

Changes in Public Commons as a Consequence of Urbanization: The Agara Lake in Bangalore, India

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Abstract The city of Bangalore in southern India is rapidly expanding, resulting in major transformations in land use, wetland management, and the distribution of green spaces. This paper examines how transformations in land use and governance consequent to urbanization can change people's perceptions of and interactions with an urban ecological commons, using the case study of the Agara lake in the south Indian city of Bangalore. In less than four decades, the landscape surrounding the lake has altered from a fundamentally agricultural area, dependent on the lake for irrigation and drinking water, to a densely urbanized area where the lake is used predominantly for recreation. A change in governance from community management to state management has sidelined the fishers, fodder collectors and agricultural users who traditionally maintained this lake. The governmental agencies that are supposed to maintain the lake are unable to do so due to a complex governance structure, with overlapping jurisdictions, compounded by an ongoing litigation. Over the past decades, the lake has largely transitioned into an urban green space primarily used for recreation and nature watching. This case study provides us with a broader understanding of how changes in governance consequent to

urbanization and city expansion can impact interactions between people and ecological commons in a rapidly growing Indian city.

Keywords Cities · Green spaces · India · Lakes · Urban commons

Introduction

More than half of the world's population lives in cities, making urbanization one of the most significant drivers of global environmental change today (Grimm and others 2008). Cities around the world have driven the large scale modification of ecosystems around them (Andersson 2006), and urban land use strongly limits the availability of places where people can access nature and its services. There is a critical need to understand how changes in urban land use and governance impact the use of city ecosystems (Andersson 2006, Borgstrom and others 2006). This is particularly important for the developing world, where transformations due to urbanization are often rapid and ill planned.

Cities in economically poorer countries have been relatively little studied in comparison to studies of Europe and North America (Baud and others 2008). Asia represents an especially important context for studying the consequences of urbanization, as many of the largest future cities are located in this continent (Grimm and others 2008), with a greater focus on southeast Asia (Sanchez-Rodriguez and others 2005). In India, unprecedented urban growth has occurred in recent decades, transforming a predominantly rural population to one that is heavily urban (Baud and others 2008). This has had major impacts on the governance and management of natural ecosystems, with concomitant

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effects on their ecological condition (Chakravarty-Kaul 1990; Zérah 2007; Singh and others 2010).

Bangalore, India's third largest city with a population of over 6 million and a decadal growth rate of 38% between 1991–2001, provides a characteristic example of rapid urban expansion at the expense of natural ecosystems (Sudhira and others 2007). While the city can trace its history as far back as the fourth century (Rice 1905), there has been an unprecedented explosion of growth in recent decades (Sudhira and others 2007). The city is a major commercial and cultural center of southern India, and faces rapid development along with highly unequal growth rates, and contested access to natural resources including water and green spaces. High population pressure and rapid growth due to immigration from different parts of the country (and outside) has resulted in tremendous pressure on the city's ecosystems and natural resources. Water bodies are being increasingly polluted, and encroached on for agriculture and urban built space, and agricultural lands are being converted into commercial, industrial and residential settlements (Nair 2005, Sudhira and others 2007). In this process, the valuable economic, ecological and social services contributed by ecosystems including biodiversity support, water recharge, nutrient cycling, bioremediation and microclimatic buffering are being irreplaceably lost (Schipperijn and others 2010).

Can urban ecosystems be resilient to human pressure? This largely depends on governance issues (Baud and others 2008). In most Indian peri-urban areas, ecosystems like lakes are public commons, governed and managed by local village communities—some of whom have successfully managed and maintained lakes for several centuries (Rice 1897b). Yet, as the boundaries of cities grow and engulf these ecosystems, the governance systems undergo a transformation, from community-based management to state management. Rapid changes in role, governance and value lead to differences in perceptions of the lake, between traditional rural and new urban users, as well as between communities and the state.

This paper examines a case study of the Agara lake in Bangalore, which has undergone a major transformation in the past four decades from a peri-urban, community managed lake to an urban lake managed by the state, with an abortive attempt at private–public partnerships. Concomitant with this transformation are rapid changes in land use in the surrounding areas, and in public perceptions of the lake itself, from a common ecological resource, to a recreational space. We use this lake as a lens to investigate how changes in governance from community based systems to state management following urbanization, leads to changes in the relationship of people with the lake, and eventually to changes in the ecological condition of this now-urban commons. In this process, differences in

perceptions of the importance of the lake and its management are also investigated. We end with a brief exploration of suggestions that emerge from this study for guidelines for effective polycentric governance of urban lakes, with collaborations between communities and the state.

The Historical Context: Lake Networks in Bangalore

Bangalore, the capital of the South Indian state of Karnataka, is located on the Deccan Plateau at a height of 839 to 962 m above sea level (Kamath 1990). The region surrounding Bangalore has had a recorded history of settlements from as early as the fifth century AD, but gained further prominence in the sixteenth century when it was established as the capital of the local king Kempe Gowda's kingdom (Rice 1897b).

