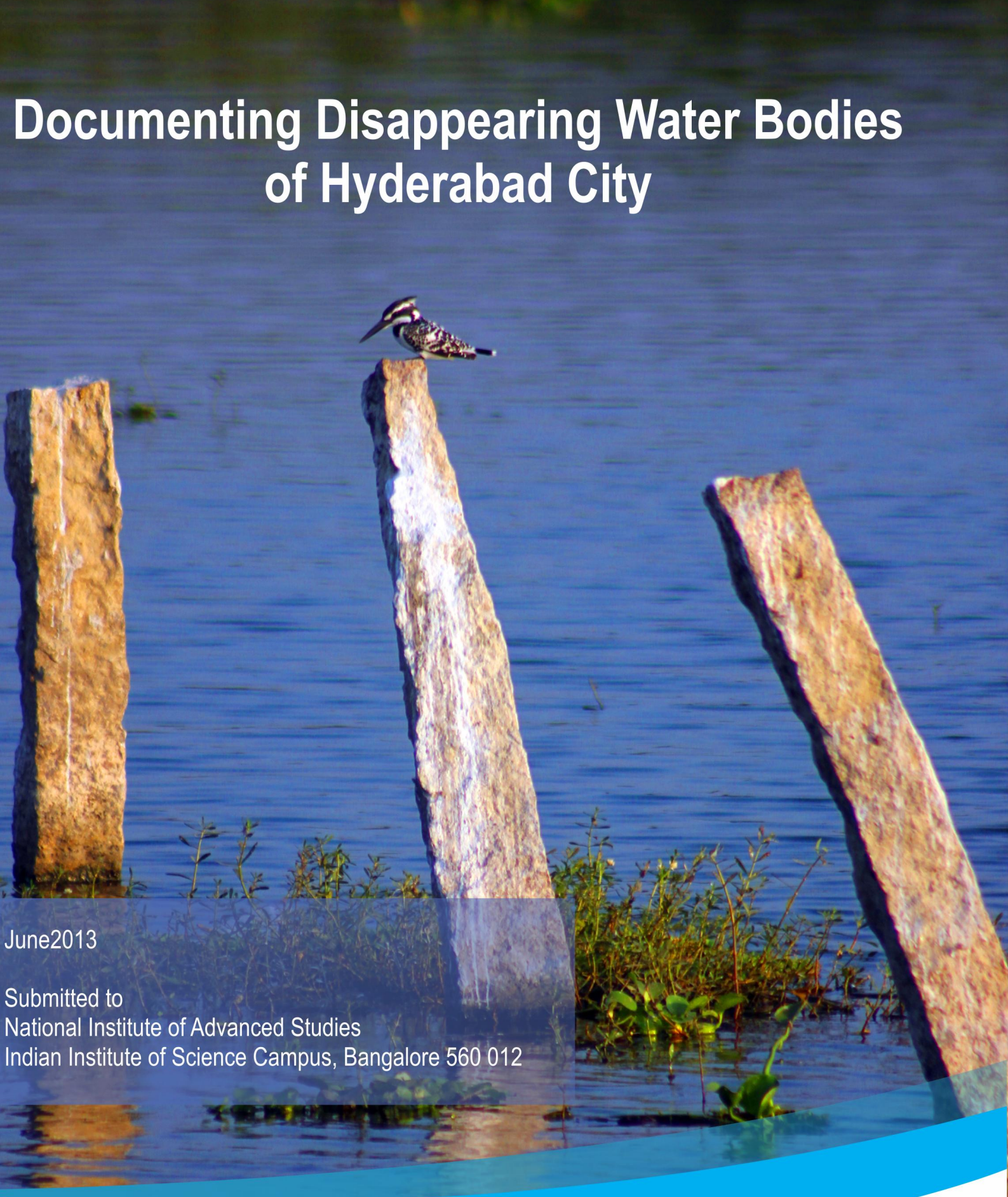
Documenting Disappearing Water Bodies of Hyderabad City



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Submitted by

SaciWATERs

Documenting Disappearing Water bodies of Hyderabad City: Social Technological Options for Drinking Water Supply

Technical report

Prepared by SaciWATERs

Submitted to NIAS

CHAPTER ONE
Introduction

1.1 Cascade Systems of Hyderabad: A Traditional Technology in Urban Water Management

" A Lake is the landscape's most beautiful and expressive feature. It is earth's eye: looking in to which the beholder measures the depth of his own nature. The fluviatile trees next to the shores are slender eyelashes which fringe it, and the wooded hills and cliffs are its overhanging brows"

- Henry David Thoreau

Water heritage of Hyderabad has been strongly shaped by its physiography, forces of history and human creativity, as well as their environment. Undulating Deccan topography, highly impervious basement rocks, shallow and weathered soil type, seasonal fluctuations of rainfall regime, amazing architectural antecedents of medieval Nizam rulers and well developed decentralized management system resulted into emergence of an endemic forms of hydraulic civilization manifested with myriad of tanks/water bodies. "It has been demonstrated that, these tanks are not isolated entities, but often found in clusters forming part of a hydrologically integrated system known as a 'cascade'"(Panabokke, 2002, Bandara 2010).These cascade of tanks locally known as Kuntas, chreruvus, etc are systematically organized within a micro-(or meso-) catchment of the dry zone landscape, storing, conveying and utilizing water from an ephemeral rivulet'(Bandara 1985, Kulkarni and Mahajan 2007). The backbone of this ecosystem was its ability to store the rainfall water within the system for the benefit of the whole system. Unlike in modern irrigation systems, which are focused on supplying the crop water requirement for the root-zone, this ancient "hydraulic system" of Hyderabad was focused on the water requirement of the entire ecosystem.

Indirect and circumstantial evidence points out to the fact that most of these traditional devices of water harvesting evolved around 4th and 5th century AD and later were upgraded to a more impressive network of irrigation systems by the Qutub Shahi and Asaf Jahi rulers, local chiefs, dominant farmers caste, merchants, and priests for revenue enhancement, tax concession and religious merit (Subbhalakshmi 1988). The undulating topography of Deccan plateau provided a good base for these amazingly innovative, indigenous manmade structures, which ensured drinking water supply, groundwater recharge, and protective and efficient irrigation facilities (Kulkarni and Mahajan 2007).

Figure 1.1 (a) and (b) shows a schematic diagram of typical tank system of southern India. These cascade tanks were constructed in series by bunding the running stretch of the sub

watershed at several points. They form a part of the natural hydrological network where the surplus water during monsoon spills over from the upstream lakes down to the next in the chain and from there to the further down. The connectivity between the lakes did not allow an overflow of the water out of the lake to the surrounding area as additional quantity of the seasonal water was transferred to other lakes. The lakes thus form a chain of reservoirs cascading downwards. The entire network facilitates the downward flow of excess water from lakes in the upper ridges. In the summer the water is distributed evenly and the water bodies are being kept alive perennially. In this manner these structures were used to store water in the ecosystem (i.e. in the soil) in drought periods and were used in flood mitigation in rainy periods. It should be mentioned here that irrigation was only a part of this hydraulic system.

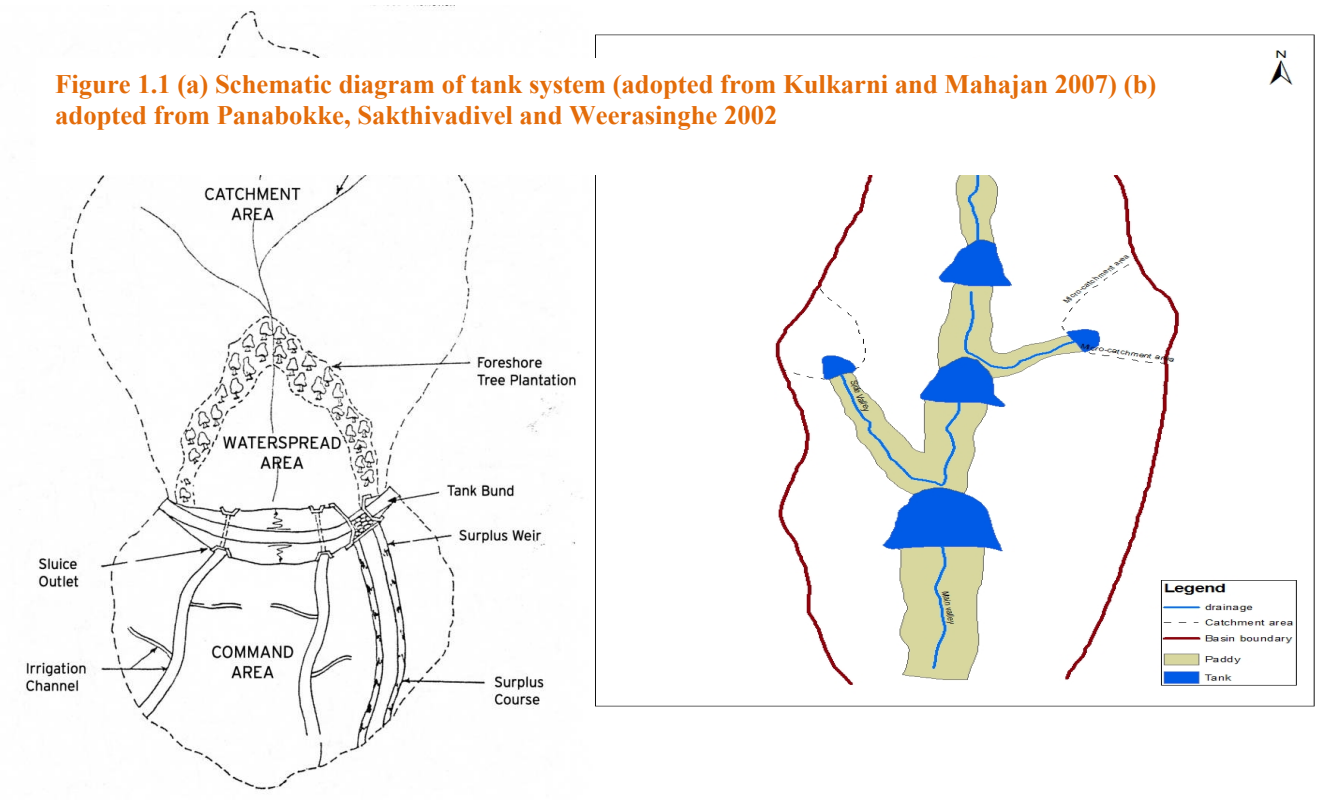


Figure 1.1 (a) Schematic diagram of tank system (adopted from Kulkarni and Mahajan 2007) (b) adopted from Panabokke, Sakthivadivel and Weerasinghe 2002

Several historical commentaries inferred that although many of these tanks were controlled and directed by the kings and other higher echelons of the irrigation bureaucracy, they were essentially being managed by the village communities which in turn ensured the sustainability of this system.

Sir Arthur Cotton, a well-known British Engineer who worked in India at the time of Colonial imperialism narrated “The natives have constructed tens of thousands of tanks in almost every kind of soil with earthen bund without the puddle bank, which English Engineers fancied necessary”. In the words of John Ambler (1994) such cascading tanks were not simply a collection points located within a well-defined system but has multiple uses. Over centuries, a sophisticated system of irrigation had evolved around them that had incorporated regulated access and allocations between and within tanks and also provided for

their upkeep and improvement. Though they were not free from the social inequalities that existed in the larger system, nevertheless they provided some minimum water assurance for those traditionally entitled to farming land. However, even in the immediate post-independence period tanks still retained their eminence as providers of water for irrigation, drinking and various livelihoods. Some of the big tanks built during those periods are Hussain Sagar, Mir Alam, Afzal Sagar, Jalpalli, Ma-Sehaba Tank, TalabKatta, Osmansagar and Himayatsagar, Saroornagar Lake, Sharmirpet Lake Durgam Cheruvu etc. (Rekha Rani, 1999).

1.1.1 Present status and issues concerning the cascading tanks of Hyderabad

The tale of deteriorating material heritages of Hyderabad's waterworks began post-independence with takeover of community and zamindari tanks (private tanks) by the state (Kulkarni and Mahajan 2007). The traditional norms, customs, laws laid down by the king or regional chieftains in relation to the repair, maintenance and management of these structures slowly give away to more centralized functioning system((Paranjape and Joy 2010). 'This led to an institutional breakdown and erosion of traditional arrangements in most tanks, consequent breakdown of collection of water charges, lack of maintenance and increasing encroachments on tank beds and feeder channels. The decline also led to decrease in recharge of groundwater and increase in flash floods and overspills and reduced capacities. At the same time, there was an increasing population that demanded services from the tanks and their expectations were also changing rapidly and away from traditional thinking that framed traditional agriculture and tank use (Paranjape and Joy 2010).

