Urban Ecosyst (2015) 18:613–632
DOI 10.1007/s11252-014-0401-0

Privatizing the commons: impact on ecosystem services in Bangalore's lakes

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Published online: 10 August 2014

Abstract The incipient megapolis of Bangalore, India, has historically been dependent on ecosystem services provided by an extensive network of lakes. Today, many of these lakes have disappeared or been degraded due to pressures of development and urbanization. This paper assesses the impact of governance through Private-Public-Partnerships (PPPs) in three lakes, by examining the impacts on provisioning and cultural ecosystem services, by comparison with adjacent, state managed (public) lakes. Public lakes support a greater diversity of traditional livelihoods, non-commercial uses and cultural services as compared to privatized lakes. PPPs thus appear to exacerbate inequities in access, in particular for users dependent on traditional livelihood services and cultural ecological services from lakes. Results indicate that implementation of PPP approaches need reconsideration from an equity perspective in cities of the global South.

Keywords Ecosystem services · Ecosystem privatization · Lake systems · Urban commons · Asia

Introduction

The urban landscape is a product of human interactions with nature (Heynen et al. 2006). Cities constitute complex social-ecological systems (Cumming 2011), and the sustainability and resilience of cities is strongly related to the ecosystems and ecosystem services they provide (Elmqvist et al. 2003; MEA 2008; TEEB 2011).

Within the complexity of the urban social-ecological system, urban commons deserve special mention. Commons, or common pool resources, refer to goods and services that are

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not excludable (difficult to enclose or limit access to), and where excessive use by one user reduces the benefits available to others (subtractability) (Berkes et al. 1989; Ostrom and Hess 2007). Today urban commons have become synonymous with a range of urban public spaces including lakes, parks, streets, wetlands, and remnant forests (TEEB 2011). Although ownership of these spaces rests with the state, a range of city residents and communities access them and influence their management, thus they constitute operational commons (Garnett, 2011).

While urban ecosystems are inherently vulnerable to loss of resilience and sustainability (TEEB 2011), this vulnerability is exacerbated in ecosystems that constitute urban commons, as a consequence of their increased susceptibility to enclosure and conversion to private or government regimes. In rural environments across most parts of the world, ecosystems such as lakes, wetlands and forests have been largely managed as commons (Ostrom and Hess 2007). With urbanization, many of these spaces experience a transformation from consumptive spaces with traditional, local cultural elements into locations of urban recreation (D'Souza and Nagendra 2011; Monbiot 1994). The trend towards rapid urbanization concomitant with rising land prices has also led to large-scale privatization of many urban commons.

At the same time, many governments have moved towards a regime of centralized control of services with respect to natural resources and commons (Ades and Glaeser 1995). Alongside these changes, the ability of the public sector to provide quality services has been severely critiqued (Milakovich 1991; Osborne 1993; Gael 2010. This growing dissatisfaction with state management has led to the rise in the prominence of Private- Public – Partnerships (PPPs) (Lanjekar 2009).

PPPs can be defined as 'the combination of a public need with private capability and resources to create a market opportunity through which the public need is met and a profit is made' (UNEP 1996; Budds and McGranahan 2003). The rationale for PPPs often arises during periods of 'regulatory slippage', when government management and monitoring deteriorate, providing space for new experiments with governance (Foster 2011). The PPP model invites greater participation from the private sector, especially in those roles where the government has traditionally been responsible. The entry of private stakeholders can bring in much needed infusions of capital, but can also result in the exacerbation of inequities in access to services, through resource commoditization followed by increases in pricing (Lanjekar 2009). This can further lead to disruption in the social fabric of local communities dependent on these resources (Foster 2006). Yet, PPP partnerships have gained favor globally, with many cities in different parts of the world having implemented such initiatives (Prager 1994; Domberger and Jensen 1997).

The imposition of access regulations following privatization strongly derives from unconfirmed perceptions that unregulated nature is over exploited (Rowe 2008). Yet, although privatization of public resources has been widespread in urban contexts, the impact of this change in governance remains poorly understood (Heynen and Perkins 2005; Foster 2006). Some scholars suggest that the privatization of urban commons has resulted in the exacerbation of environmental inequalities (Heynen and Robbins 2005). This is perhaps most clearly visible in the case of provisioning and cultural ecosystem services (Plieninger et al. 2013). Cultural values associated with a landscape are often locally specific, unique and irreplaceable (MEA 2008; Plieninger et al. 2013). It is therefore very important to understand traditional cultural services that have co-evolved locally with the ecosystem, and the interaction of these explicitly social features with the entire ecosystem (Schwartz 1997; Grimm et al. 2000; Alberti and Marzluff 2004; Redman et al. 2004). Unfortunately, cultural ecosystem services are also less researched, particularly within urban landscapes where planning has remained focused on urban recreational and provisioning ecosystem services (Tengberg et al. 2012; Milcu et al. 2013; D'Souza and Nagendra 2011). It thus becomes imperative that we understand how the impact of privatization can influence bundles of ecosystem services, especially within the context of provisioning as well as cultural ecosystem services.