The Bangalore plateau is in the rain shadow of the Deccan hills, and has always been dependent on natural and human made lakes for drinking water and irrigation (Rice 1897a; Srinivas 2004). The topography of this region is undulating, giving rise to a number of small streams. These have been dammed to form multiple series or chains of fresh water reservoirs, or tanks throughout the larger region, as indeed was the practice for much of Karnataka at this time (Rice 1897a). There are a large number of such reservoirs, hereafter referred to as lakes, which vary in size from small ponds used for cattle washing and drinking, to extensive large lakes used for a number of purposes, including agriculture, fishing, drinking water and domestic uses (Buchanan 1807). Inscriptions found near lakes indicate that some of these lakes date at least as far back as the ninth century (Rice 1905).

The natural topography of the region divides the stream network into three main valleys, the Hebbal valley to the north, the Vrushubhavathi valley to the east, and the Koramangala-Challaghatta valley to the west (BBMP 2010). Within each valley, lakes were created by checking the flow of rainwater, along a topographic gradient such that the outflow of water from a lake at a higher level supplies water to the lakes at a lower level (Rice 1897a). Many lakes were seasonal, carrying water for about half the year (Kamath 1990). In the monsoon, fertile silt accumulated in the lake beds, which was used by local communities for inputs into agriculture. The overflow during the monsoons was used to irrigate the wetlands adjacent to these lakes, and fishing and grazing constituted other important livelihood activities supported by these wetland-lake ecosystems (Buchanan 1807; BBMP 2010). At one point, in 1830, the network of lakes in the surrounding Mysore region was so extensive that there were 19,800 lakes in this region (Sundara Rao 1985). The surface water provided by these lakes earlier constituted over 50% of the

water supply of Bangalore (Kamath 1990). Lakes were also seen as important spaces of cultural and recreational importance (Srinivas 2004). They supported various species of flora as well as fauna, including large numbers of migratory birds (Rice 1897b).

As the city began to import piped water from the Cauvery river, lakes were no longer perceived as being critical for the supply of fresh water, and many of these lakes were converted to other land uses. Over 40 of the city's lakes have been filled and converted to urban land uses including bus stands, golf courses, malls and residential areas (Gowda and Sridhara 2007; BBMP 2010). Due to the disruption of a previously well planned and maintained extensive network into a few isolated and disconnected lakes (Sudhira and others 2007), significant flooding is often reported in the monsoon season (BBMP 2010).

There are approximately 212 lakes currently located within the administrative boundary of greater Bangalore, the Bruhat Bengaluru Mahanagara Palike (BBMP 2010). The ecology of several of these lakes has been fundamentally altered, with waste water discharge from nearby urban settlements constituting a major input into the lakes, polluting lakes and converting many of them from seasonal to perennial water bodies. Many of the lakes are so polluted that they cannot be used for drinking, or fishing—or are heavily overgrown with weeds or completely dry (Chandrashekhara and others 2003; Sudhira and others 2007; BBMP 2010). This has led to significant decrease in the ground water table of the city, with consequent impacts on livelihoods, domestic consumption, cultural and recreational use, and the ecological dynamics and microbial, floral and faunal composition (Gowda and Sridhara 2007). Culturally, the tanks which remain within the city continue to have a significant role in religious and sacred rituals (Srinivas 2004)—but with increasing urbanization they also play a new role as urban recreational spaces, and locations for reconnecting with “nature” in the city (Nair 2005; Nagendra 2010).

Changes in Governance of Lakes with Urbanization

Historically, lakes were managed by the village communities living adjacent to the lake, sometimes with financial support from the kings (Rice 1897a). Certain families and communities were responsible for maintaining the canals leading in and out of the lakes, others for maintaining the lake bunds, or for periodic desilting of the lake bed. Specific communities and families were permitted to fish in the lake, while others used the lake for washing clothes, collecting fodder for grazing, and other uses (Buchanan 1807; Rice 1897a). These specialized, locally varying and adaptive roles played by different communities were gradually

replaced by formal governance structures imposed by government agencies from the end of the nineteenth century, when the British authorities set up Irrigation and Revenue departments more directly under their control (Kamath 1990). This continued into the twentieth century and post independence as well. The Revenue department became the default owner of all land (including lakes) as indicated in The Karnataka Land Revenue Act, 1964 (chapter VII, section 67), which states that public places that are not the property of individuals or aggregates of persons, become the property of the state.

This Act thus established the control of the state over all the lakes. Based on the extent and role of the lakes for irrigation water, fishing, ecological support, water supply, or other roles, a number of government departments were later involved with aspects of lake management, with overlapping jurisdictions. These include the Department of Minor Irrigations, Department of Fisheries, Ecology and Environment Department, Karnataka Forest Department, Lake Development Authority, Karnataka State Pollution Control Board and the BBMP (Gowda and Sridhara 2007).

In 1983, in response to increased public concern about the condition of lakes in Bangalore, the state government constituted an expert committee, popularly known as the Laxman Rao committee. This committee identified a number of encroached lakes and others in poor condition, and its recommendations resulted in the transfer of administration of many of these lakes to the Karnataka State Forest Department (Gowda and Sridhara 2007). In parallel, other agencies such as the Bangalore Development Authority were also involved in the management, development and maintenance of some lakes.