The situation got further aggravated with rapid urbanization that the city has been experiencing for last 20 years with increasing apathy of the planners and policy makers towards preserving these systems. Several studies inferred that the city has lost about 3245 ha of water bodies over last 12 years. 'A yet another study on land use/land cover for Hyderabad and a large area around, reveals that the area under water bodies has come down from 2.51 per cent of the geographical area in 1964 to 2.40 per cent in 1974 and to 1.57 per cent in 1990 (Mujtaba, 1994). The decline during 1974-90 period has been particularly sharp. This was also the period of rapid growth of the city and its environs. Micro level studies would indicate much more reduction in the area under water bodies (Ramachandraiah, 2002). The studies mentioned above differ in the size of the area covered around Hyderabad but all of them indicate, in varying degrees, that the area under water bodies has been declining over time due to urban sprawl' (Ramachandraiah and Prasad 2004)

As the city has grown, the urban sprawl has encroached into vacant lands and water bodies due to the increasing pressure on land for housing and other activities. Many water channels that used to carry floodwaters from one lake to the next in a catchment area, have also been encroached by private and government agencies. Tanks have been silted up, their embankments were breached and their beds were used for personal gains, wells fell into disuse and collected rubble and garbage, knowledge of traditional water harvesting systems was not put into practice or not passed on to future generations, and above all the latest trend of land grabbing, indiscriminate constructions for profit, probably with the connivance of the

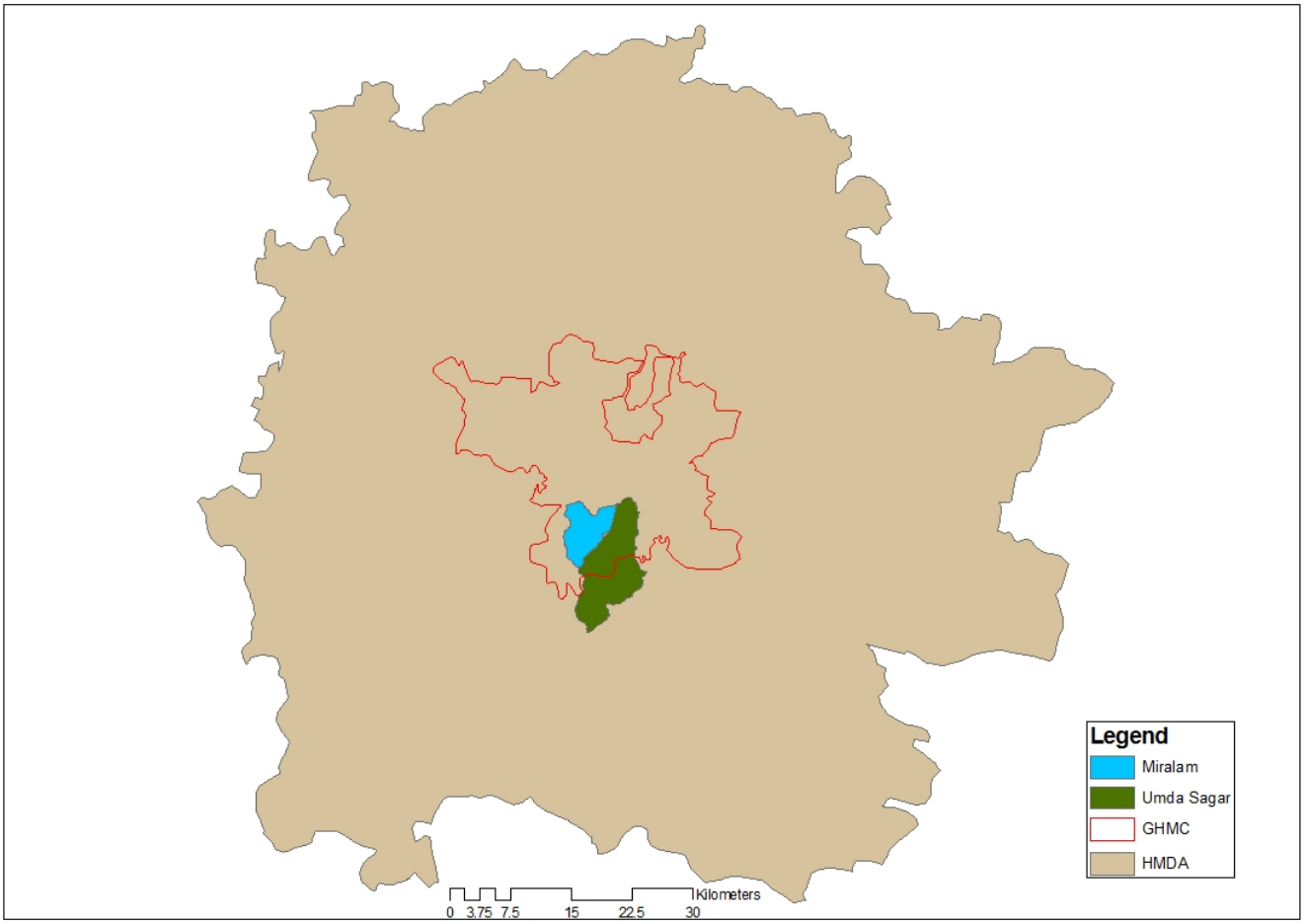
concerned authorities, have wiped out many of the 100000 tanks and ponds both in the urban and peri urban areas of Hyderabad. Added to that, delayed realisation of the ill effects of encroachment, negligence of government functionaries and lack of timely action gradually adds momentum to this process. Presently, official records states the existence of about 3084 lakes within the territorial limits of Hyderabad metropolitan region, however little is being done towards documenting the actual status of these lakes. Considering the criticality of the problem, some efforts have been made from the policy makers, researchers and practitioners in rejuvenating them but with limited success. In fact no comprehensive and systematic study has been done in understanding the status of these valuable water bodies. Historical documents on lakes are in a dilapidated condition and often remain inaccessible. Substantial research gap lies in identifying, mapping and documenting these lakes across time and space. It has been increasingly realized that policies, acts or institutional restructuring at the governance level would not be adequate to safe guard these resources implicitly. It is a dire need of the community to take active action in restoring and rejuvenating these water bodies. The action is desperately needed in a city grappling with a rapacious land mafia, the indiscriminate disposal of sewage and the lack of legal action against such activity.

1.2 Objectives:

In light of the foregoing the study attempts to develop methodological framework for creating a data base for water bodies of Hyderabad metropolitan region that essentially captures information on sources of degradation of the water bodies as well as their inter connections. The study adopts watershed based approach for identifying and delineating varied lakes/tanks within the jurisdiction of Hyderabad Metropolitan Development Area. Considering the fact that lakes/tanks are part of the cascading system understanding the watersheds are more conducive for planning and restoration of lakes and re-establishing their successive inter-connections. The study aims to create thematic layers on physical and anthropogenic factors affecting the status of water bodies falling within two major watersheds, Mir Alam and Umda Sagar falling within Hyderabad metropolitan region.

The project believed that generating scientific database will unable to make any significant response across policy makers or common people unless it is backed by strong advocacy strategies. With this viewpoint the study focuses to generate advocacy materials so as to bring about tangible improvements in the management of the precious but decaying water bodies of Hyderabad.

Figure 1.2 Locations of Mir Alam and Umda Sagar meso-catchments within Hyderabad Metropolitan Area



Specific objectives are as follows:

1. Demarcation of Hyderabad metropolitan development area into major WSs and identify revenue divisions contained within them
2. Select one-two major watersheds and identify lakes /water bodies /connecting channels circumscribed within
3. For each of these lakes prepare a lake profile that includes satellite imagery data as well as current ground level situation on water spread , FTL, encroachment, pollution, catchments features that impair fresh water or pollution inflows etc.
4. From contour maps – trace out the connections of successive lakes in a consolidated watershed map that will also serve as a template for preparing other watershed maps
5. Prepare simplified database depicting the status of the water bodies, extent of water spread and sources of degradation for advocacy purpose

1.3. Methodology:

Creating database for the lakes with a purpose to inform policy makers towards their effective restoration requires understanding of the entire cascading system. This in turn necessitates understanding at the watershed level. Most of the lake restoration programmes under the aegis of national or state government caters to the revival of the individual water bodies. Understanding and treating the entire cascading system has never been taken seriously.

Taking the above mentioned argument the study assumed watershed based approach to generate thematic datasets. The study assumes that such an approach is more conducive for planning for restoration of lakes and re-establishing their successive inter- connections. Above mentioned conceptual understandings are depicted through step wise methodological outline given below.

Table 1.1 Step wise Methodological Outline

Steps	Actions
Step 1	Delineating Mir Alam and Umda sagar watersheds
Step 2	Temporal change in the water spread of the individual lakes/water bodies falling within Mir Alam and Umda sagar basins
Step 3	Understanding the drainage conditions and land use and point of violations along 100 meter buffer of individual lake
Step 4	Communicate the research results to the concerned public departments

(i) Delineating Mir Alam and Umda Sagar watersheds along with the water bodies:

Mir Alam and Umda Sagar basins were delineated by using survey of India (SoI) toposheet (1:50,000) and Shuttle Radar Topography Mission (SRTM) imagery of m resolution. The SRTM data have been downloaded from US-Geological Survey (USGS) website. The final basin layer for Mir Alam and Umda sagar were prepared by superimposing SRTM data on SoI toposheets.

(ii) Temporal change in the water spread of the individual lakes/water bodies falling within Mir Alam and Umda Sagar Basins:

Water bodies/lakes falling within the Mir Alam and Umda sagar basins were identified and delineated from the SoI maps of 1978. Taking these layers as base maps a comparative understanding of the water spread was done for 2004 and 2012-13 successively. Individual lakes were surveyed for 2012-13 to obtain the field information and circumference or the water spread. With the help of Geographical Positioning System (GPS) specific points all along the water bodies were recorded for the period of October-January, 2012-13. The error of 5 meter in the GPS reading was rectified from the Google earth imagery. These readings on post monsoon water spread of 2012-13 were then compared with 2004 orbview3 data at 2 meter resolution and SoI base maps of 1978. Comparative and comprehensive understanding of these thematic maps helped to assess the status

and extent of the water bodies present and in turn created platform to inform the policy makers for the revival of the same.

(iii) Understanding the drainage conditions and land use and point of violations along 100 meter buffer of individual lakes

Understanding the behavior and the status of any tanks in Hyderabad requires assessment of the entire cascading systems. This in turn requires understanding of the connecting channels of the cascade. The base SoI maps of 1974 provided a detail account of the drainage lines or connecting channels of the Mir Alam and Umda Sagar cascading system. With a purpose of investigating the relation between disappearing drainage channels of particular order and sustenance of the entire cascading system an ordering of the same being done for the year -1974.The present conditions (2012-13) of these channels were verified from the field survey.

Land use and land cover maps are been prepared for Mir Alam at two points of time 2004 and 2012. Detail landuse along with the violation points are prepared along 100meter buffer of the individual lakes. The data for preparing these thematic layers are derived from Google earth, orbview3 from USGS and field investigation.

(iv)Communicating the research results to the concerned government departments

Advocacy is one of the important aspects of this project and as a part of such activity maps on violation points for individual lakes are being submitted to the Hyderabad Metropolitan Development Authority.

1.4 Structure of the report

The following summary report is divided into five chapters including the introductory one. The following two chapters talks about Mir Alam and Umda Sagar basins focusing on the detail account of its historical significance, physical characteristics, changing land use etc. Chapter 4 concludes with work that are still left and important inferences from the study done so far.

CHAPTER TWO

An Account of Mir Alam Meso-Catchment

2.1 Introduction

Tanks are basically small reservoirs built of earthen walls across the rivers, streams and drainage channels to impound and store water to irrigate fields through channels. Unlike the diversion channels, tanks retain the water for future use. Where not supplied by perennial rivers, which is mostly the case, their storage depends on precipitation in the catchment (Pant and Verma 2010). They are ecological security zones and true indicators of sustainable urban development (Sahana and Jagannatha 2006:1). They are ecological barometers of the health of a city and regulate the micro climate of any urban center (Jumbe, Nandini, Tandan and Sunitha 2008). Mir Alam meso-catchment with its several medium and small sized reservoirs cascading down the naturally undulating terrain of Hyderabad city is one of those networks that historically played a crucial role in providing water security to the urban andperi-urban dwellers. Such chains of tanks nestled within Mir Alam cascade present a traditional water harvesting technology that developed over long periods of history, to face the challenges of recurrent drought and flood hazards. The cascade originally consisted of 21 small and medium sized tanks of which 8 are presently surviving. Table 2.1 provides a detail of the tanks within Mir Alam cascade.

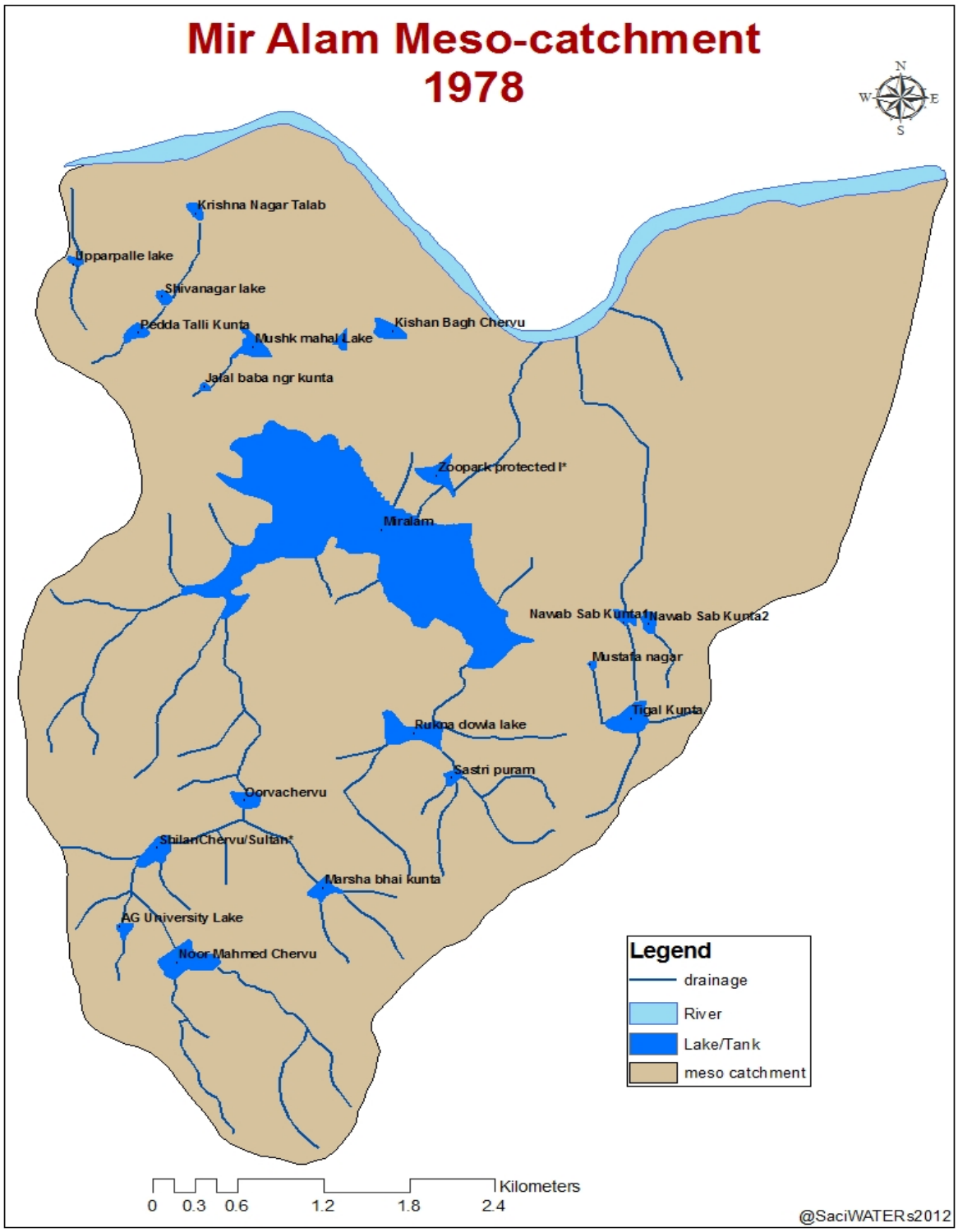
Table 2.1: List of tanks falling under Mir Alam cascade/meso-catchment

