towns together and any adjoining

show that India is increasingly urbanizing.<sup>3</sup>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 urbanization is an unprecedented pressure on the urban infrastructure and resources. Increasing urbanization 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 periurban 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 periurban regions which are usually richer in surface and groundwater.

The periurban 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, periurban 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 periurban 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 periurban 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 socioeconomic metabolism or material throughput 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

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urban outgrowths of such towns. ( Available online at <http://censusindia.gov.in/Metadata/Metada.htm> - accessed on June 8, 2012)

<sup>3</sup> In 1981 Census of India, 4629 towns were delineated. In 1991, this number was increased by 80 making the total of 4689 towns. In 2001, this number shot up to 5161 adding 472 towns. In 2011, 2774 towns were added to make the total number of 7935 towns in India (eCENSUSIndia : Issue Number 3 : 2001- accessed at [http://censusindia.gov.in/Census\\_Data\\_2001/Census\\_Newsletters/Newsletter\\_Links/eci\\_3.htm#news](http://censusindia.gov.in/Census_Data_2001/Census_Newsletters/Newsletter_Links/eci_3.htm#news)

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 periurbanisation 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 periurban Hyderabad as a result of rampant urbanisation problems. Section three concludes this paper and provides a framework for the periurban water security problématique.

## Section 1

### 1.1 What are periurban areas?

Ideally, a periurban<sup>4</sup> 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 on the definition of periurban areas provide a geographical construct or define 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 periurban 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 periurban 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 periurban 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

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<sup>4</sup>The word periurban is used here without hyphen between peri and urban. Some scholars of the periurban believe that the hyphen between the two words differentiates between peri and urban and it’s the unification of the two concepts which is needed for better action (Personal Communication- Vishal Narain, January 2012).

urban or rural governments alone and require innovative ways of being addressed'. The literature on periurbanisation 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 periurban 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 periurban zones and between periurban and urban core areas.

## **1.2 Understanding periurbanisation from an environmental perspective**

The expansion of urban and periurban areas poses many challenges, especially in South Asia. As the city expands, it poses many threats to the periurban spaces and may also bring in benefits. To understand this further, the periurban 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; periurban agriculture that caters to urban populations such as growing vegetables; and rising land prices could provide benefits for the periurban residents. However, this paper focuses on understanding periurban 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 periurban interface and its environmental vulnerability in the context of solid waste management discussing the reasons for the environmental neglect of periurban 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 periurban 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 periurban 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 periurban areas are areas of concern. Refuse dumps and sewage treatment plants in the periurban 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 periurban 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 periurbanisation 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 traditional water harvesting structures, known as *Johad*, from the periurban landscapes of Gurgaon in Haryana, India.<sup>5</sup> 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 periurbanisation process therefore requires an examination of what happens to the environmental resources when urban expansion takes place.

The cases above show that the periurban issue can be looked at from the conceptual framework of the flow of environmental services from urban to periurban 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 periurban areas through public or private tanker supply while urban waste is directed towards the periurban 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 periurban areas**

One of the major challenges for better environmental governance in urban and periurban 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 periurban areas are managed by panchayats in the Indian case.<sup>6</sup> In many mega cities, the urban development authorities have a jurisdiction over periurban areas but in the planning and management of environmental resources, there is hardly

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<sup>5</sup> Johads were made by excavation of earth and dumping it on the banks around. Johads vary in shape, size (generally less than one hectare) and depth (about six meters). The numerous Johads were connected by a series of channels, which ran either below or above ground. Channels below ground level, locally called Nullaha, were interconnecting most of the Johads to facilitate the collection of rainwater by gravity and direct overflow of Johads in elevated areas to Johads in lower areas subsequently and finally drains into streams in the area. Hence, before draining excess rainwater to water stream and maximum groundwater recharging was achieved. The annual practices of de-silting maintained the capacity and value of these Johads structures in the society and at the same time kept the monsoon floodwater under control (Rishi and Anant, 2006)

<sup>6</sup> Panchayats is a system of governance in which gram panchayats are the basic units of administration. It has 3 levels: village, block and district.

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 periurban 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 12<sup>th</sup> 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 socioeconomic 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 12<sup>th</sup> Schedule of the Constitution 74th 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).

## Section 2

### 2.1 Urbanization Trends in India and Hyderabad

India’s urbanisation process is considered slow as compared to other parts of the developing world as about only one third of India is urbanised 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% 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: Population Growth during 1991-2011**

Population 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
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**Source:** Provisional population totals, Census of India (2011).