In 2002, a decision was taken to set up a separate agency, the Lake Development Authority, as an autonomous body responsible for the maintenance and restoration of lakes in Bangalore (Gowda and Sridhara 2007). The LDA attempted to implement new Public–Private–Partnership (PPP) approaches to lake management, involving private companies as well as residents associations in management of lakes. A few lakes in the city, including the Agara lake, were leased out to private companies for management periods of up to 15 years. This has been an extremely controversial step, which met with widespread resistance from civil society, environmentalists, and activist groups, and resulted in a number of public interest litigations which have arrested this process for the time being. At the time of writing this paper, the BBMP and BDA have been identified as the agencies which will be responsible for the maintenance of the majority of the lakes within the city limits, although the LDA will continue to hold responsibility for management of a few of the other lakes in the city.

Thus, in summary, urban lakes have changed considerably in governance as well as management, from community managed spaces used for primarily for fishing, grazing of cattle, and provision of irrigation and drinking water, to urban ecosystem governed by the state, either without active management, or managed and maintained largely for purposes of urban recreation.

Research Setting

Agara lake is located within the administrative limits of greater Bangalore, in Koramangala-Challaghatta Valley, in the south-east of Bangalore (Fig. 1, BBMP 2010). The Agara village, with which this lake is associated, is an old settlement which was famous for mango cultivation in the early nineteenth century (Buchanan 1807). Later, during the middle of the nineteenth century, a large British artillery practice ground came up close to this region (Rice 1897b). Inscriptions observed in the Agara village and at the lake show that the lake was in existence at least as far back as the eighth century (Rice 1897b; 1905). Currently, the Agara lake boundary covers an area of 48.38 ha. The water from this lake drains into the adjacent Bellandur lake to the immediate north, and eventually into one of Bangalore's largest lakes, the Varthur lake located at the south-eastern boundary of the city (BBMP 2010).

Agara lake has catered to a variety of needs over the centuries, including irrigation, livelihoods, groundwater replenishment, as well as supporting a number of birds and other fauna. In the 1990s, the Bangalore Development Authority (BDA) formed a residential layout, the HSR layout, in the area to the south of the lake, by acquiring agricultural land from the villagers. This resulted in a shift in the nature of the economy from a largely agricultural and pastoral based livelihood, to a more urbanized and service-based economy. The BDA also fenced the lake during this period and the practice of agriculture in the wetlands adjacent to the lake was gradually discontinued as a consequence. The BDA created a walk way around the water body as well as a park in the northern part of the lake (Gowda and Sridhara 2007).

In 2007, Agara lake was leased to a private firm, Biota Natura Systems by the Lake Development Authority (LDA) under its Public–Private Partnership model to create an amusement park around the lake (Yeshwanth 2007). Strong protests followed from residents living adjacent to the lake, and environmentalists and other concerned citizens who were concerned about the impact this would have on the ecology and health of the lake. The Environment Support Group (ESG), a non governmental organization which has played a major role in countering the rapid encroachment of public commons and ecosystems in

Bangalore, filed a Public Interest Litigation (PIL) against the PPP schemes for development of Agara lake and other lakes in Bangalore (Khandekar 2008, Environment Support Group 2009). In 2009, in response to the PIL and immense public pressure generated by ESG and other green organizations, civic activists and local residents, the LDA cancelled the agreement with Biota, claiming a lack of proper maintenance (Gandhi 2010). Biota countered this by filing a case against the LDA. Since these cases are still being heard in court, and no final decisions have been taken, there is a complete lack of any maintenance in the lake, which is now largely overgrown with weeds, as observed during our field visits.