Lake Name	Mandal	Status	area in Hectares_1978	area_2004	area_2012/13
Krishna Nagar Talab	Hyderabad	Good Condition	1.1965	1.5062	0.5708
Pedda Talli Kunta	Hyderabad	Good Condition	1.7324	0.9646	0.9646
Mushk mahal Lake	Hyderabad	Disappeared	3.3254	0.3473	0
Gurunanak Ground Lake	Hyderabad	Disappeared	1.0755	0.994	0
Kishan Bagh Chervu	Hyderabad	Good Condition	2.6449	1.7716	1.6174
Miralam	Hyderabad	Good Condition	157.7724	138.854	139.6006
Oorvachervu	Rajendranagar	Disappearing	2.3444	1.5634	0.7969
ShilanChervu/Sultan Chervu	Rajendranagar	Good Condition	3.6862	6.5061	6.9066
Noor Mahmed Chervu	Rajendranagar	Good Condition	7.2017	6.9801	7.2123
AG University Lake	Rajendranagar	Protected	1.0281	0	0
Marsha bhai kunta	Rajendranagar	Good Condition	2.4417	1.9765	2.0716
Rukna dowla lake	Rajendranagar	Good Condition	7.0688	1.8304	0.4621
Tigal Kunta	Hyderabad	Disappeared	5.0447	0	0

Nawab Sab Kunta1	Hyderabad	Disappeared	1.4347	0	0
Nawab Sab Kunta2	Hyderabad	Disappeared	1.553	0	0
Zoopark protected lake	Hyderabad	Protected	3.6816	3.1628	4.0275
Upparpalle lake	Hyderabad	Disappeared	0.7206	0	0
Sastri puram	Rajendranagar	Disappeared	1.1645	0	0
Jalal baba ngr kunta	Hyderabad	Disappeared	0.4447	0	0
Shivanagar lake	Hyderabad	Good Condition	1.0233	0.4165	0.1721
Mustafa nagar	Hyderabad	Disappeared	0.3522	0.2524	0

Source: SaciWATERs, 2013

Figure 2.1 Mir Alam Meso-catchment



Mir Alam tank, the principal tank of the cascade was once Hyderabad's early water sources and played a significant role in meeting the urban water crisis. Built way back in 1806, during the reign of third Nizam, Mir Akbar Ali Khan Sikandar is still considered an engineering marvel, the first multiple-arch dam in the world. It is named after Mir Alam Bahadur, the prime minister of Mir Akbar Ali Khan Sikandar (Ramachandraiah and Prasad 2004, City

Water-Excreta Survey report, 2006). The tank covers an estimated area of 1.7 sq. km with13-14 m deep and it was reported in the Imperial Gazetteer in 1909 that after this tank was built, the incidence of cholera declined in the city. It remained the primary drinking water source to the people of Hyderabad for 125 years before both Osman Sagar and Himayat Sagar reservoirs were finally built. The Mir Alam basin with about twenty one water bodies falling within it helped in checking floods, recharging and maintaining the groundwater table and establishing agricultural activities. Traditionally Mir Alam has supported a large biomass and diverse stakeholders. Apart from fishing, agricultural and other domestic needs it has served the zoological park located adjacent. The entire basin over the years in fact has existed as a rare wonder of mutual co-existence between human and nature.

lake

Historically towards the end of the last century Mir Alam cascade started off on a long and painful journey towards the most horrifying form of environmental degradation. Few studies that have talked about this cascade mentioned about the chain of events including rapid and uncontrolled urbanization, attributing towards encroachments and disappearance of several medium and small reservoirs within its basin area. Dumping of the domestic sewage, industrial effluents and toxic products had seriously affected the water quality of the Mir Alam tank along with several others within the system. The situation got further deteriorated with transfer of the management power of the tanks from community to the state. This led to an institutional breakdown and erosion of traditional arrangement, consequent breakdown of collection of water charges, lack of maintenance and increasing encroachments on tank beds and feeder channels. Field information and data from orbview4 satellite imagery shows that in most of the tanks within the meso-catchment the water spread area was encroached upon, bunds are weak, sluices were either closed permanently or dismantled, the surplus weirs were either broken or silted up to crest level, all the tanks were heavily silted, eutrophication rate was extremely high, supply channels that formed the main conduits for water to flow into the tanks were largely encroached. The decline also led to decrease in recharge of groundwater and increase in flash floods and overspills and reduced capacities. At the same time, there was an increasing population that demanded services from the tanks and their expectations were also changing rapidly and away from traditional thinking that framed traditional

agriculture and tank use. Within the span of 20 years the meso- catchment has lost about 13 reservoirs This in turn has affected the water regime of the entire system particularly Mir Alam tank.Some conservatory measures have taken up by the government to reserve the Mir Alam Lake with limited results. One of the crucial factors responsible towards its poor performance is lack of understanding of the cascade system as a whole. No integrate approach towards preservation of the basin has been thought or planed for the last several years. The research on the status of the Mir Alam cascade is almost absent which created a gap in understanding its current position. Following section provides a detail account of the Mir Alam cascade/meso-catchment as a whole.

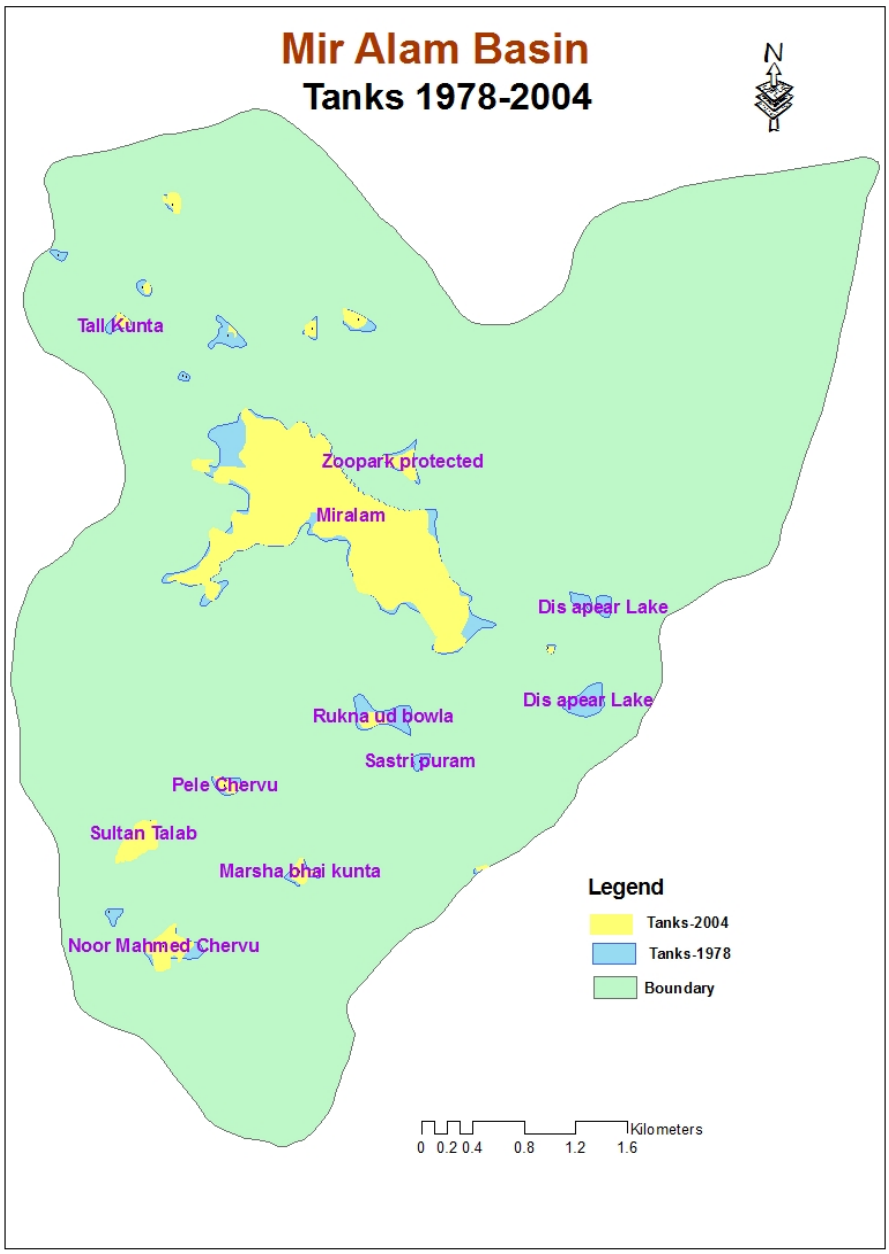
2.2 Mir Alam basin: A Physical Account

Mir Alam meso–catchment had 21 water bodies according to 1974 Survey of India Toposheet. The designed, distribution and location of these 21 small tanks or reservoirs, each having its own micro catchments, were not randomly located and distributed as commonly perceived; rather they were found to occur in the form of distinct cascading pattern that were positioned within well defined meso-catchment of Mir Alam. These small tanks formed a series of successive water bodies interconnected with drainage channels with a gradient from south and south eastern towards north and finally draining into Musi River. The advantage of such a system is that excess water from a reservoir along with the water used in its command area is captured by the next downstream reservoir, and is thus put to use again in the command area of the second reservoir. Water from the upper parts of the cascade was used and re-used several times before it reached the outlet. It may therefore, be argued that the Mir Alam tank cascade systems only gave expression to the famous royal dictum that 'Let not a single drop of water go waste into the sea without benefiting the world (Madduma Bandara 1985). The water was thus continuously recycled helping to surmount irregularly distributed rainfall, non-availability of large catchment areas and the difficulty of constructing large reservoirs.

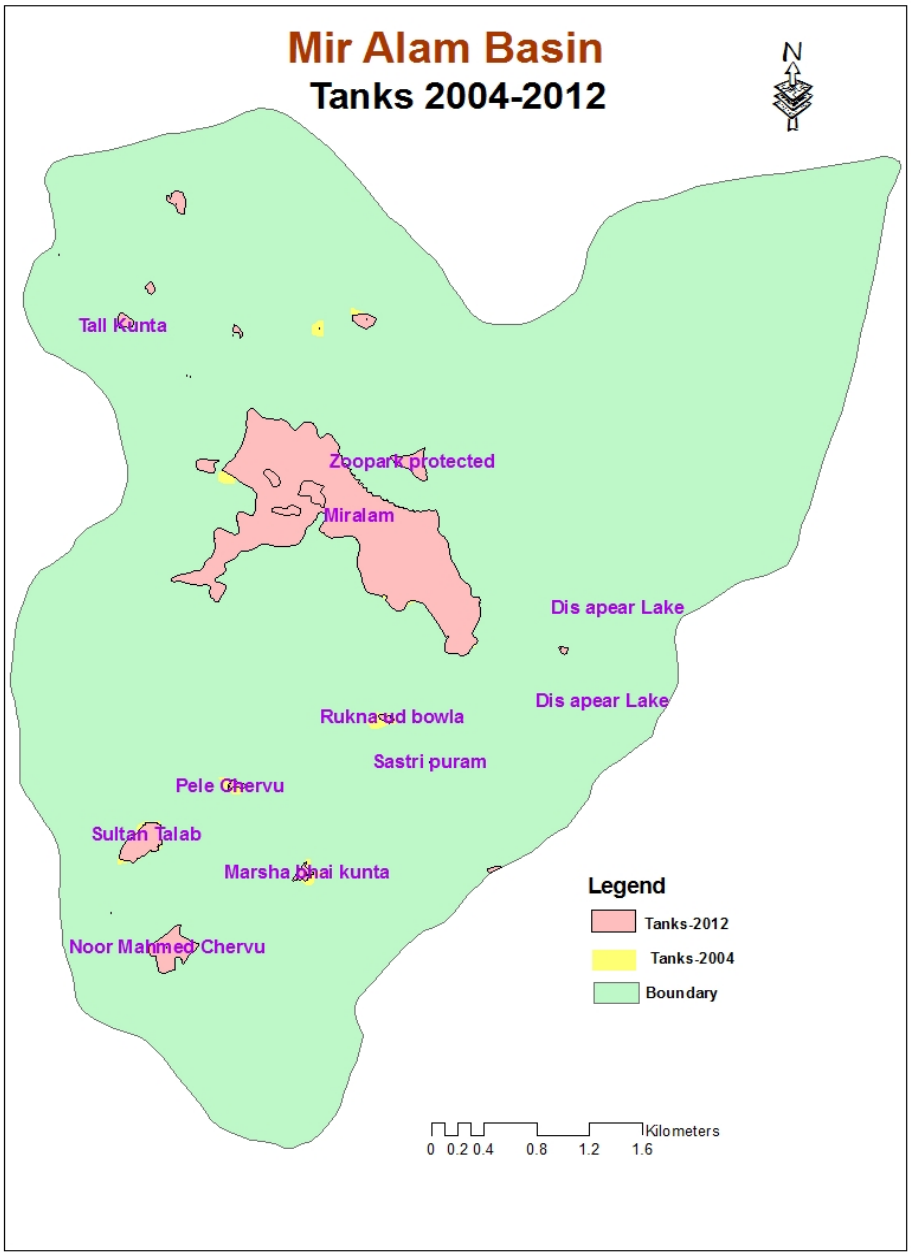
The survival of Mir Alam cascade was not only depended on its architueal value, but on age old cultural bonding of the settlers within it. In fact Mir Alam cascade like any other cascading systems evolved like a cultural ecosystem wherein the maintenance was not driven by the self-interest motivated by greed, but by the other motivation like sharing resources equally and the equity of ownership. The water management was essentially centred around optimization of the ecosystem as a whole. Water was mainly stored, in the soil and conveyed through the soil and the soil facilitated mainly the water purification process. Water was taken from the soil (from water table) then the used water was again put to the soil, which purify the water and feed the water table for reuse. In this manner water receive from the two monsoons was reused several times before it ultimately drained to the sea. Even the inter monsoon rains would have facilitated this reuse process (i.e.cyclicity). Also these structures facilitated flood mitigation process in the lower parts of the ecosystem in heavy rainy periods.