The Indian city of Bangalore provides a useful context within which to examine the issue of privatization of the commons, and its' impact on access to ecosystem services. The city is India's fifth largest, with a population close to 8.4 million (Census of India, 2011), and struggles with the challenge of balancing intense economic growth and urban expansion along with conservation and management of its natural resources. Bangalore is known for its interconnected network of lakes that were for centuries traditionally managed as commons, but later experienced a transition to government control. In recent years, the city has experimented with PPPs in a few lakes. This situation provides an opportunity to contrast differences in ecosystem services provided by privatized and public lakes, and to assess the influence of privatization on land use within and around these water bodies. We focus on provisioning and cultural ecosystem services and map them by contrasting public and privatized lakes in order to understand the impacts of different governance regimes.

Study area

Bangalore

Bangalore is located in the semi-arid Deccan plateau, in a region prone to water scarcity. The city has historically accessed fresh water from a network of hundreds of interconnected, artificial lakes that were distributed across the region (Rice 1897). There are four major watersheds associated with Bangalore, in the Hebbal, Koramangala, Challaghatta and the Vrishabhavathi valleys (Sudhira et al. 2007; Mahapatra et al. 2011). Some of the lakes in the city can be dated as far back as the 4th century A.D. (Annaswamy 2003; Rice 1905), and hold significant historical and cultural importance for Bangalore. In a sense, the social history of human settlement in Bangalore is intimately linked to its ecological profile, with the city constituting a tightly coupled social-ecological system (Mathur and da Cunha 2006).

Apart from serving as important sources of fresh water, Bangalore's lakes have provided important cultural contexts for religious ceremonies, for livelihoods such as fishing and grazing, and for recreational activities such as nature watching and art (D'Souza and Nagendra 2011; Sudhira et al. 2007; Sundaresan 2011). These lakes are now facing severe challenges due to pollution, encroachment and disruption in connectivity following urbanization (Narayanan and Hanjagi 2009). The degradation of lakes has exerted considerable impact on the social fabric of neighborhood areas (Sundaresan 2011). Lake degradation and disappearance has also led to environmental and health consequences that range from flooding and increased urban heat island effects to decline in ground water and increased incidence of mosquito-borne infectious diseases (Prasad et al. 2002; Kiran and Ramachandra 1999; Gowda and Sridhara 2007).

Bangalore's lakes have thus served communities around them in diverse ways. The city provides a useful context to follow transformations in social ecological systems following changes in governance and managerial regimes. As with all commons, the issue of lake management and maintenance has proven to be highly challenging for city administrators. A number of institutions are associated with the management and maintenance of lakes, including the Bangalore Development Authority (BDA), the *Bruhat Bengaluru Mahanagara Palike* (BBMP), Forest Department, Minor Irrigation and Fisheries, Pollution Control Board, and various Indian Armed Forces establishments. In 2002, the Lake Development Authority (LDA) was formed with the aim of consolidating management of all lakes within the city – an objective that has not yet been achieved (Center for Science and Environment 2013). Today,

this nodal agency is one among the many that are accountable for this function, rendering unclear the issue of accountability for the current decline of lakes.

The foundations for this paper lie within a significant undertaking of the LDA, which in 2004 leased out lakes to private parties for management. The organization invited tenders for privatization of four lakes in the city - Hebbal Lake, Nagavara Lake, K.R. Puram Lake (Vengaiahnakere) and Agara Lake. The exercise was conducted without extensive discussions or inputs from the general public or community stakeholders. The implementation was also carried out in the face of strong public opinion against this decision (D'Souza 2006; ESG 2008). The PPP model did not proceed further in one of these lakes – Agara – due to legal interventions through a Public Interest Litigation by the Environment Support Group (D'Souza and Nagendra 2011, D'Souza (2011). Thus, we selected the remaining three lakes for this study.

These lakes were leased out to private enterprises for development into revenue generating ventures. Lessees were responsible for overall maintenance of the lake, and were permitted to develop the lakes into profit-making recreational facilities for the paying public (D'Souza 2006). While privatization of additional lakes has subsequently been discontinued in Bangalore, there is a recent resurgence of interest in what is being termed "People Private - Public- Partnerships across India, as well as within Bangalore, specifically focused on lakes: underscoring the need for detailed studies of these previous experiments with privatization.