Methods

Mapping Land Use Change

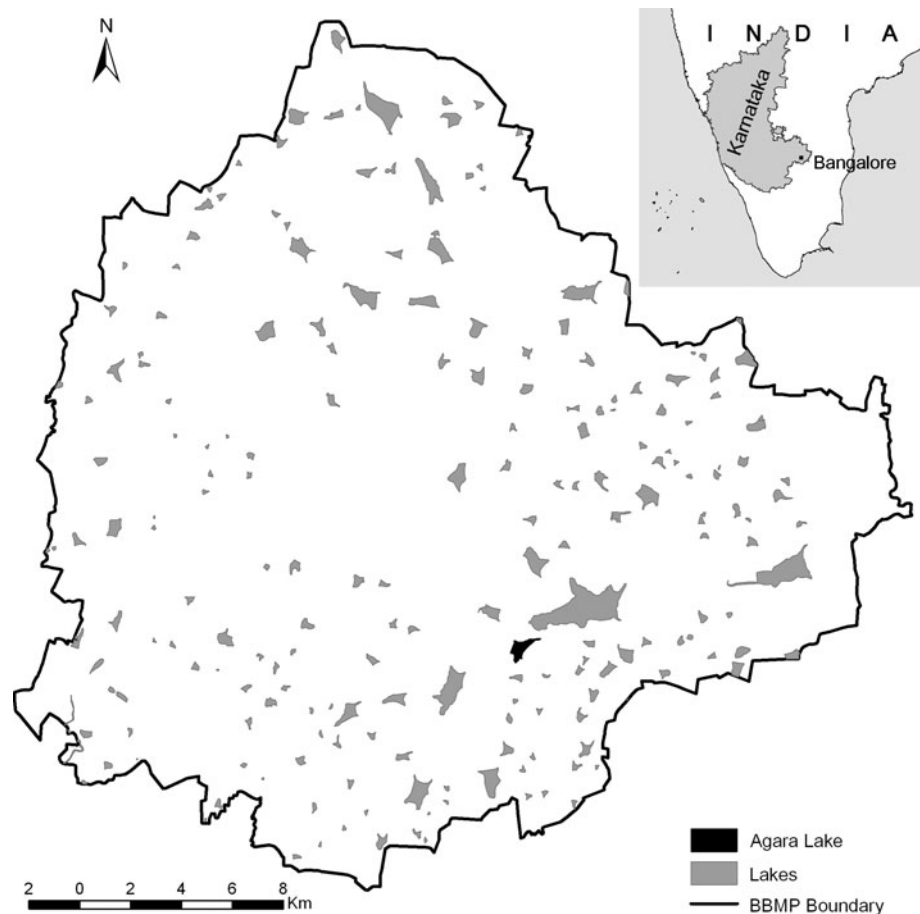
A 1:50,000 Survey of India topographic sheet covering the Agara lake and its surrounding area, was compared to a high resolution GeoEye satellite image from 2009 (Nagendra and Rocchini 2008) to understand the changes in land use and land cover that have taken place within and around the lake in the time period between the mid 1970s and 2009. The GeoEye image provides detailed information on roads, settlements, lake boundary and nearby land use types such as orchards at a spatial resolution similar to that of the toposheet. We were unable to generate maps of mid-timepoints as toposheets more recent to the 1970 map were not available, and satellite images from the 1980s, 1990s or early 2000s were not available at the spatial resolution required for this purpose. To supplement the information from the maps, a spatial survey of the lake was conducted to ascertain the main areas used by different visitors.

Interviews

Our aim was to understand the different areas of the lake visited and used by humans; the extent of use and perceptions of value of the lake by different categories of visitors; and to ascertain if there are differences in perceptions of the importance of the lake between categories of users. Towards this, a detailed questionnaire was developed to interview lake visitors. We collected basic information about the respondent—name, age, level of education, occupation, gender, and the location of their place of residence (whether in close proximity to the lake, or distant from it).

We then asked a series of questions related to the use of the lake, and awareness of its role. These included questions about the length of their stay in Bangalore, how long

Fig. 1 Distribution of lakes within BBMP administrative limits in Bangalore



and how often they had been coming to the lake, and whether they brought their children to the lake. If they were livelihood users of the lake, we enquired if their income from the lake had changed over time, and if so, what were the reasons behind such a change. We asked visitors what they considered to be the use or role of lakes in the city, and how they thought this lake compared with other city lakes. We investigated whether they thought that lakes should be accessible to all citizens, if entry fees should be charged for the lake, if they would still visit the lake if fees were charged, and if they were aware who maintained the lake.

Finally, we asked a set of questions to understand perceptions regarding lake management. We ascertained what problems visitors thought the lake faced, what improvements they would like to see, if they had noticed changes in lake condition over time, and if they were aware of larger problems that impacted lake management or governance in the city. If visitors had participated in any efforts to manage the lake, or to engage with public authorities for such management, we collected information about such attempts. In addition, if there was other information that the visitors wished to contribute, we engaged in detailed open-ended conversations to gather more detail.

Interviews were conducted over a two month period between July and August 2009. We temporally distributed the interviews, with the maximum number of interviews conducted during the weekend, and at evenings, when the number of recreational visitors is highest. We also conducted a few interviews during the week, and during mid-day, as these enabled us to sample different categories of visitors including fishers, fodder collectors, and people washing clothes. Interviews were spatially distributed around the lake, focusing on the walking path, the cricket field, the water area used by fishers, the grassy patch used by fodder collectors, and the area near the main entrance, where a larger proportion of the interviews were conducted as this area is used most frequently by a range of visitors. As visitors to the lake are from different parts of India, with familiarity in different languages, we conducted interviews in English, Hindi, Kannada, Telugu and Tamil, using languages well known to each park visitor, so that extensive communication was possible.

A total of 63 interviews were conducted with visitors. Upon analysis, we found that there were very few visitors from the original Agara village, whose information was critical for us to ascertain changes in the manner in which the lake was being used and managed. Thus, we conducted

an additional nine interviews with residents of Agara village, primarily focusing on interviews of elderly residents, to gain information on their previous and current relationship with the lake. While we used the questionnaire described above for these interviews as well, of greater importance here were open ended discussions with them, particularly with older residents, asking about the changes in land use and use of the lake that they had witnessed over time, and describing a time line of change from these interviews. Finally, open-ended discussions were conducted with selected officials of government institutions including the BBMP, Pollution Control Board, LDA, and other departments responsible for the maintenance of lakes to understand the timelines of changes in governance, and to get some detail about their perspectives on lake utility and management.