For the last 20 years Mir Alam cascade has deteriorated with several of its small reservoirs and feeding channels disappeared completely. From 1978 till 2004 number of small lakes with their micro catchments decreased from 21 to 14 and further reduced to 8 by 2012-13. Information from orbview3 and field investigation shows that total water spread of all

substantially Figure 2.2 and 2.3 shows the extent of water spread of the lakes within Mir Alam Meso-catchment at three points of time, namely 1978, 2004 and 2012-13.



Source: SaciWATERs, 2013

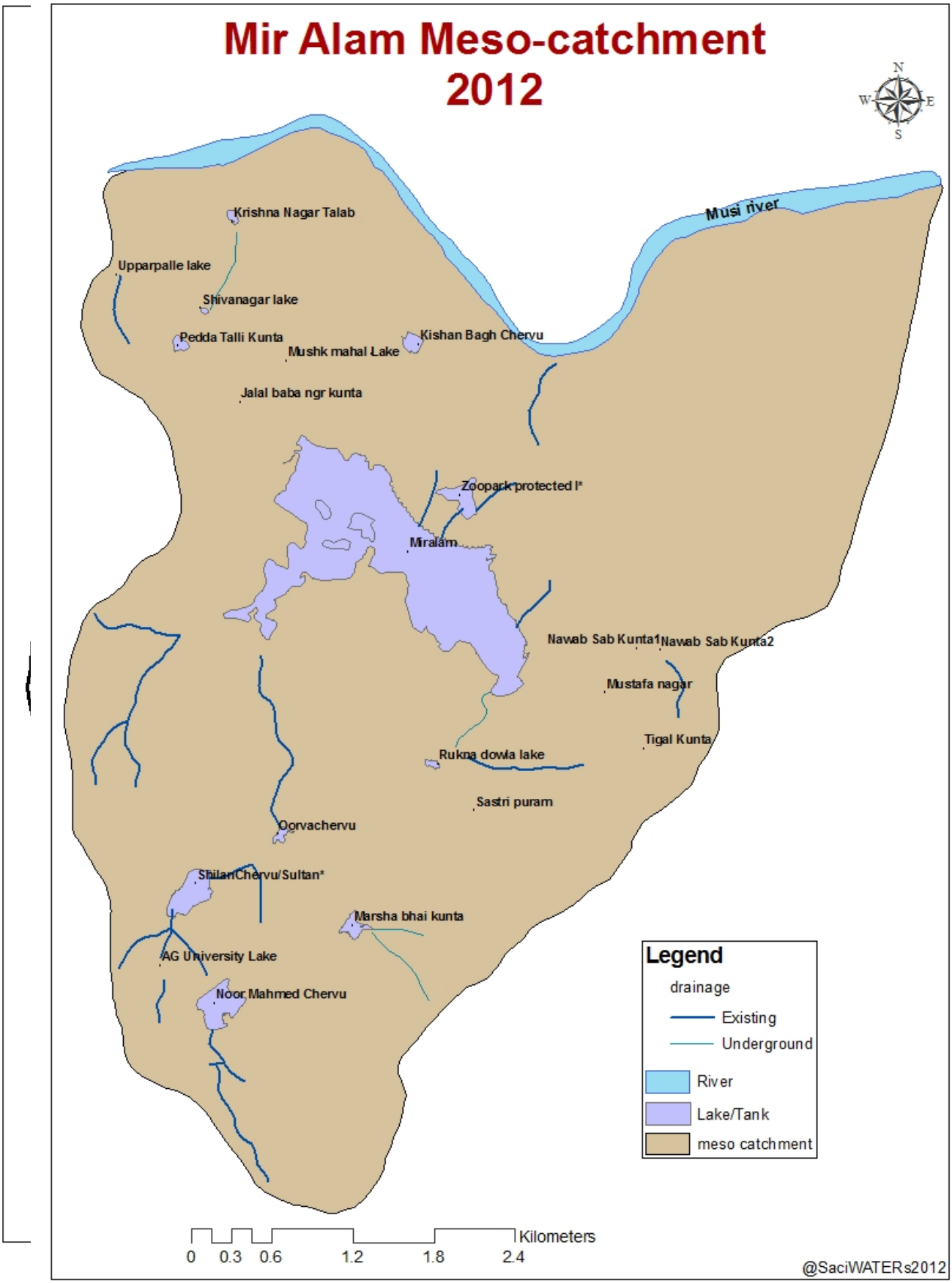


Source: SaciWATERs, 2013

Data from 2004 orbview3 at 2 meter resolution and field investigation has informed that enchrouchment in the water spread over time is essentially due to reduced water flow in the supply channels. This in turn is due to disappearance of the supply channels, .Most of the connecting channels that formed the fundamental to this system's survival were ruthlessly encroached upon either in the name of developmental initiatives like construction of roads etc or illegal settlements. Figure 2.4 indicates Following Horton–Strahler ordering the connecting streams of the meso-catchment have been numbered. Most of the drainage channels belonged to first, second and third order streams. They are mostly headwater streams and form part of the upper reaches of the Mir Alam meso-catchment. Understanding this stream network that essentially depicts the size and strengths of different streams provides an effective base for water management. However , with the passage of 20 years unplanned development and

massive urbanization has destroyed most of the third order streams as depicted in figure 2.4. This in turn has an adverse impact on the survival of the entire meso-catchment as higher order streams have greater recurring capacity. However, most of the revival programmes for Mir Alam as being undertaken by the government so far has miserably failed in understanding the hydrology and stream network.

Figure 2.4 Tank and Drainage order of Mir Alam cascade



2.2. Changing land use of the Mir Alam meso-catchment

Following section shows the tank wise land use and land cover change within Moir Alam meso-catchment. Within 100 meter buffer zone points of violations depicts the sad state of affairs that most of these lakes are going through.

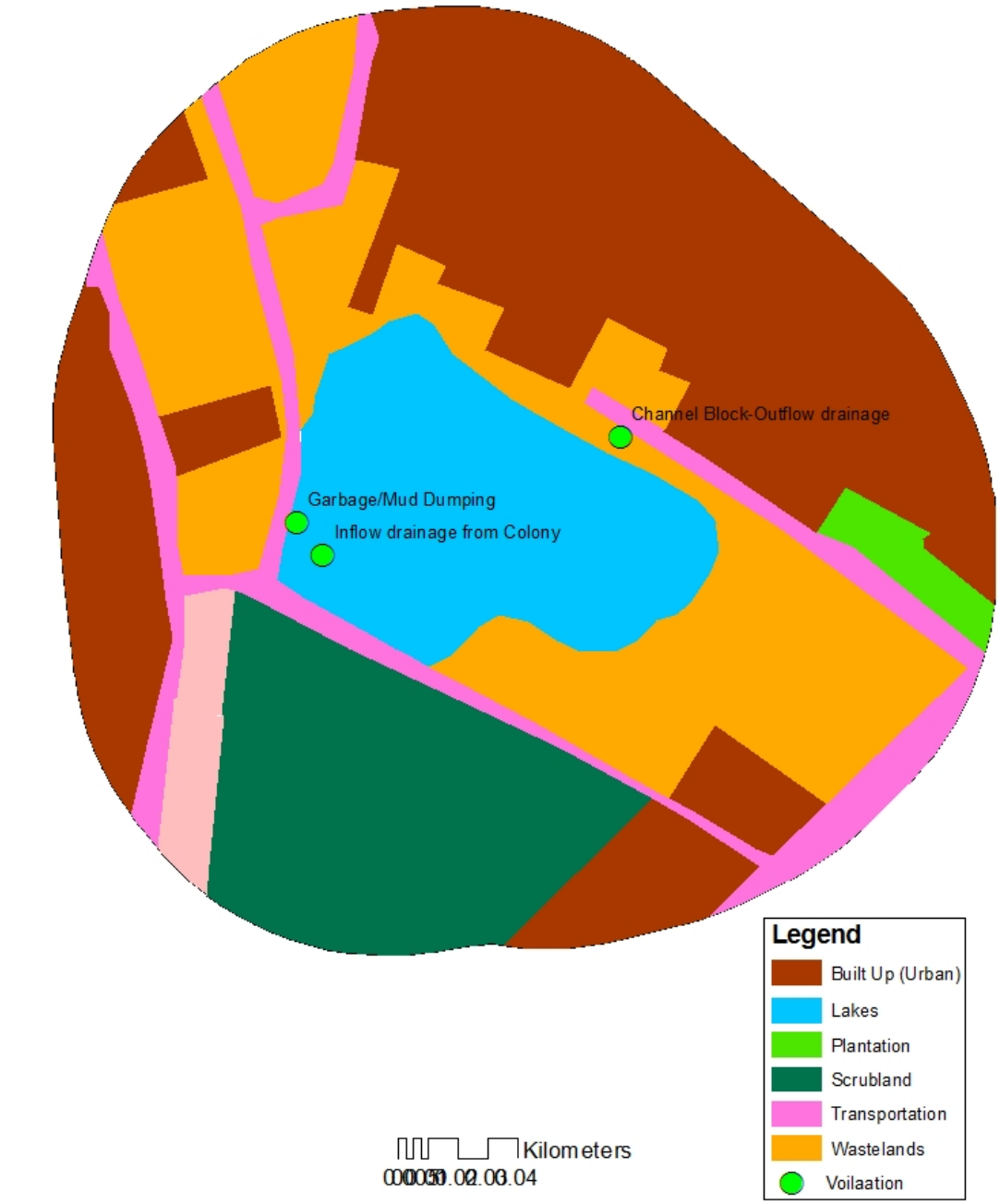
Source:

SaciWATERs, 2013

Landuse / Land Cover Map 2013(100 mt Buffer)

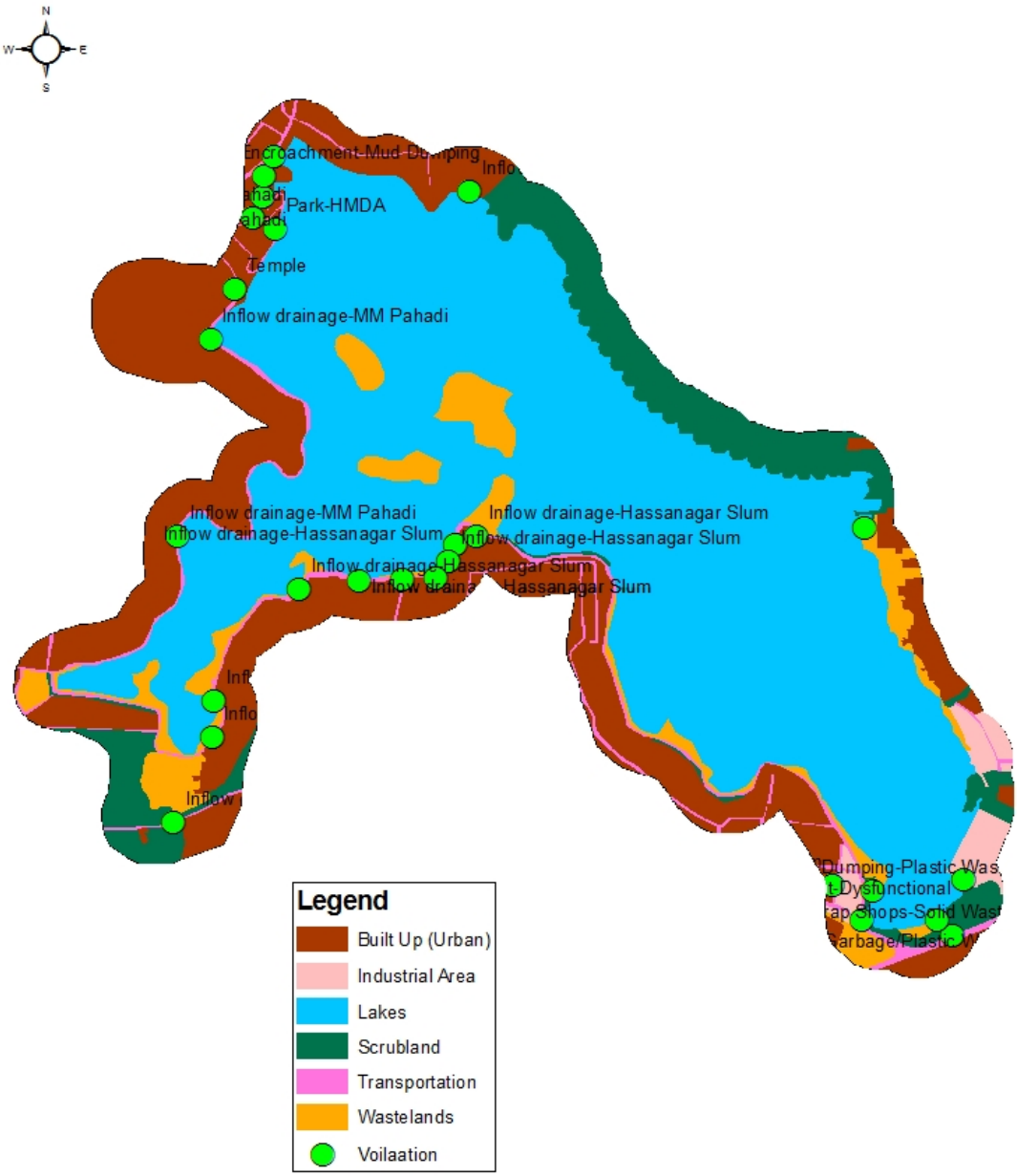
Landuse / Land Cover Map 2013(100 mt Buffer)