Study design: Paired public-private lakes

For each privatized lake, a companion public lake was chosen for comparison, taking care to select an adjacent lake of similar size in the same sub-network for maximum comparability. These lakes differ primarily in terms of their governance structures as well as the nature of land use around them. The three privatized lakes identified for the study are Hebbal Lake, Nagavara Lake (also called Lumbini Gardens following privatization) and K.R. Puram Lake or Vengaiahnakere (also called Fantasy Lagoon, or *Hagalu Kanasina Kere*, following privatization). The corresponding publicly managed lakes are Rachenahalli Lake, Jakkur Lake and Kodigehalli Lake or Sadaramangala Lake respectively (Fig. 1). Given that the city has only three privately developed lakes as explained earlier, we believe that this study site selection is adequately representative for the purposes of this study (Table 1).

Methods

Field research for the study was conducted between July-August 2012. This corresponds to the post-monsoon season in Bangalore, when water levels are maximum, and when lake use is at its highest during the year. At each of the six lakes under study, two researchers conducted a transect walk along the immediate periphery of the lake. In private lakes, surveys were conducted after payment of the required gate entry charges. The area extending from the periphery of the lake to 500 m outside the lake boundary was also surveyed, with the exception of areas that were inaccessible to researchers, largely due to private land use restrictions imposed by landowners and managers. Lake boundaries were identified based on fencing at their periphery, which provided a basis for demarcation. Field visits were conducted both during the weekdays as well as during weekends. We also took care to conduct our observations in the mornings as well as evenings in order to capture the maximum range of activities – both commercial and traditional that occurs in and around the lake. Three transect walks were undertaken around each lake - on a weekday morning, a weekday evening and a weekend. Researchers ensured they accessed areas distant from roads and lake gates in order to obtain a

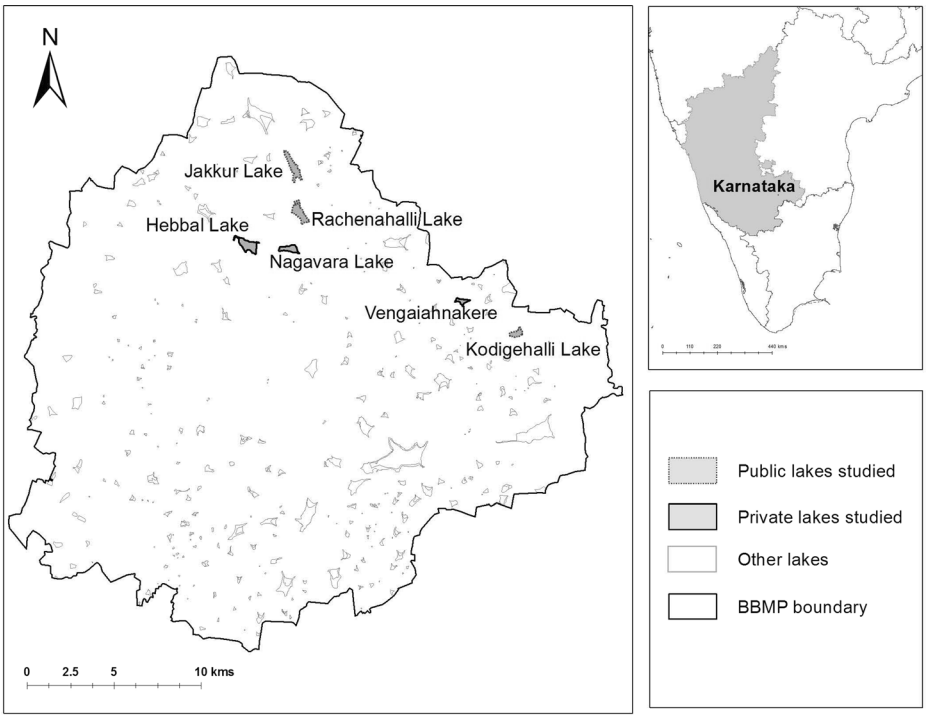

Fig. 1 Study area: Location of study sites within the city of Bangalore, Karnataka, India

comprehensive assessment of activities around all parts of the lake. During each transect walk, the provisioning and cultural ecosystem services accessed by lake visitors were recorded.

In order to map ecosystem services through their users, we adopted two approaches to collect our data. The first was by means of direct visual observations of people engaged in a particular activity such as fishing. The second was through indirect evidence of uses such as alcohol consumption through observation of indicators such as discarded alcohol containers or of religious ceremonies through observation of waste (such as old flowers or coconuts) observed around the water body. .

The activities observed at each lake were further categorized based on the nature of activity involved and the kind of ecosystem service it represented. Based on the nature of activity, three categories were identified– commercial, subsistence and non-income generating. Commercial activities included those directly aiding profit making such as commercial fishing, manufacture of mud bricks and commercial water based recreation. Subsistence activities were those activities which benefited the user and his or her family. Such activities as the harvest of fodder grass, green leafy vegetables, reeds as well as livestock grazing were grouped under this category. Other domestic, recreational and spiritual uses of the lake were grouped under the non – income generating category. Each of these uses was also classified based on the type of ecosystem service it provided – provisioning or cultural, based on the definitions provided in the Ecosystems and Well Being: Manual for Assessment Practitioners (Ash et al. 2010).