Results

Land Use Change

The region surrounding Agara lake has undergone substantial transformation between 1970 and 2009 (Fig. 2). In 1970–1971, Agara lake was defined spatially in terms of the water holding area and the lake bund, bordered on the west by an orchard, and surrounded by agricultural fields on all other sides (Fig. 2a, Survey of India 1980). The southern portion of Bellandur lake, one of Bangalore's largest water bodies, can be observed to the north of Agara this water body receives the overflow from Agara lake. A number of canals connect the surrounding wetlands to Agara lake, and there are numerous smaller lakes, as well as some small patches of plantations and orchards to the south. There is also a large open space to the east, which represents land owned by the Indian armed forces. The landscape surrounding the lake thus appears largely dominated by agriculture, with a few settlements to the west and east, and a few roads providing connectivity. Agara village, in which the communities that once managed the lake were located, can be seen as a small settlement to the southeast of the lake.

By 2009, this landscape had undergone substantial transformation (Fig. 2b). The small water bodies to the south of the lake were converted to other land uses. A dense network of roads interspersed with settlements had come up to the south, east and west, and no agricultural fields are visible in the surrounding landscape. To the north, the wetlands that connected this lake to Bellandur lake have been fenced off and converted to private property, and a large apartment complex is anticipated to come up in this area shortly. Thus, the wetlands that buffered this lake ecosystem have been transformed during a span of

about 35 years into an impermeable, impassable concreted mix of road and settlement. The only area that has survived largely untouched is the military owned land to the east. The Agara village has been cut off from the lake by a number of large and small roads with high density traffic, making access to the lake difficult. Further, the lake itself has changed in shape and function. While the shape of the lake remains largely similar, the water-spread area has shrunk considerably. An artificial island has been created in the center, with the silt that was obtained from dredging the lake. The lake rejuvenation program of the BDA has also altered the shape of the lake, creating space for a walking path all around, as well as two large open areas to the north-east and south, intended for recreation.

Field visits to the lake provide a more detailed spatial view. The lake is surrounded by roads on all sides and fenced, with a gate at the eastern boundary, and one at the southern end. There are steps leading to the water body close to the main entrance. The gate at the southern end is closed, but a large gap has been forced, through which cattle routinely enter the lake area. Once they enter, there is a large open patch with a number of weeds, which connects to a marshy wetland that leads into the water body. This wetland area is quite polluted, with a number of plastic bags and other debris, and cattle graze in this area as well as in the adjacent open patch.

Towards the north lies a park which is overgrown with weeds and is not maintained, and an open area within this is used as a cricket field by local youth. The walkway along the circumference of the lake is paved with gravel and is planted with bushes and small trees along the periphery. Small channels of water lead into the water body from the Sarjapur road at the northern boundary. There is also a large storm water drain that runs parallel to the lake on the western boundary, but which contains highly polluted water.

Park Visitors

Interviews with park visitors were used to categorize them into two broad user groups—visitors whose livelihoods depend or are supplemented by the lake, and others who use the lake for purposes not associated with livelihood use (Fig. 3). These user groups are spatially distributed in different parts of the lake.

There are three main categories of livelihood users—commercial fishers, fodder collectors and sex workers. Commercial fishers belong to organized fishing societies with a lease from the Fisheries Department, as well as informally organized groups who fish without a lease. Commercial fishers typically fish in the water body while on a coracle, while the informally organized groups (mostly local residents from Agara village) wade through

Fig. 2 Land use map of the landscape surrounding Agara lake in **a** 1970–1971 [based on a Survey of India toposheet (Survey of India 1980)]; **b** 2009 (based on a GeoEye satellite image)