Pedda Talli Kunta-Miralam Basin

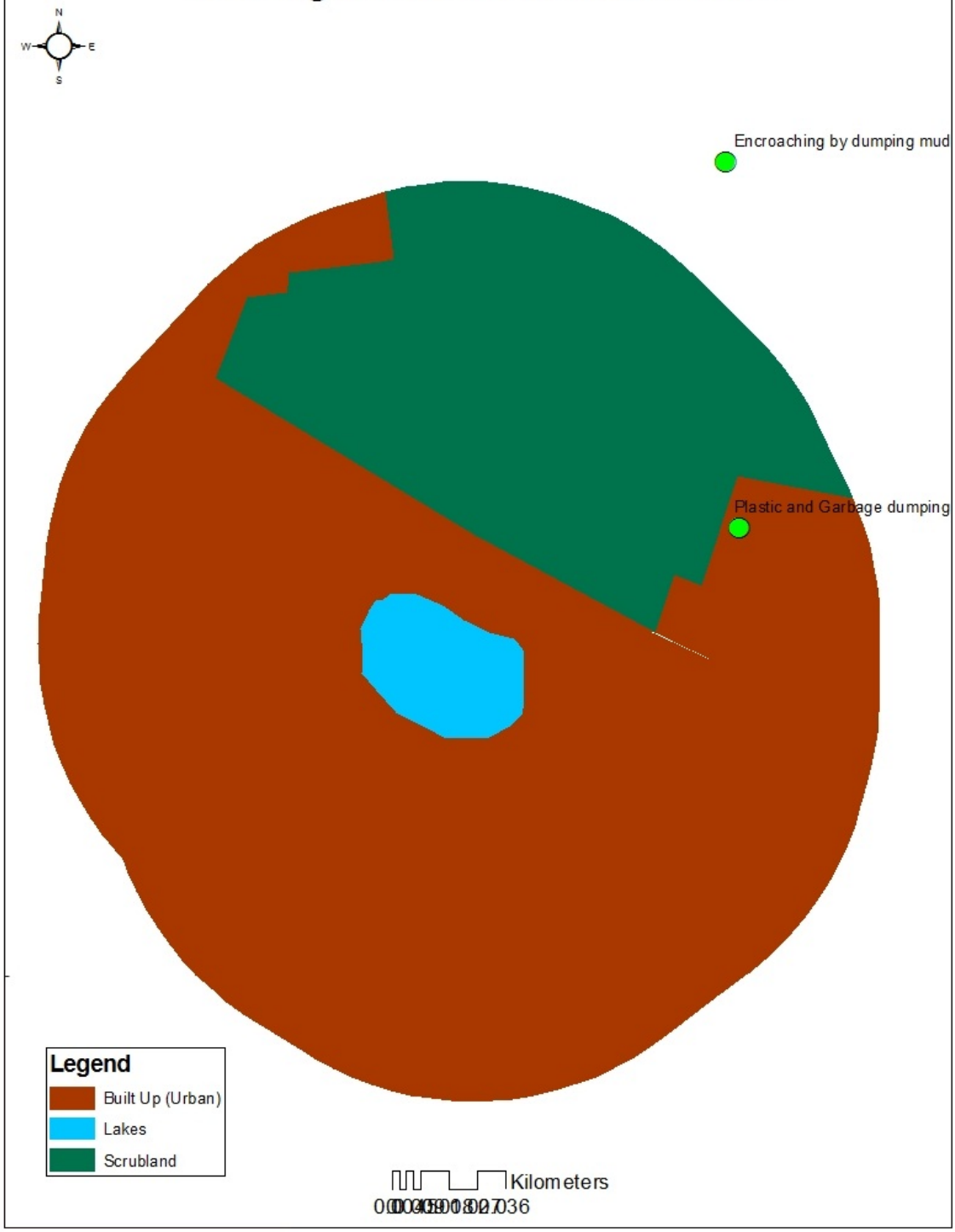


Landuse / Land Cover Map 2013(100 mt Buffer)
Noormehmed Kunta-Miralam Basin

Landuse / Land Cover Map 2013(100 mt Buffer)
Miralam Chervu-Miralam Basin



Landuse / Land Cover Map 2013(100 mt Buffer)
Sivanagar Chervu-Miralam Basin



Landuse / Land Cover Map 2013(100 mt Buffer)
Ruknadowla-Miralam Basin

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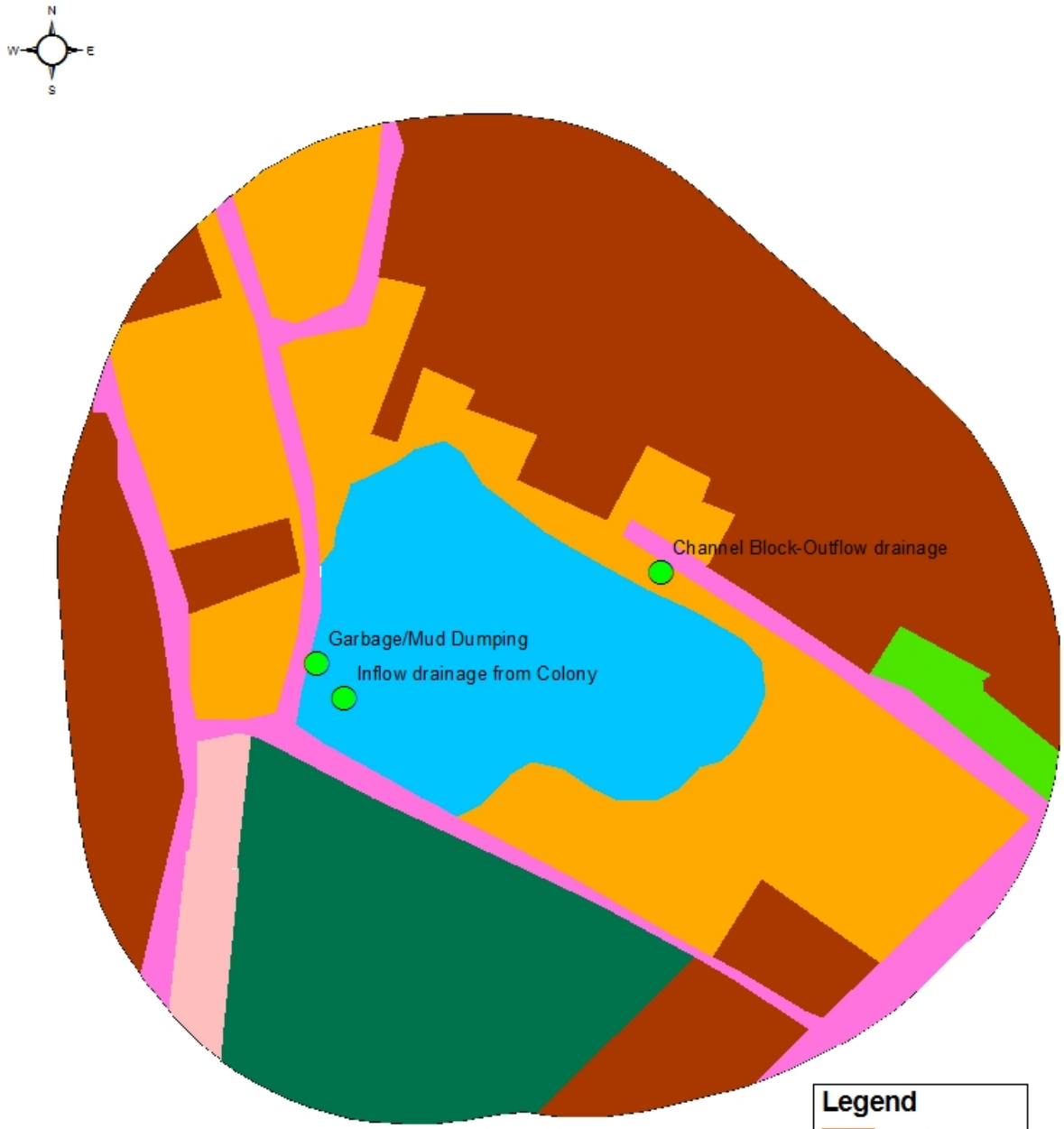
Garbage dump

Landuse / Land Cover Map 2013(100 mt Buffer)
Pedda Talli Kunta-Miralam Basin



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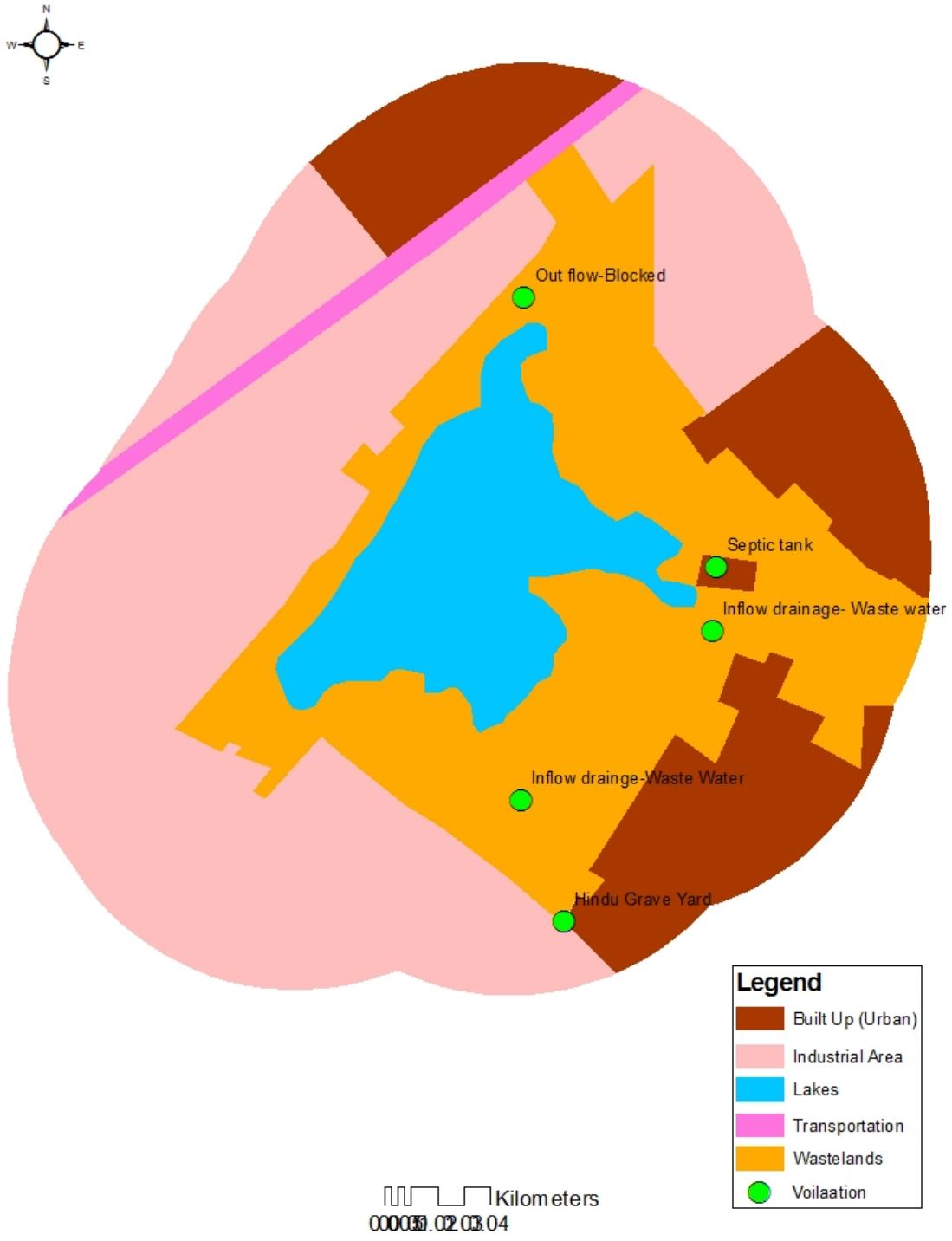
Landuse / Land Cover Map 2013(100 mt Buffer)
Marshabhai Kunta-Miralam Basin



source: SaciWATERs, 2013

Landuse / Land Cover Map 2013(100 mt Buffer)
Noormehmed Kunta-Miralam Basin

CHAPTER THREE
An Account of Umda Sagar Meso-Catchment

3.1 Discussion

Tanks act as breeding sites for many birds and repository for many aquatic animals and it is often necessary to protect them from human interventions. Shrinking, vanishing and polluting of these water bodies may be a threat to the survivability of wild life as well increase ground water pollution, reduce water availability for wells and tube wells. Ultimately vanishing of water bodies leads to less water penetration and low recharge of ground water. Like Mir alam Umda Sagar meso- catachment also acted an important water source for the city and its suburban areas is now at the state of decline. Through Multi temporal ortho-rectified satellite datasets, toposheets and field survey a detail account of the Umda Sagar meso-catchment have been generated. Unlike Mir alam the change analysis for Umda sagar was done for two points of time, namely 1978 and 2013, wherein cascade of tanks falling under Umda Sagar meso-catchment have been vectorized to incorporate into GIS domain.

the change analysis using the survey of India map of 1978, vector map of 2012-13 as well as field information generated showed reduction in water bodies both in the area as well as in number for Umdasagar meso-catchment. With a total area of 7571.5463 ha the catchment had 27 tanks according to 1978 survey of India toposheet, out of which currently 9 are surviving and in a relatively good condition. Table 3.1 provides a detail of the current status of the tanks within umdasagar meso- catchment.