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 periurban 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<sup>7</sup>

Hyderabad was established in the 15<sup>th</sup> 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 2012 census, Hyderabad is currently ranked as the fourth largest Indian city by population.<sup>8</sup> 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 below:

**Table 2.2: Percentage Growth Rate of Population within HUA**

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

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

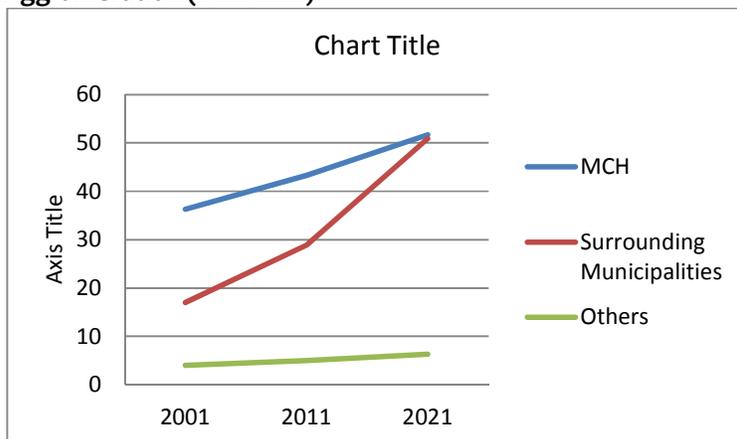
A future projection of population for the HUA is shown in the graph 2.1. This graph reveals an interesting trend, whereby the population of the surrounding municipalities will grow very rapidly and is expected to touch the population of the main corporation. This indicates that growth and development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

<sup>7</sup>This section is from author’s earlier paper -Prakash et al 2011. Some data has been updated for information available from Census of India, 2011.

<sup>8</sup>The other three Indian cities that precede Hyderabad is Mumbai, Delhi and Bangalore. It is to be noted that two out of four megacities Chennai and Kolkata rank 6<sup>th</sup> and 7<sup>th</sup> respectively. For more information see <http://www.census2011.co.in/census/city/392-hyderabad.html> [Accessed on April 21, 2012]

### 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 construction of two reservoirs approximately 8 km upstream of the city: the Osmansagar on the Musi River and the Himayatsagar 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 HussainSagar the source was moved to HimayathSagar and Osmansagar 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 NagarjunaSagardam (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

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

Source	Year Commissioned	Withdrawals(in MGD)
Osmansagar	1920	25
Himayathsagar	1927	15
Manjira Barrage (Phase I & II)	1965 & 1981	45
Singur Dam (Phase III & IV)	1991 & 1993	75

<b>KrishnaProject</b>	2004 & 2007	180
<b>Total from all sources</b>		<b>340</b>

Source: JAW, 2011<sup>9</sup>

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 idly 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 percent of the population, many of whom live in poorer locations.

### Section 3

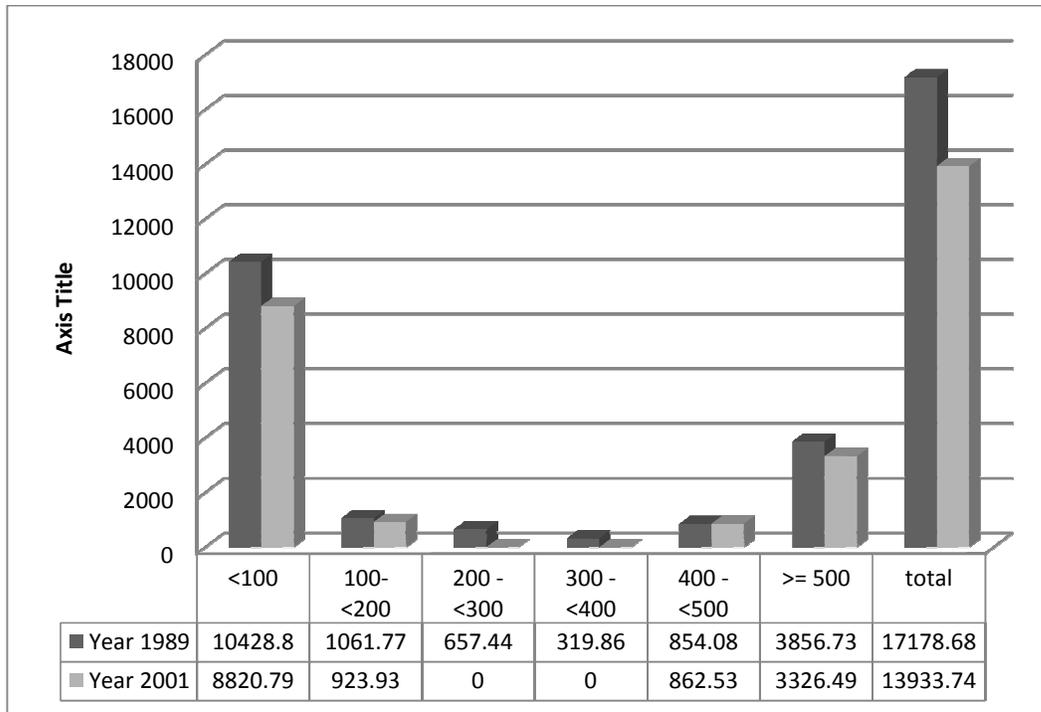
#### 3.1 Disappearing water bodies in Hyderabad: A result of haphazard growth

Hyderabad is known popularly as the city of lakes. Within the Hyderabad Metropolitan Development Authority's (HMDA) boundary itself, there are about 3086 small, medium and large lakes. Out of these, 368 are major irrigation tanks whereas 2684 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 7800 km<sup>2</sup> to identify the impact of expanding urbanization 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 percent of the water body disappeared in eleven years, losing about 3235 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

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<sup>9</sup>Available online at the website of Joint Action for Water - <http://jointactionforwater.org/about/facts-about-hyderabad-water-supply>. [Accessed on April 28,2011]



Source: Prasad et al. 2009.