Detailed observations were made about the types of land use at the periphery of the lake (within a distance of 500 m from the lake fence), with specific attention to the type of

Table 1 Description of study sites

Study sites	Private	Public
Pair 1	Hebbal Lake: Located in North Bangalore, and part of the Hebbal Valley, covering an area of 57.75 ha. The lake was leased out to East India Hotels Ltd (the Oberoi group) for a period of 15 years in 2004. The lake is situated very close to the Outer Ring Road and the Bellary Road Junctions.	Rachenahalli Lake: Also located in north Bangalore, and part of the Hebbal Valley. The lake has recently been restored by the BDA.
Pair 2	Nagavara Lake: Situated in North Bangalore, and part of the Hebbal Valley, this is a privatized lake of approximately 43.86 ha. Leased out in 2004 to Lumbini Developers, following which the commercial park within its premises is called Lumbini Gardens. Intensive commercial landscaping for lake, including water sports, children's play area, and food court.	Jakkur Lake: Situated upstream of the Nagavara Lake, part of the Hebbal Valley Network. The lake is situated adjacent to Jakkur Village.
Pair 3:	Vengaiahnakere: Situated in Eastern Bangalore, and part of the Koramangala-Challaghatta Valley. Also known as KR Puram lake, and called Fantasy Lagoon (Hagalu Kanasina Kere) following privatization. Leased out in 2004, to Par C Limited. The lake has been developed as a commercial park with a specialized children's area, a food court, jogging path and boating areas.	Kodigehalli Lake: Situated in Eastern Bangalore, and part of the Koramangala-Challaghatta Valley. Also known as Sadaramanagala Lake. Access to this lake is mainly through traditional bunds built by the villagers.

settlements around each lake (high and middle-income vs poor settlements) (Table 2). Spatial locations of specific uses and types of settlements were recorded using a Geographical Positioning System (GPS), and were used to create detailed land use maps for each of the studied lakes.

Table 2 Description of housing categories

Character	Low income housing	Middle income housing	High income housing
Roofs	Thatched or corrugated iron sheets	Cement roofs	Cement roofs, often with luxurious facades
Walls	Mud, corrugated iron sheets or tarpaulin sheets	Mud or cement	Cement
Construction	Single to double roomed structures, often housing many households within the same land or building	Modest single to multi roomed houses or apartments with or without a parking lot	Luxurious buildings or apartments with large parking space and other amenities such as a swimming pool, children's play area etc.
Surroundings	Low lying or low valued areas such as those next to a drain or a landfill, with few civic amenities such as tarred roads, public toilets and street lamps	Government or private layouts often at some distance from the lake, budget apartments, with ample civic amenities.	Gated communities, often next to lakes, both with civic amenities as well as other facilities such as a community club, gym etc. within the locality.

Results

Differences in land use

In general, we observed that land use near the privatized lakes is mainly commercial, while that around the public lakes was quite heterogeneous at the time of this study. This heterogeneity is in the form of rural settlements and livelihood based land uses interspersed with those that are representative of urbanity such as apartments and gated communities Fig. 2.

Hebbal Lake and Rachenahalli Lake

Hebbal Lake A commercial park was developed around this lake subsequent to its administration and privatization by the Lake Development Authority. An entry fee of Rs.15 (roughly 0.24 USD) is charged per adult visitor. The area of the lake accessible to park visitors is restricted to a portion of the lake facing a high volume traffic road, the Outer Ring Road. Owing to the large area of the lake and the presence of multiple unmanned entry points into it, the entry fee does not appear to restrict entrance into the lake. Unauthorized access is penalizable through fines, although this seems to be poorly enforced.

The lake is largely surrounded by commercial enterprises and low to middle-income settlements. Some sections of the lake that are distant from the road are surrounded by fallow land and land belonging to the Indian Armed Forces.

Rachenahalli Lake This public lake is part of the Hebbal Lake sub-network, and is managed by the Bangalore Development Authority, connected to three villages. The lake is bounded by three academic institutions, a gated residential community, rural and peri-urban low-income settlements of local adjacent villages, and a large grazing land. Land use is heterogeneous, with agricultural fields and pasturelands interspersed with slums, high-income houses and a few commercial establishments Fig. 3.

Nagavara Lake and Jakkur Lake

Nagavara Lake This privatized lake contains an amusement park that offers boating and other water-based recreational activities. There is one entry point into the lake that is accessible to users on payment of an entry fee of Rs.20 (approximately 0.32USD). All other entry points into this lake are locked. The lake connects with a village on the eastern, the previously mentioned Outer Ring Road to its west and another main road to its south.

Land use around the lake is primarily commercial in nature, with numerous informal establishments including stone sculptors, transport warehouses and small shops. A prominent Information Technology park and a few engineering colleges are also located near this lake. The village consists primarily of low-income households.