Table 3.1 the status oftank falling under Unda sagar meso-catchment

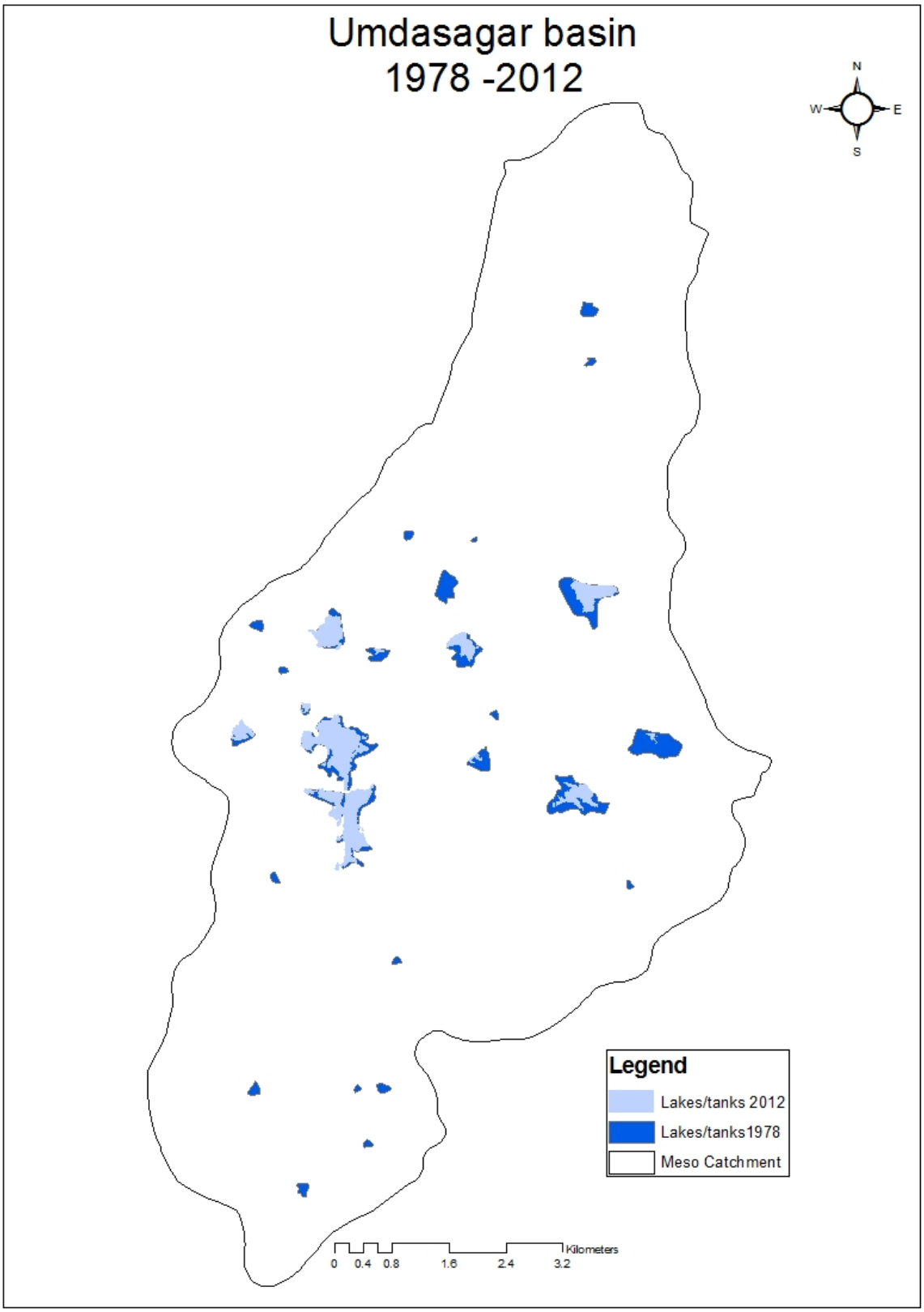
Lake Name	Mandal	Status
Kumkiya Chervu	Saroor Nagar	Disappeared
Mamaidipally area	Saroor Nagar	Disappeared
Ongaroni Kunta	Saroor Nagar	Disappeared
Akkammakunta	Saroor Nagar	Disappearing
Pahadisharif area	Saroor Nagar	Dissapeared
Balapur	Saroor Nagar	Disappeared
Lakshmiguda/jalapalli Village	Saroor Nagar	Disappeared
Jalapalli Talab	Saroor Nagar	Good Condition
Shaheen NGR Bowli	Saroor Nagar	Good Condition
Umda Sagar	Saroor Nagar	Good Condition
Pedda Chervu	Saroor Nagar	Disappearing
Yerrakunta	Saroor Nagar	Good Condition
Salala area	Saroor Nagar	Disapeared
Maddi Kunta	Saroor Nagar	Good Condition
Lakshmiguda area	Saroor Nagar	Disapeared
Jahangeerabad	Saroor Nagar	Disapearing
Noorisha Talab/Salakam Chervu	Hyderabad	Good Condition

Palle Cheruvu	Rajendra Nagar	Good Condition
Durga Nagar	Saroor Nagar	Disappeared
Gurram Chervu/Balapur Talab	Saroor Nagar	Good Condition
Suram Chervu	Hyderabad	Disappeared
Indira Nagar	Saroor Nagar	Disappeared
Hashamabad	Saroor Nagar	Disappeared
Lalithabagh Kunta	Saroor Nagar	Disappeared
Mirjumla Talab	Saroor Nagar	Dissapeared
Abhushare Talab	Saroor Nagar	Good Condition
Osman Nagara Talab	Saroor Nagar	Good Condition

Source: field survey, 2013

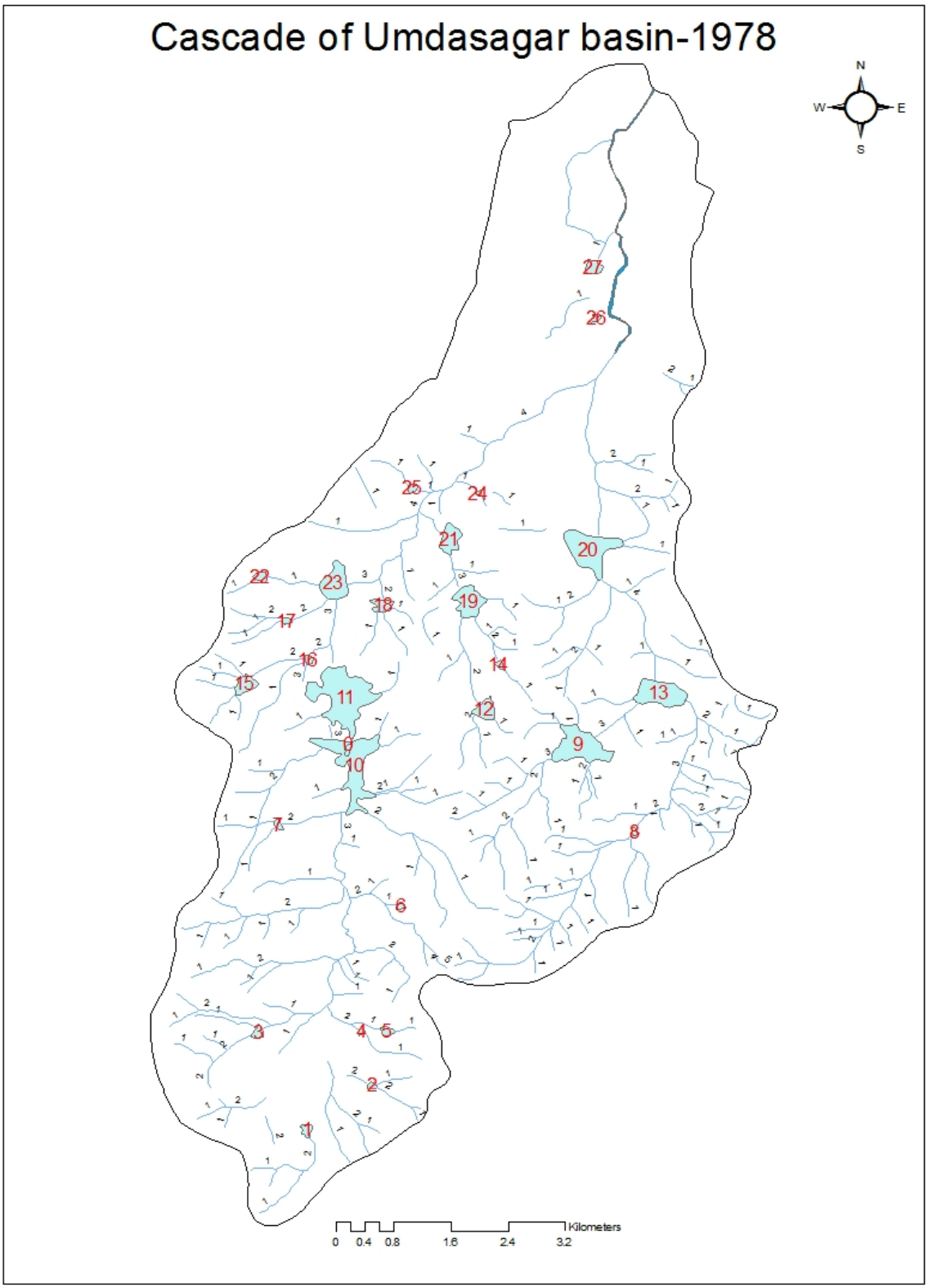
Figure 3.1 shows the water spread of the for all the tanks falling within Umda sagar basin. Water bodies in the range of 200-<300 and 300-< 400 were totally absent in 2012-13. Either they might have gone through process of shrinkage and finally disappeared or changed into the class of <100. The shrinkage may be due to the purposeful anthropogenic activity of land filling/dumping for the urban construction or rapid growth of weeds that covered the surface of the water bodies by the process of eutrophication. The water bodies in the category of <100 have reduced owed to illegal encroachments indicating complete lost.

Figure 3.1 showing the status and water spread area of the tanks falling under umda sagar meso-catchment



Source: SaciWATERs 2013

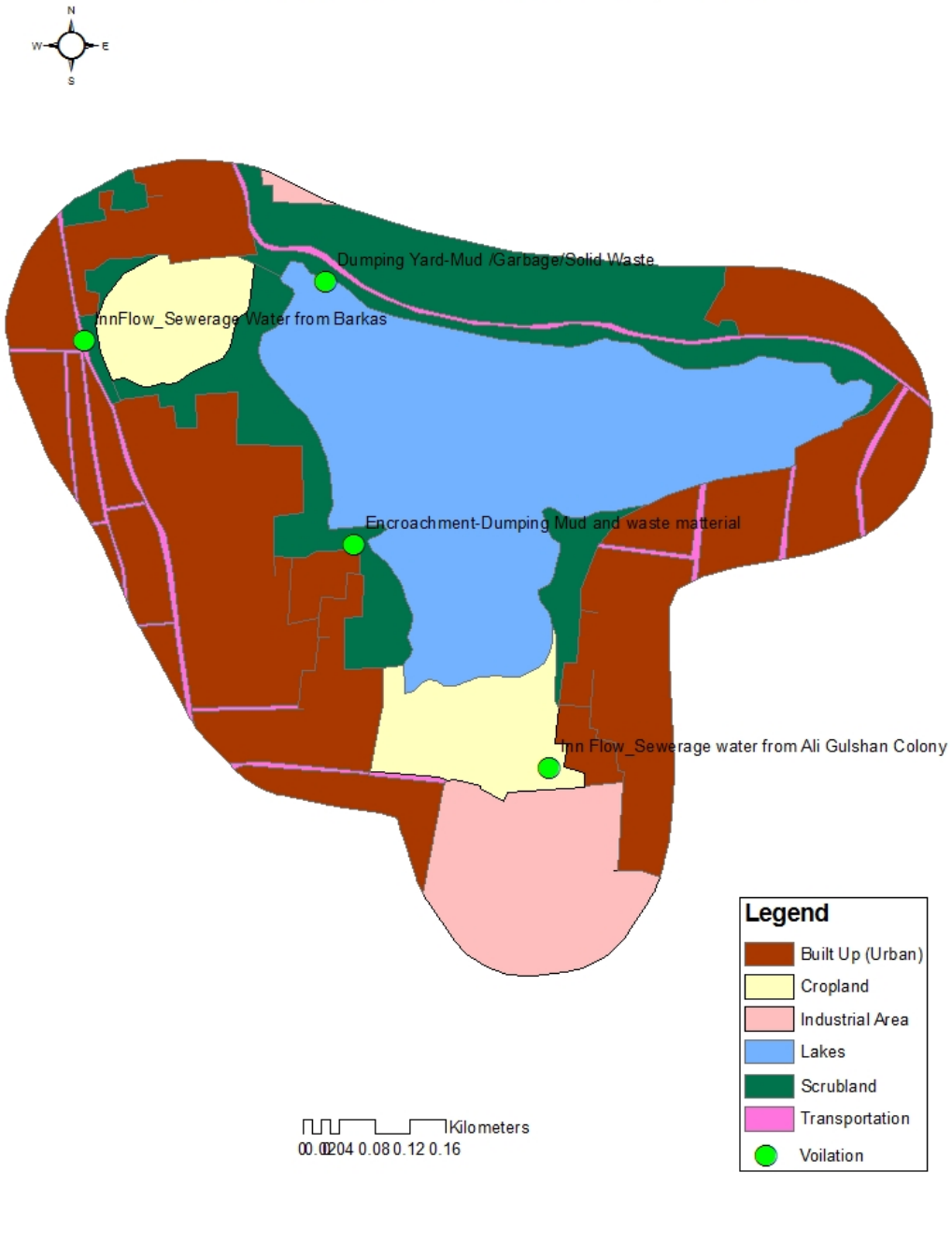
Figure 3.2 showing drainage and ordering of tanks falling under umda sagar meso-catchment