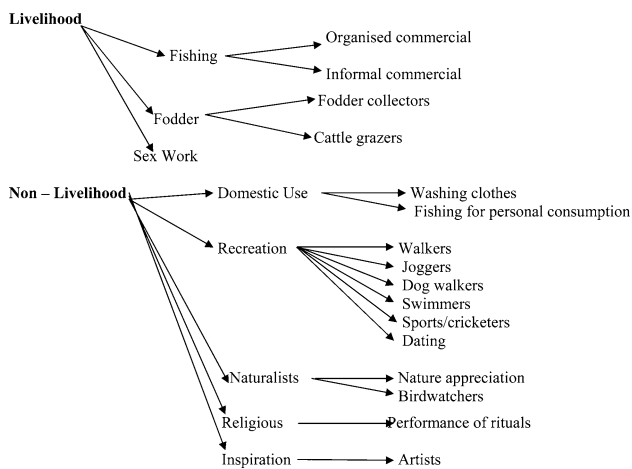
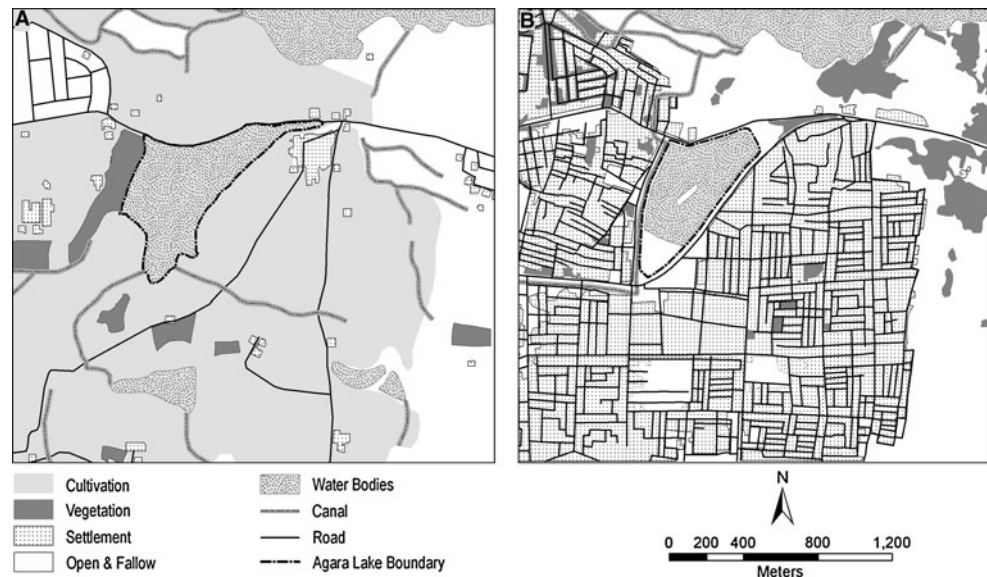


Fig. 3 Categories of park visitors based on the main purpose of the visit

shallow marshy parts of the lake with fishing nets. Some visitors also visit the lake as individuals using fishing rods, sitting along the northern semi circle of the lake—these visitors catch fish for personal consumption and not for sale, and have been categorized as non-livelihood users. An interview with a fisher from one of these organized societies indicated that they had not renewed their fishing lease, as the volume of fish catch had reduced substantially in recent months.

The informally organized fishers are largely young men from the surrounding villages of Jakkasandra and Agara, and catch fish for sale in local markets. Their ‘illegal’ fishing appears subject to negotiation and understanding with the guard and local police, as indeed observed during our field work. Fodder collectors were of two kinds: those who collected fodder to take with them to feed their cattle, and those who brought their cattle to the lake premises to

graze. Both cattle grazing and collection of fodder largely took place at the south-western end, in the marshy wetlands and open areas adjacent to the gate. Finally, some transgender sex workers frequent the overgrown park area to the north of the lake.

Non-livelihood users visited the lake for domestic use, recreation and leisure, religious and cultural use, inspiration, and naturalists such as bird watchers. Domestic use included washing of clothes, largely by migrant workers, and fishing for consumption. Walkers, joggers, dog walkers, swimmers, and players of games like cricket visited the lake for recreation, along with dating couples. Walkers, joggers and dog walkers used the path around the lake boundary. The many bushes along the path and the sloping embankments along the northern part of the lake provided a space for people to sit and relax. Religious visitors included those who performed specific rituals such as immersion of idols in the lake during specific Hindu festivals. A flight of steps on the eastern shore, near the main entrance, provided access to the water for such immersion, and was also used for washing clothes by individual fishers. The open area to the north was frequented by local youth to play cricket.

Changes in the Relationship Between the Lake and the Agara Village

It is clear from responses on the history and formation of the lake that the lake exists in the collective consciousness of the residents. They remember the lake as being in existence for a long period of time, “from 4 generations”, “100s of years”, “from my grandfathers times” etc. They indicated that there was an extensive and detailed practice of lake maintenance previously in place, with specific

communities in charge of maintaining the canals and bunds and collecting the silt. In addition, the local village governing body (the Gram Panchayat) and its representatives, as well as engineers from the Fisheries Department and the Minor Irrigation department provided inputs into lake maintenance. Historical uses of Agara, as with other lakes in this region, included the extraction of water for irrigation, household purposes, fishing and also as a public space (Rice and others 1897a). Older residents of the village indicated that bathing and washing clothes was done directly in the lake, while they collected drinking water from four wells in the village adjacent to the lake. The dominant land use in the area surrounding the lake was agriculture, as also indicated in old maps of the area (Fig. 2a). Rice and sugarcane, both water intensive crops, were most frequently planted. Currently, use of the lake by the Agara village seems to be almost non-existent. Most residents responded that they did not visit the lake—the few who do, visit primarily for walking.

Much of this disconnect can be traced to land use changes following urbanization. The interviews with local villagers indicate that a major landmark event was the creation of the HSR layout by BDA in 1986. Located to the south of Agara village, this layout resulted in an increase in land value and many parts of the wetland surrounding the lake were converted to other land uses (Fig. 2). Piped water supply was provided from the Cauvery river to the middle and upper class residents of the HSR layout, and also reached the Agara village. Changes in land use following the construction of a major road, the outer ring road that is adjacent to the village and the lake, filled up the four wells that the village depended on for their water supply. Agara lake thus stopped being a source of water for a majority of the village, and residents indicate that this severed a primary link between the village inhabitants and the lake.