Jakkur Lake This is a public lake downstream of the Nagavara Lake and connects with three villages as well as a recently formed residential gated community. It is managed by the Bangalore Development Authority.

A railway line and main road are located close to the lake; however, land use around the lake is semi-rural with wetlands and pasturelands interspersed with small villages and open areas, as well as recent gated communities and apartments. A sewage treatment plant is present

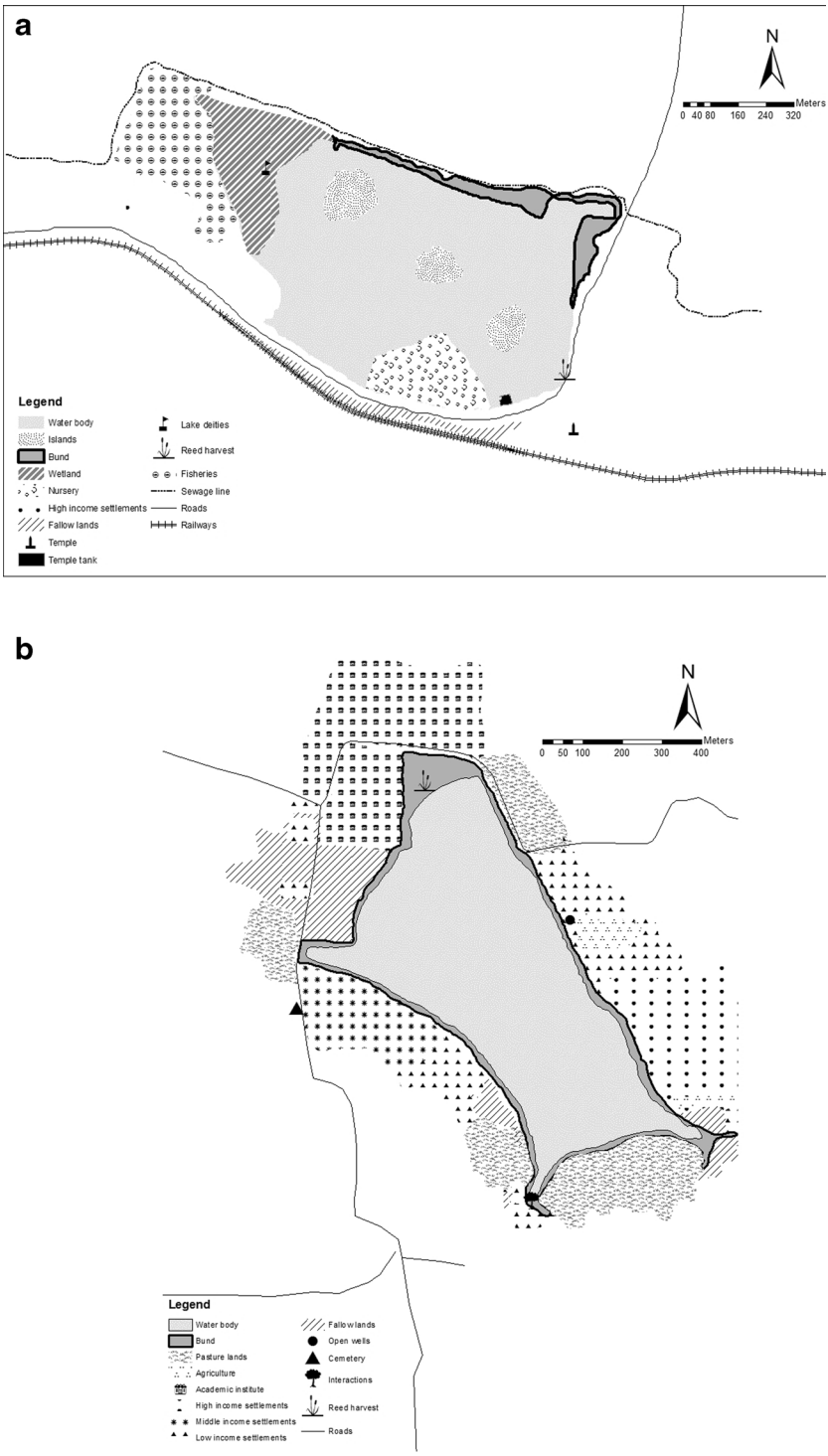

Fig. 2 **a** Land use map – Hebbal Lake. **b** Land use map – Rachenahalli Lake

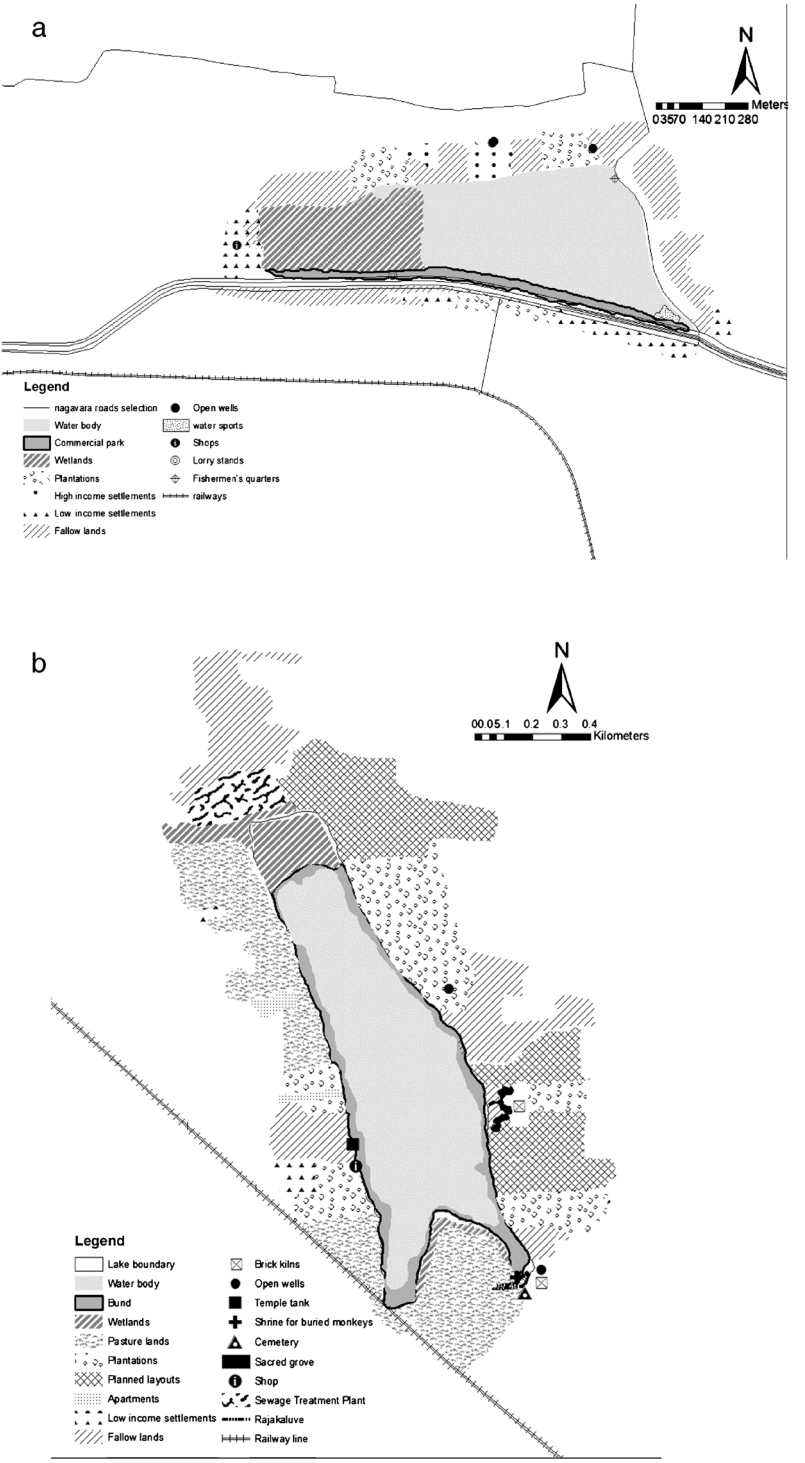

Fig. 3 **a** Land use map – Nagavara Lake. **b** Land use map – Jakkur Lake

at the northern end of the lake while a sacred grove or "gundu thoppu" is located near the east, accessed by nomadic communities and as livestock grazers Fig. 4.

Fig. 4 **a** Land use map – Vengaiahnakere. **b** Land use map – Kodigehalli Lake

Vengaiahnakere and Kodigehalli Lake

Vengaiahnakere This privatized lake is located within the Koramangala Challaghatta Valley. A commercial park was constructed along its banks with provisions for a food court and recreational facilities including boating and a children's play area. Entry into the lake is regulated by means of a fee of Rs.30 (approximately 0.47 USD) per adult. Unlike the other privatized lakes, an additional surcharge of Rs. 100 – Rs. 150(approximately 1.69–2.53 USD) is levied for the use of electronic equipment such as cameras and video recording devices.

The landscape surrounding to the lake includes residential layouts, a prominent academic institution and a sewage treatment plant. Commercial enterprises are present along the eastern edge of the lake, which is also connected to a busy main road.

Kodigehalli Lake This is a public lake downstream of Vengaiahnakere, and is situated in a peri-urban neighborhood. The lake is relatively inaccessible from large motorable roads and does not attract a large number of visitors.