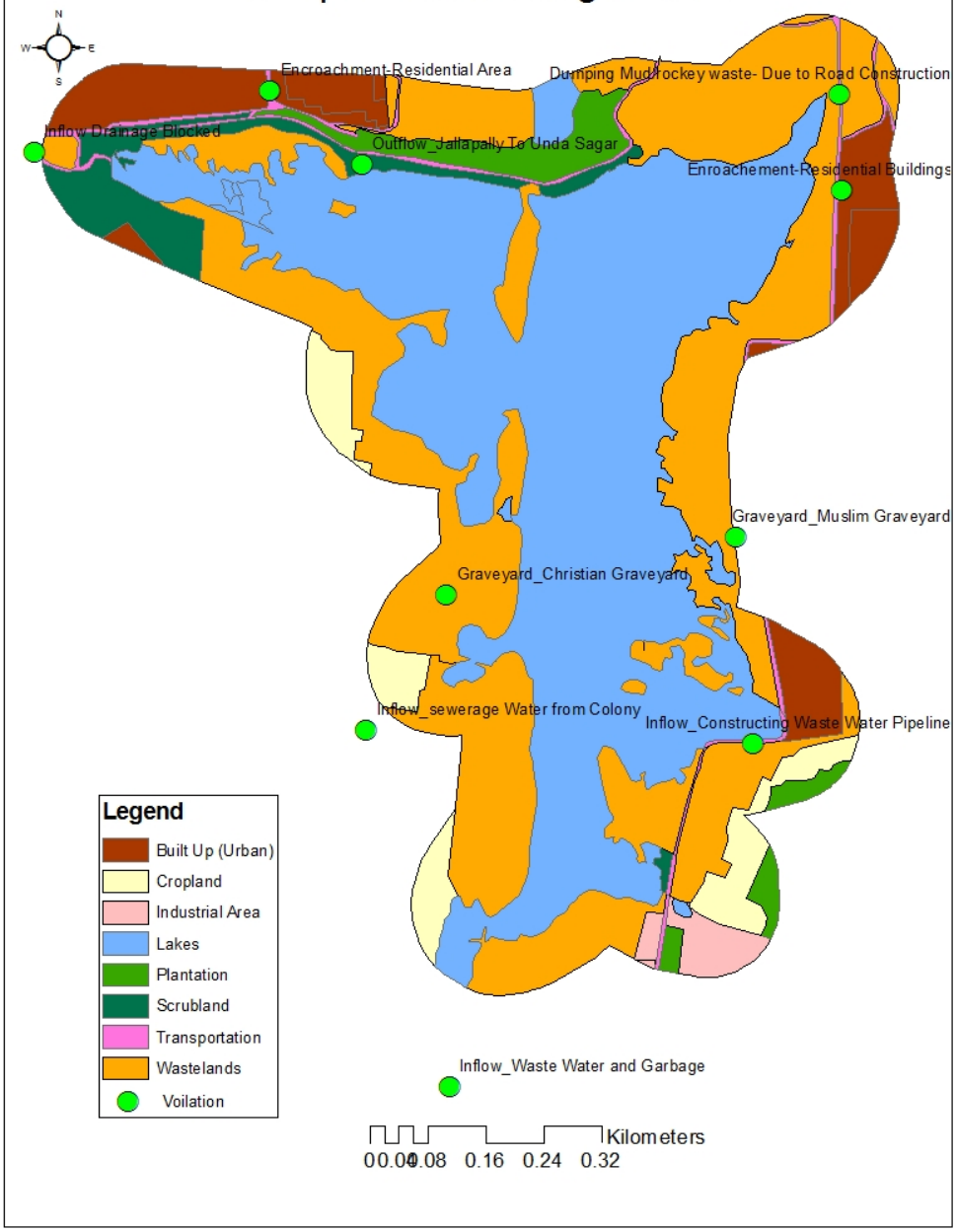
source: SaciWATERs, 2013

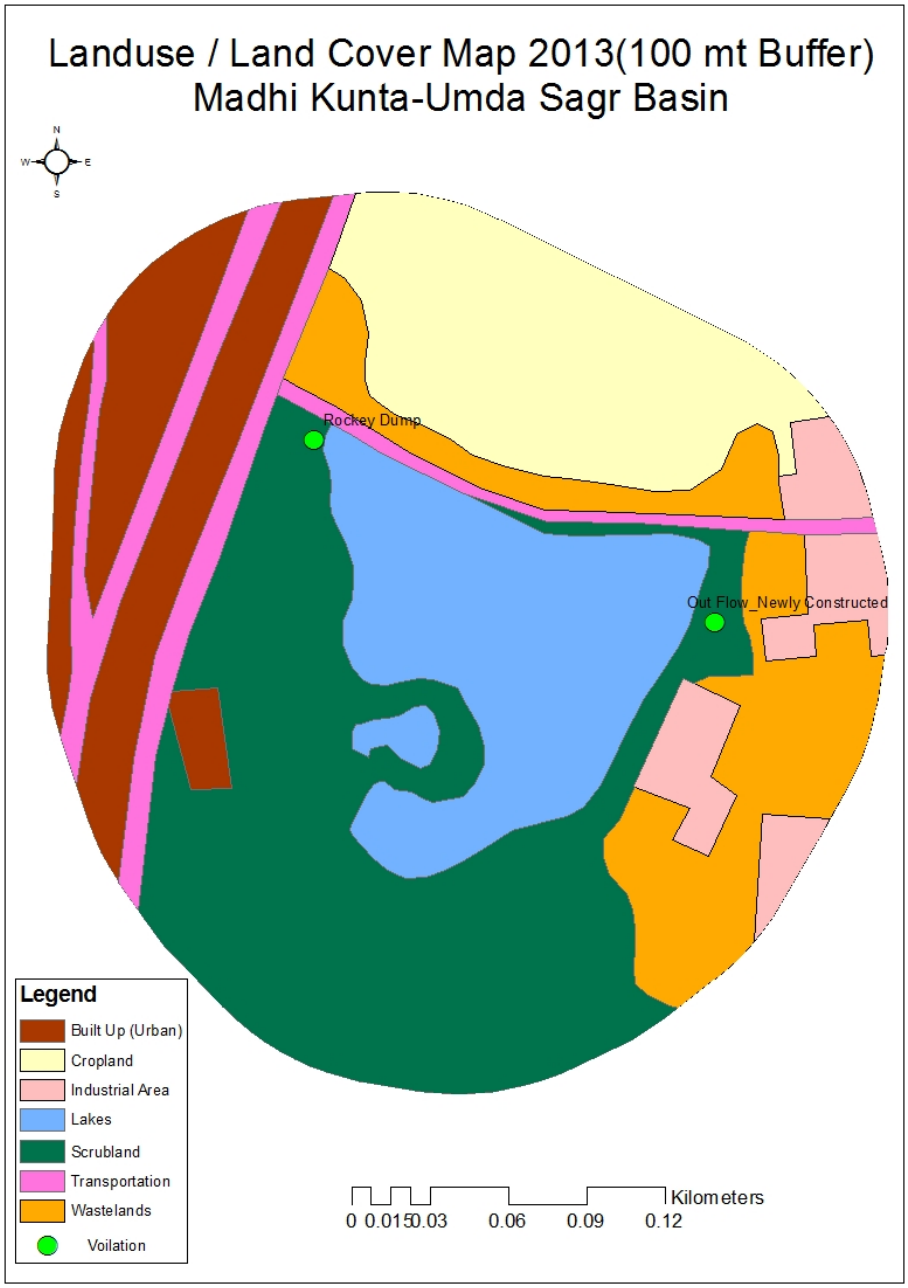
Landuse / Land Cover Map 2013(100 mt Buffer) Jahabgeerabad Cheruv-Umda Sagr Basin

Landuse / Land Cover Map 2013(100 mt Buffer) Gurram Cheruv-Umda Sagr Basin

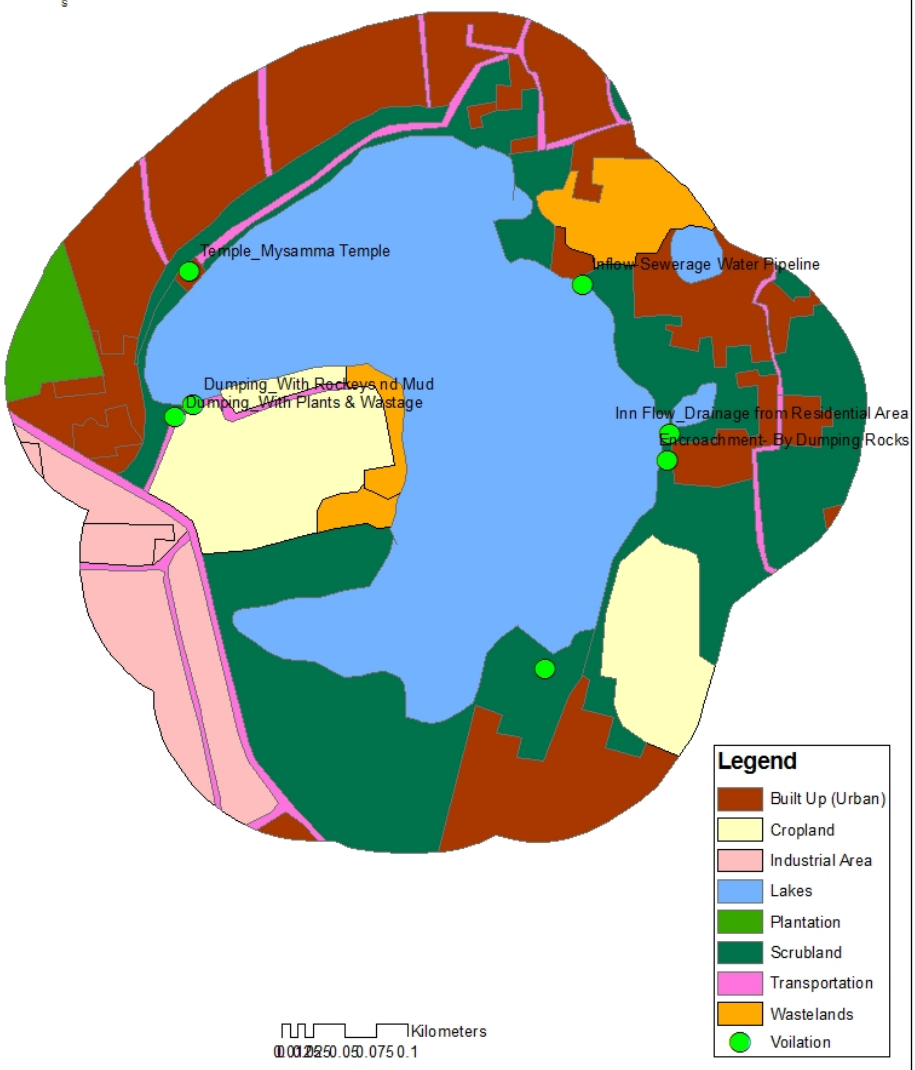


Landuse / Land Cover Map 2013(100 mt Buffer)
Jalapalli-Umda Sagr Basin

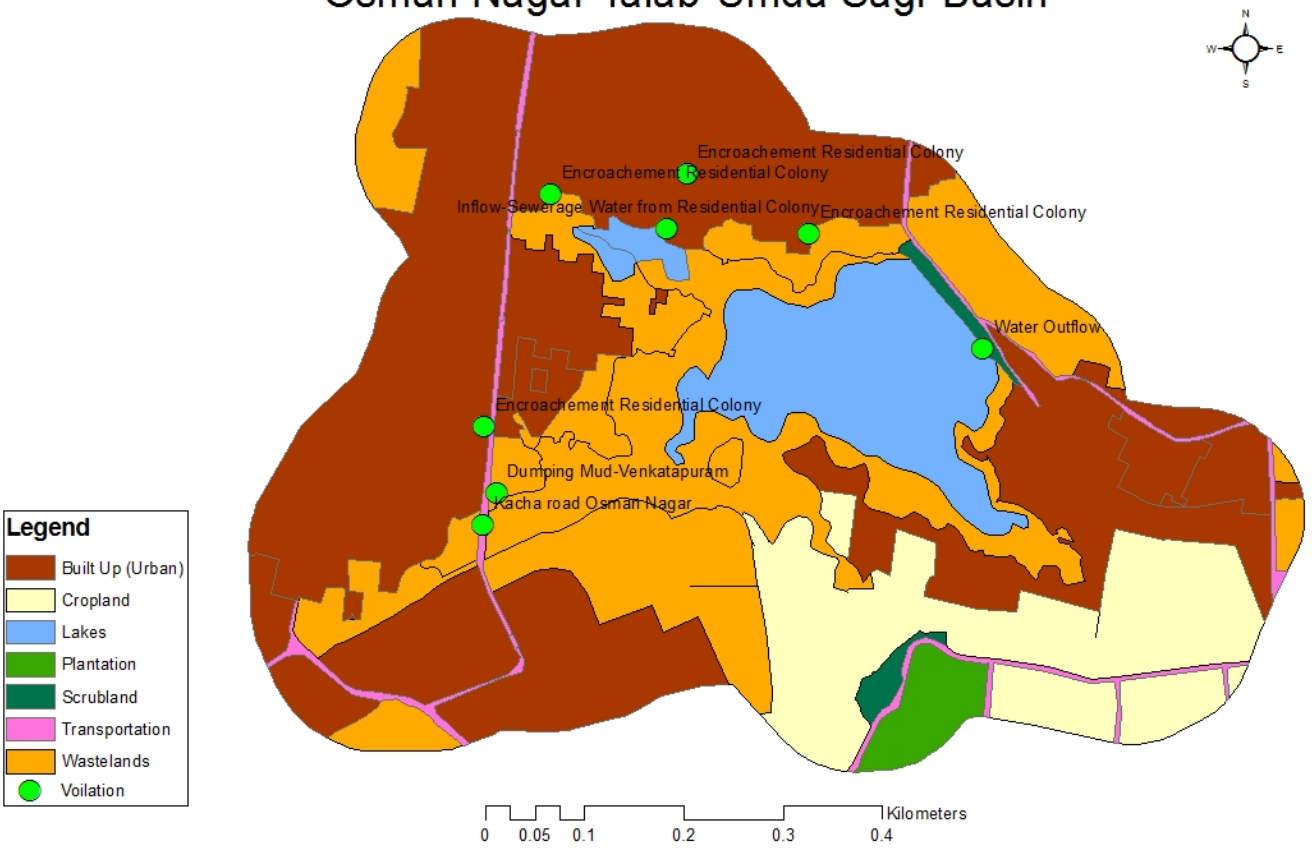



Landuse / Land Cover Map 2013(100 mt Buffer)
Madhi Kunta-Umda Sagr Basin
N
W
E
S
Rockey Dump
Out Flow_Newly Constructed
Legend
Built Up (Urban)
Cropland
Industrial Area
Lakes
Scrubland
Transportation
Wastelands
Voilation
0 0.015 0.03 0.06 0.09 0.12
Kilometers