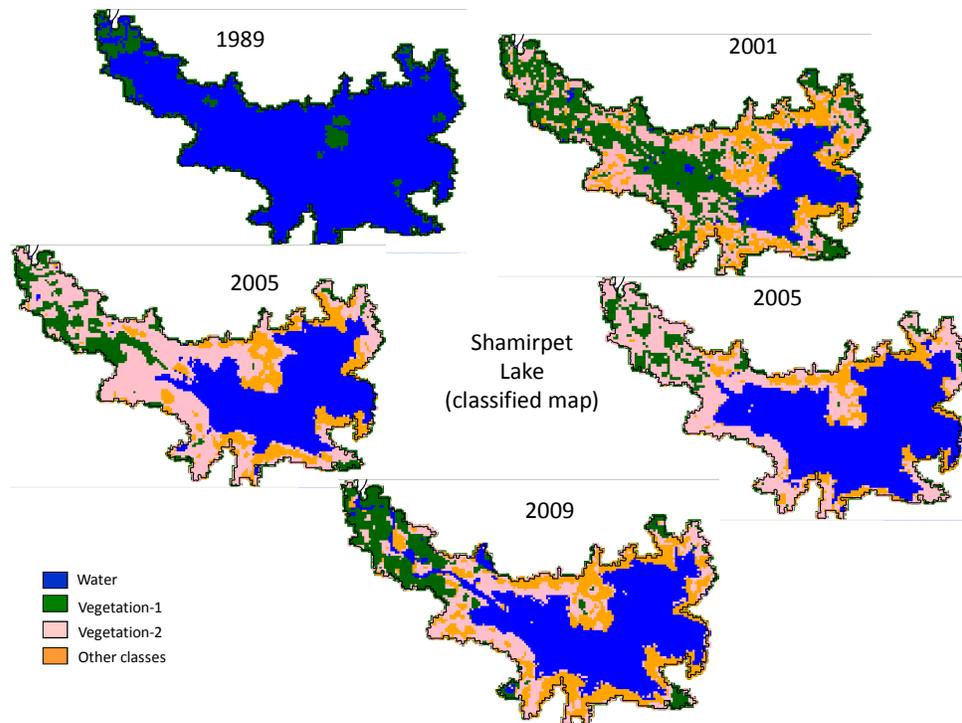
Note: Figures in hectares. The first column shows the size class of the lake. For example <100 means lake which is less than 100 hectare.

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, Hussainsagar 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 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.<sup>10</sup>

**Figure 3.1: Status of Shamirpet Lake in Periurban Hyderabad 1989 – 2009**

<sup>10</sup>Interview with village panchayat head of Aliabad village in December 2011. Aliabad is located in the command area of the Shamirpet Lake.



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”.<sup>11</sup>

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 QutubShahi rulers (1534-1724 A.D.) and later by the AsafJahi rulers (1724-1948) in and around Hyderabad city. Some of the big tanks built during those periods are Hussain Sagar, Mir Alam, AfzalSagar, Jalpalli, Ma-Sehaba Tank, TalabKatta, Osmansagar 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 sq.miles and it was the source of water for the Residency and suburbs north of MusiRiver (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

<sup>11</sup>Accessed from [http://www.unep.or.jp/ietc/publications/short\\_series/lakereservoirs-1/1.asp](http://www.unep.or.jp/ietc/publications/short_series/lakereservoirs-1/1.asp) on April 28, 2012.

irrigation systems especially in Andhra Pradesh, Tamilnadu 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 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 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 periurban 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 urbanization 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.

#### **4.0 Conclusion**

This paper, via a case study of Hyderabad, has demonstrated how increasing urbanisation has had an impact on the periurban 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 percent of Hyderabad is covered by formal water supply mechanism and the rest of the city is accessing water by informal means.<sup>12</sup>

In conclusion, this paper tries to understand the Problématique of water insecurity in periurban 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 urbanization 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 periurban 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 periurban location.

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<sup>12</sup>Communication with Mr Adhar Sinha, Managing Director of the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWS & SB) in a public meeting at Center for Economic and Social Studies, Hyderabad on March 29, 2012. Activists claim that only about 40 percent of Hyderabad is served by formal water supply and rest of the city is dependent on groundwater and private water supply through tankers.

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