Agricultural fields and plantations surround the lake. The fields towards the northern end of the lake are fallow with two sewage channels feeding into them. A large slum rehabilitation project was nearing completion at the time of the study. Two disused open wells, a mud brick-manufacturing unit and a few commercial enterprises were located near the northern edge of the lake.

Differences in ecosystem services

A diversity of provisioning and cultural ecosystem services were observed across the six lakes studied, as characterized further in Table 3.

Table 4 presents a comparison between privatized and public lakes in terms of the ecosystem services observed around the lakes.

Provisioning services

Activities, which do not involve community initiatives, and are centrally controlled, such as commercial fishing are common to both private and public lakes. Commercial fishing is regulated by the Minor Irrigation and Fisheries department and therefore exclusionary regulations such as admittance fees do not restrict their activities. In contrast, occupations such as commercial washing of clothes and the manufacture of mud bricks are only observed in public lakes. These constitute traditional livelihood occupations that are characteristic of the village communities who are long-term residents of this landscape. These people have historically maintained these lakes before they were engulfed by the expanding city, and their management was taken over by the city municipality.

Services ensuing from commercialization of the commons such as the levy of an entry fee and sale of tickets for amusement rides are, of course, exclusive to the privatized lakes. In contrast again, subsistence activities such as the grazing of livestock and harvest of fodder grass, green leafy vegetables or reeds, which do not require direct access to the water body, but can take place either on its periphery or wetlands are found in all public lakes. However, they were observed in only one privatized lake – Hebbal – due to its large area and the difficulty in securing the periphery of the lake from unauthorized visitors. Even in privatized lakes, thus,

Table 3 Diversity of activities observed around lakes under study

Serial number	Activity	Description and actors involved	Type of inference		
			Direct	Indirect	Both direct and indirect
1	Commercial fishing	This is centrally managed by the state fisheries department and is enabled through a competitive tender based process. Fry of predetermined fish species are let into lakes where they are raised along with a few other species already present in the water body. These are then collectively harvested at appropriate times of the year. Common fish species include *Labeo*, *Catla* and *Tilapia*.	X		
2	Sale of tickets	Another centrally managed venture. Tickets sold are those for the commercial park, water based amusement rides and the children's play area	X		
3	Commercial laundering	This activity is performed by members of a washing community who collect clothes from houses, hospitals and hotels in the vicinity for laundering. People of this occupation are mostly women but also include a few men. They provision water from the lake to wash clothes often at its banks. The washed clothes are also set up for drying near the lake, after which they are carried back in vehicles.	X		
4	Manufacture of mud bricks	This activity provisions water and mud and therefore large manufacturing units are often set up on the banks of water bodies. Often set up by members of nearby communities as a livelihood means.	X		
5	Groundwater extraction	Is accomplished by means of bore wells dug into the aquifers near the lake and is carried out for three main purposes. The first and most commonly observed reason is for water supply companies that provide drinking water in tankers to localities without a piped drinking water connection. The second commercial objective of extracting groundwater is to maintain agricultural lands near the lake. A third purpose was for the maintenance of water in lakes which offer commercial water based recreational facilities such as boating and wave pools.			X
6	Surface water extraction	Surface water from the lake is provisioned for agricultural purposes by means of special lever like constructions made of stone and metal. They are operated by specific members of local communities called *"neergantis"* whose responsibility it is to provide appropriate quantities of irrigation water to the surrounding fields.	X		

Table 3 (continued)

Serial number	Activity	Description and actors involved	Type of inference		
			Direct	Indirect	Both direct and indirect
7	Harvest of fodder grass, green leafy vegetables and reeds	This was performed by women of local communities working in groups, both around the lakes on its periphery or surrounding wetlands. The harvest is then used as cattle feed within households or as subsistence for the family.	X		
8	Livestock maintenance	This includes both grazing as well as washing cattle belonging to villagers from villages surrounding the lake. In cases where we did not directly observe this activity, the presence of cattle and sheep dung served as useful indicators.			X
9	Collection of dry twigs	Dry twigs from trees and shrubs near the lake were collected by women of nearby marginalized communities for use as firewood.	X		
10	Domestic activities	Bathing and washing clothes. Marginalized members of local communities are often seen using these services.	X		
11	Sale of refreshments	In and around the immediate vicinity of the lakes. This activity capitalizes on visitors accessing recreational utilities provided by the lake.	X		
12	Real estate markets	Manifests itself in the form of hoardings that advertise the benefits of lake front living. Creates opportunities for new gated communities and other housing ventures.		X	
13	Dedicated space for cultural interactions	People from various communities gather around specific spots around the lake for relaxation or to interact with each other.	X		
14	Amusement rides	Boating, water slides, wave pools and other water based recreational activities.	X		
15	Angling	Recreational fishing using rods was practiced by local youth who found this a relaxing pastime.	X		
16	Exercise	Used by local residents as walking or jogging tracks for daily exercise.	X		
17	Other recreational pursuits	Bird watching, dating and consumption of alcohol. The presence of alcohol tetrapacks, bonfires and food remains served as useful indicators for alcohol consumption.			X
18	Spiritual activities	Included three main activities. A traditional part of village life, people worship sculpted stones representative of a belief in protective deities of the lake. This also relates to the provisioning of water and other resources from the lakes. The second is the ritualistic burial of monkeys around water bodies. Monkeys are spiritually venerated here as a divine incarnation and			X