As with other lakes in Bangalore, fishing was traditionally conducted by specific communities living in the adjacent Agara village. These traditional fishers from the village indicated their resentment at the Fisheries Department and the BDA for denying them leases to fish in the lake. Interviews with officials from the Fisheries Department indicated that leases are awarded based on bids from any fishing cooperative, and no preference was given to traditional users. Thus, the transformation from a previously informal and negotiated access to a centralized regulation through fishing leases by the Fisheries Department seems to have also contributed to this fracture of this local group's relationship with the lake.

Changes in Perceptions of the Lake as a Public Space

Over time, lakes of human origin have acquired natural characteristics and become nature preserves, yet their

transformation into urban landscaped spaces is perhaps the most significant change in their recent history. While Agara lake may function as a nature preserve in the mind of a naturalist, it is also a vital social space, attracting people from different ethnic, cultural, economic and social backgrounds. This has been recognized while “developing” many of these lakes through various urban rejuvenation programs, which have largely been designed keeping recreational and aesthetic values in mind, thus further shaping the notion of lakes as public spaces (Nair 2005). As with other cities, the activities that the users of such spaces intend to participate in could be passive, social activities, active individual or active group activities or water oriented activities or miscellaneous activities (Gobster 2002; Low and others 2005).

This further shapes the spatial differentiation between spaces such as those used by joggers and walkers, those used by people playing games such as cricket, and other areas used for grazing, collecting of fodder, washing of clothes, and fishing. While there are many spaces within the lake premises that various users can access and use, the different types of uses lead to some conflicts, because of the competing uses of the lake. For instance, migrant workers, informal fishers and collectors of grazing material can conflict with urban naturalists, people out for walks, or artists who perceive the lake in specific ways. Thus, urbanization can change the historical use and perceptions of public spaces like lakes considerably in the Indian context.

Differences in perception of the importance of the lake are perhaps most stark when one looks at naturalists, fishers, and poor migrants who wash clothes in the lake. The fishers are in competition with the bird population for the fish, whose populations are already impacted by the low levels of water and high levels of pollution in the lake. This has led to dissatisfaction among the naturalist groups and birdwatchers who visit the lake, and who have met with officials from various government agencies asking for a ban on fishing, as well as on the washing of clothes in the lake, which they feel will pollute the lake further. Thus there are different perceptions held by different socio-economic groups—wealthier visitors viewing the lakes as natural spaces and locations for recreation that should be maintained in a pristine condition, and migrant low-income workers and fishers who view the lake as essential sources for fishing and domestic use. Agara village residents also express dissatisfaction with granting of fishing licenses to organized fishing groups from outside, which have replaced their traditional fishing rights to the lake.

Discussion

This paper reports results from a long term program aimed at monitoring ecological, environmental and land use

change in the city (Nagendra and Gopal 2010, 2011; Nagendra 2010). As the city expands, formerly agricultural rural areas in the periphery are being converted to urban land uses. Thus in less than four decades, the landscape surrounding the lake and the village appears to have transitioned from a wetland-lake seasonal ecosystem acting as a village commons (Ostrom 2005), managed by community control and through local governing bodies, to a fenced and protected lake disassociated from the surrounding wetland-agriculture matrix, and managed under centralized and state control. From a state agency, the BDA, lake management was then transferred to a para-statal body, the LDA, and then under the Public–Private Partnership, leased to Biota Natural Systems, and now finds itself in administrative limbo, while waiting for a decision from the court. The lake is now poorly maintained, polluted with sewage and solid waste, overgrown with weeds, and with depleting water levels. Compare this to the condition of the lake even up until the 1980 s, when residents state that they were able to organize successfully to prevent a local hospital from dumping medical waste into the lake, while they now state that they have no influence on the management of the lake.

Public–private partnerships, which were initially envisaged for this lake, have been applied in a few other lakes in Bangalore before this process was halted due to intense action by local civic groups, leading to a public interest litigation. Several of the other lakes in the city that are managed through public–private partnerships have been largely managed with a view to profit making, and disregard for ecological services. Thus, activities such as motorized boating and creation of amusement parks next to the water area have been allowed, resulting in pollution of these waterbodies, and deterioration in the condition of these ecosystems. Fortunately, strong agitations from civic groups and citizens initiatives were critical in ensuring that the process of private involvement in this lake was not allowed to proceed. Yet, unfortunately, multiple lengthy litigations have led to the effective non-governance of the lake.

Public–private partnerships are not in themselves incapable of successful balanced outcomes. Yet, there is an onus on the government to ensure that such programs are steered towards addressing the needs of diverse groups of people, particularly those from disadvantaged sections of society—such as fishers and fodder collectors. Otherwise, especially in countries such as India, where socio-economic inequities are high, these partnerships remain vulnerable to takeover by special interest groups, or those interested in making profit at the expense of ecosystems (Miraftab 2004). Experiences from other Indian cities indicate that community involvement is critical in achieving the successful outcome of public–private partnered projects (Dutta 2000). Unfortunately, the “public” in

public–private partnerships is often the state, without any input from the community in either planning or execution of these projects. Thus the public sphere is capable of several meanings, which for some is a democratic site, but for others constitutes an exclusive domain (Blomley and others 2001).