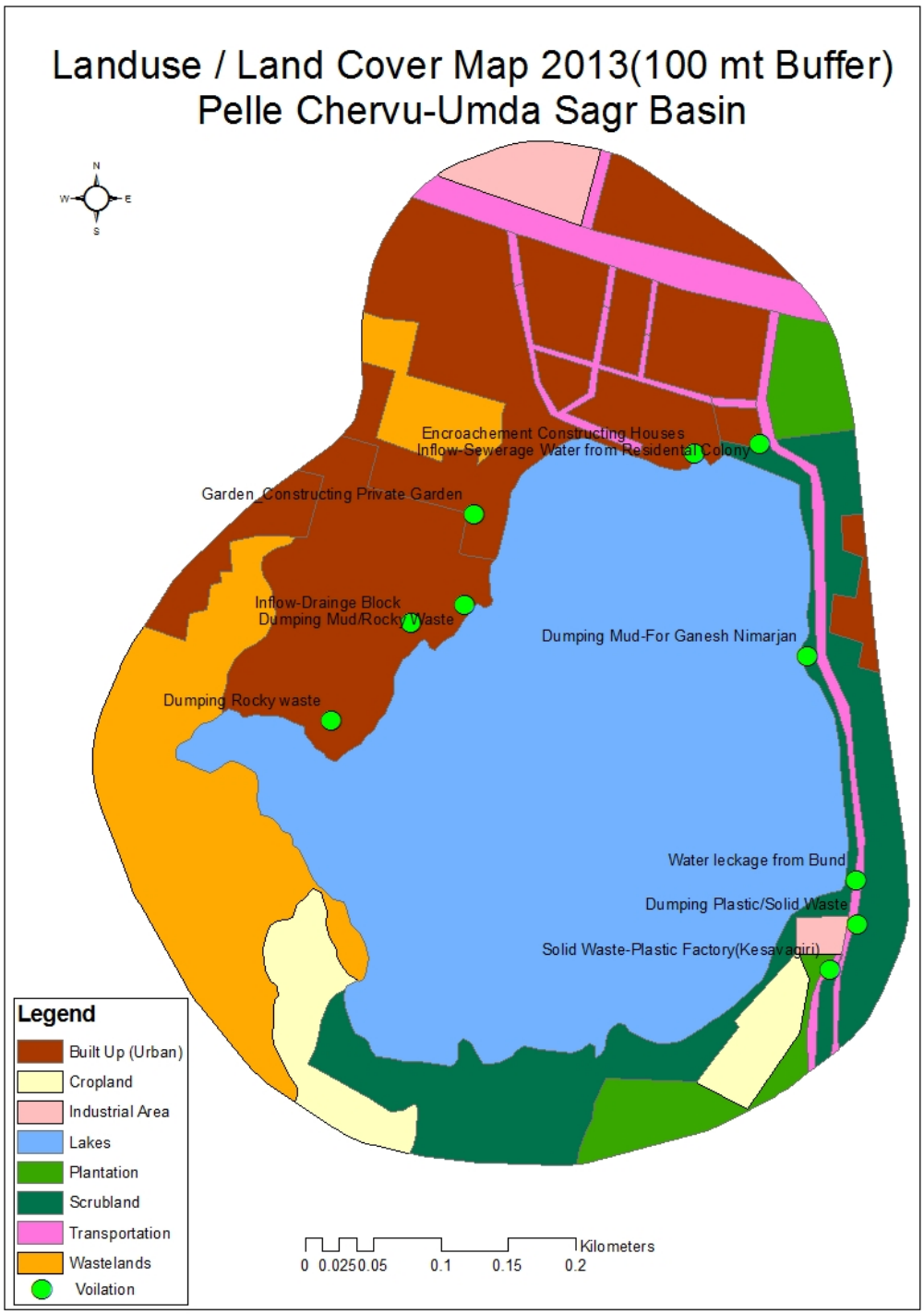
Landuse / Land Cover Map 2013(100 mt Buffer)
Noorisha Talab-Umda Sagr Basin



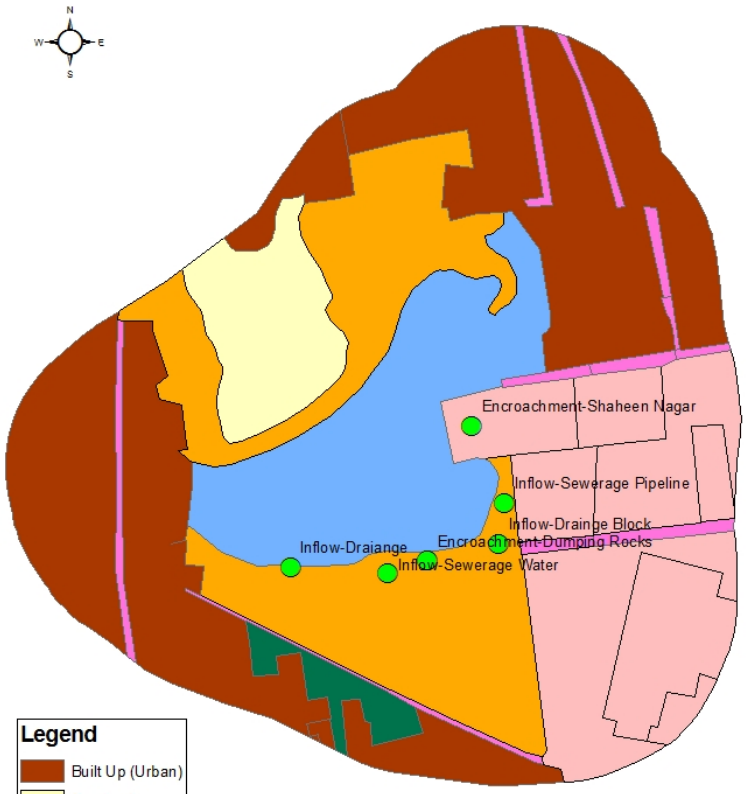
Landuse / Land Cover Map 2013(100 mt Buffer)
Osman Nagar Talab-Umda Sagr Basin



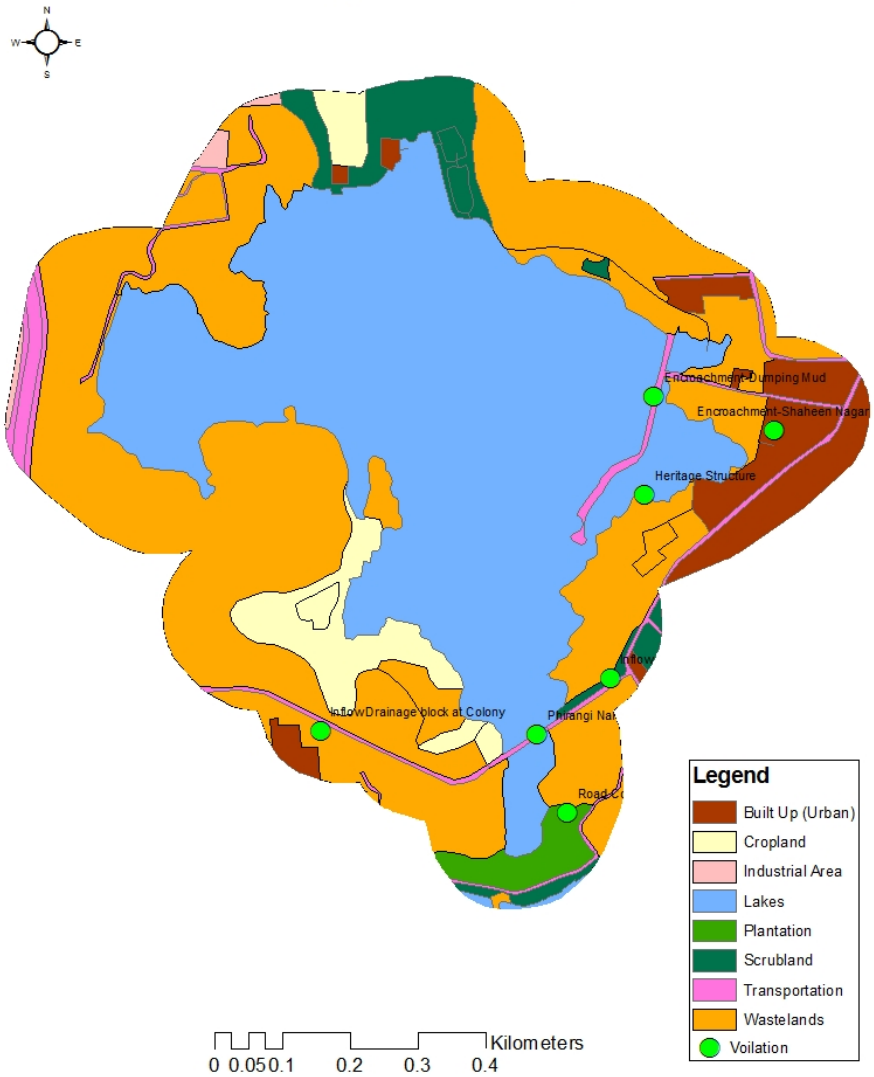
Landuse / Land Cover Map 2013(100 mt Buffer)
Pelle Chervu-Umda Sagr Basin

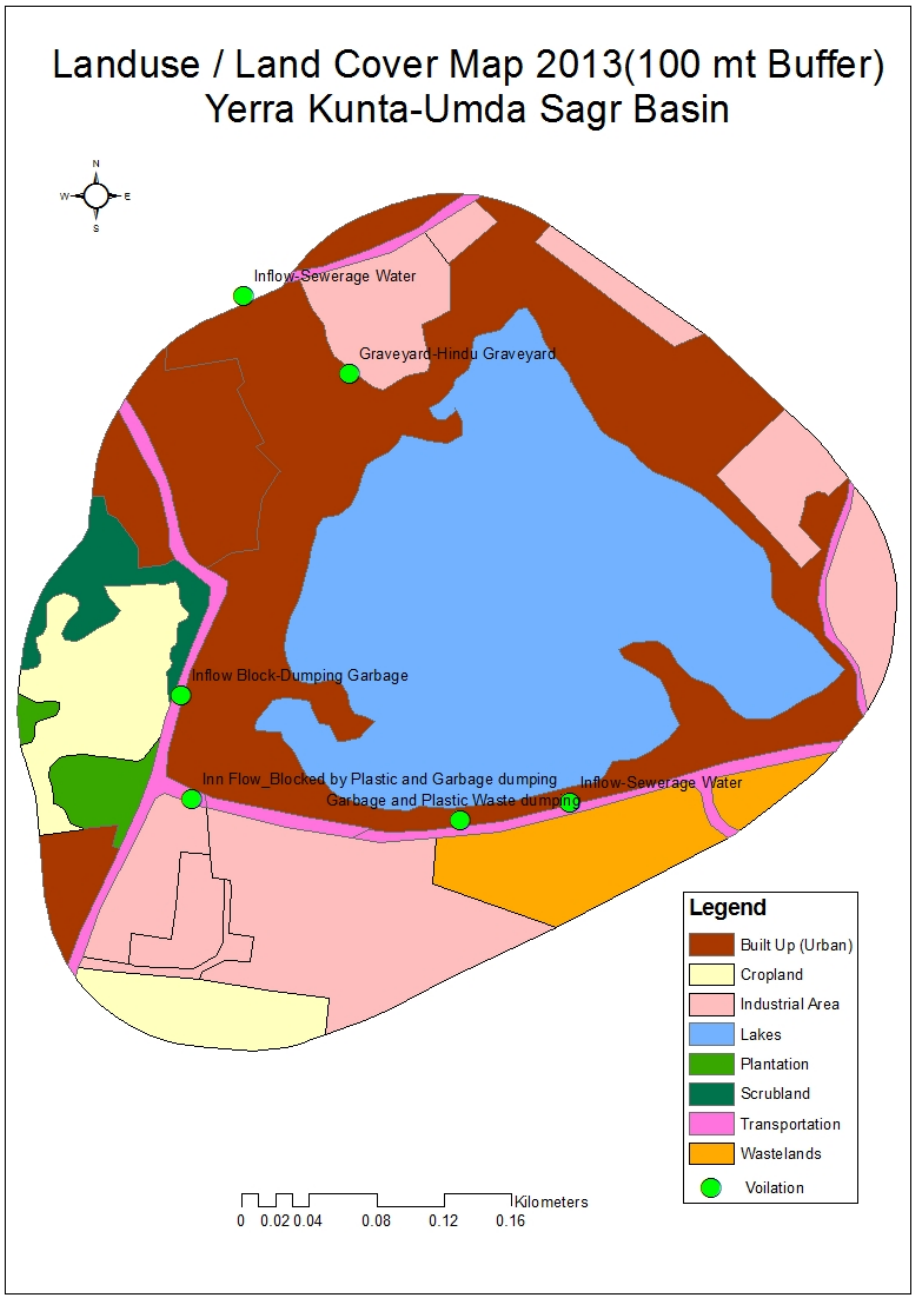


Landuse / Land Cover Map 2013(100 mt Buffer)
Shaheen Nagar Bowli-Umda Sagr Basin



Landuse / Land Cover Map 2013(100 mt Buffer)
Umda Sagar-Umda Sagr Basin





CHAPTER FOUR
Way Forward

The study so far has shown that there are changes in the extent and distribution of the water bodies in and around the city, based on the satellite image data analysis and field survey.

Both the catchments of Mir Alam and Umda sagar have deteriorated massively. The study is ongou=ing and the areas that need to be captured are

1. Land use and land cover change for the basin particular emphasis on tanks for Mir Alam and Umda saga
2. Creation of GIS based data on drainage conditions for Umda sagar(2012).

3. Capturing narratives and oral history of the people living close to the lakes and putting them on to the GIS platform

SaciWATERs

H.No. B-87, Third Avenue, Sainikpuri,
Secunderabad - 500 094

Website: http://www.saciwaters.org/lakes/

Participating Institutions:

IIIT, HYDERABAD

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