Meanwhile, the public perception of the lake has largely shifted from that of a community maintained commons (Ostrom 2005), used for fishing, fodder collection, irrigation and drinking water, to an urban public space focusing on recreation and leisure, leading to the notion of the lake as an oasis of nature in the city, as well as a home for a diversity of bird species of interest to naturalists and bird watchers. In sheer volumes, the bird watchers and nature seekers outnumber other categories of users, though this group largely visits the lake during specific times such as morning and evening, and on weekends. A security guard stationed at the southern end of the lake is asked to prevent of entry of those whose activities are perceived as illegal, which includes a range of activities from collection of fodder and fishing, to washing of clothes, and sex work. Due to the litigation over the lease, there is no enforcement of this ban, and informal arrangements appear to be routinely worked out between these different users, the guard, and local police. This attempt to enclose and control commons and public spaces such as lakes contrasts with traditional access to such spaces as narrated by recent historic users such as those in Agara village, where lakes were used and managed through negotiation and traditional user rights, linked usually to community affiliation.

Thus with urbanization, lakes appear to be undergoing a shift in public perception as pristine “natural” spaces that need protection and enclosure, leading to calls for exclusion of visitors belonging to lower income groups, who use the lake for domestic use, fishing and other activities critical for them. The traditional users who maintained this lake have been sidelined in this process, and the governmental agencies that are supposed to maintain the lake are unable to do so due to a complex governance structure, with overlapping jurisdictions, compounded by an ongoing litigation. Similar trends are observed in other metropolitan centres in India as well (Chakravarty-Kaul 1990; Singh and others 2010).

While the authorities in charge of maintaining the lakes of Bangalore (predominantly, the LDA, BDA and BBMP) are engaged in lake protection and rejuvenation efforts, these appear largely focused on surveying, mapping and fencing these lakes, and on engineering and ecology oriented designs for rejuvenation. Little attention has been paid to understanding the social use of lakes as critical natural spaces in the city, or to developing approaches to lake design that enable the use of these areas by traditional community-based users for fodder collection, fishing, and

cattle washing, as well as for more contemporary urban uses such as jogging and bird watching.

This approach to urban ecosystem management goes contrary to learnings from meta-analyses of large numbers of ecosystem conservation and restoration initiatives around the world, though in non-urban contexts. The success of ecosystem management and conservation initiatives is greatest when community involvement is high (Brooks and others 2006); and such initiatives do not have a high chance of success unless they are integrated within the original cultural context within which these systems are managed (Waylen and others 2010). Yet rather than involving the original community-based users of the lake, or even attempting to understand the original cultural context within which this lake was successfully managed for centuries, urban management of Agara lake alienated the original community, instead choosing to engage in an abortive attempt at engaging in private partnerships that can only benefit a selected few. In this process, a critical natural space which has been in existence for at least 1200 years has been significantly reshaped, resulting in significant differences in the perceptions of the importance of the lake between traditional rural users, and recent urban visitors. While the communities that were formerly dependent on the lake received direct value from the lake in terms of drinking water, irrigation water, fish and grazing material, these lakes are now largely treated as recreational areas, of some value to all, but essential to none. Appreciation of the true ecological and social value of the services provided by the lake is critical to ensuring its continued future (Arrow and others 2000).

In the city context, where multiple agencies and groups are involved in the management of urban lakes, with often overlapping jurisdictions, powers and scopes for action, achieving effective governance by engaging different institutions working at multiple scales is critical (Ostrom 2010). Having active, engaged communities that interface closely with the state can be very useful, and it is also important to have inclusive plans that incorporating the needs and visions of multiple users from varied socio-economic backgrounds.

Other instances of collaborative restoration of urban ecosystems in Bangalore point to lessons for Agara. In the Kaikondanahalli lake in southeastern Bangalore, citizens have engaged in extensive discussions with the BBMP over the past three years for restoration (Nagendra 2010). The group is diverse, comprising urban researchers, educationists, inhabitants of the peri-urban villages around the lake, as well as representatives from recently built high-end apartment complexes. Consequently, lake restoration has been done keeping in mind the need for jogging and cycling paths for urbanites, as well as a cattle wash area for the peri-urban villages, and a clothes wash enclosure for

the poor and for migrant labor. The lake is adjacent to school that serves children from low income families, and the children's playground and facilities have been designed so that they can serve a dual purpose, accessible by the school children as well as lake visitors. Thus, this lake restoration provides an unusual model where attention is paid to the traditional and current urban uses of lakes by local residents from diverse backgrounds, and where close relationships have been developed between citizens and the government for better management of lakes. Yet in the Agara lake, where transformations have taken place in perceptions of value, and approaches of management, as the lake has changed in governance from community to the state, it is essential to assist this process of change by developing more inclusive, collaborative, collaborative management based on dialogues between local communities and the government. Such dialogues and collaborations can greatly help this critical ecosystem to increase its resilience to the inevitable transformations that emerge with urbanization.

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