Table 3 (continued)

Serial number	Activity	Description and actors involved	Type of inference		
			Direct	Indirect	Both direct and indirect
		thus when they die, communities get together to feast and give it a traditional burial. The place of burial subsequently becomes spiritually significant to them. Water bodies are also used to perform a range of other religious ceremonies such as those performed at weddings or deaths. Evidence of such rituals is provided by flower garlands, vermillion and other religious materials scattered near site of worship.			

some of these activities continue to take place in areas around the lake, where access restrictions to the water body itself do not apply. Finally, while groundwater is extracted for agricultural purposes from both private and public lakes, only public lakes provide domestic water supply through open wells at their periphery. Related to this, only public lakes provide water accessed for domestic uses such as bathing and washing clothes, which is particularly adopted by migrants and poorer households from local neighborhoods. The imposition of entry fees coupled with usage regulations around private lakes effectively act as a barrier to marginalized people who depend on these lakes for domestic use and consumption.

Cultural ecosystem services

Recreational activities such as walking and jogging were common to both private and public lakes. Sacred cultural elements were frequently observed in all public lakes, while less prevalent in privatized lakes. Relics indicating the abandonment of former worship (such as disused stone idols) were found near two private lakes, attesting to their former spiritual significance. The presence of these discarded religious relics is also suggestive of a gradual alienation of communities from the water body, aided perhaps by restrictions on access and appropriation due to the boundaries imposed by private management. Further, sacred groves and village forests, commonly found near most lakes in this region, were not observed near any of the privatized lakes, further lending support to the theory of alienation of people from the resource. In contrast, in areas surrounding the commercialized privatized lakes, proximity to the lake appears to be a selling point for the real estate market, with hoardings prominently advertising the sale of "lake front" property, and high income land development in the form of gated communities and commercial establishments. The only exception was one public lake, Rachenahalli Lake, which also supports a high end is real estate market aided by the presence of multiple academic institutions and a gated community in the vicinity.

Discussion

Strong social networks and cultural identities are extremely important in maintaining a city's innate resilience to change, perhaps even more so than infrastructural advances (Campanella

Table 4 Comparison between private and public lakes in terms of ecosystem services derived

Description of activity	Nature of activity			Type of Ecosystem service		Lakes					
	Commercial	Subsistence	Non-income generating	PES	CES	Private			Public		
						1	2	3	1	2	3
Commercial fishing	X			X		X	X	X	X	X	X
Sale of tickets to commercial park	X			X		X	X	X			
Sale of tickets to water based amusement rides	X			X			X	X			
Sale of tickets to children's play area	X			X			X	X			
Harvest of fodder grass, green leafy vegetables and reeds		X		X		X	X		X	X	X
Collection of dry twigs for use as firewood			X	X		X					
Commercial washing of clothes	X			X					X	X	
Manufacture of mud bricks	X			X						X	X
Groundwater extraction for maintenance of lake	X			X			X				
Groundwater extraction for agriculture	X			X		X	X		X	X	X
Groundwater extraction for domestic use	X			X						X	X
Diversion of lake water for agriculture			X	X							X
Bathing			X	X		X			X	X	X
Domestic washing of clothes			X	X		X			X	X	X
Sale of refreshments inside and outside the lake	X				X	X	X	X			
Real estate advertisements that emphasize "lakefront living"	X				X	X	X	X	X		
Livestock grazing		X		X					X	X	X
Livestock washing		X		X					X	X	X
Dedicated space for cultural interactions between surrounding communities			X		X				X	X	X
Water based amusement rides			X		X		X	X			
Angling			X	X					X	X	
Walking			X		X	X	X	X	X	X	X

Table 4 (continued)

Description of activity	Nature of activity			Type of Ecosystem service		Lakes					
	Commercial	Subsistence	Non-income generating	PES	CES	Private			Public		
						1	2	3	1	2	3
Jogging			X		X	X	X	X	X	X	X
Dating			X		X	X	X	X			
Consumption of alcohol			X		X	X	X	X	X	X	X
Bird watching			X		X	X	X		X	X	
Worship of stones representing lake deities			X		X	X					X
Idol immersions			X		X	X				X	
Burial of monkeys			X		X					X	
Other religious rites			X		X				X	X	X

Private lakes: 1 = Hebbal, 2 = Nagavara, 3= Vengaiahnekere

Public lakes: 1 = Rachenahalli, 2 = Jakkur, 3= Kodigehalli

2006). It has been said that a society's capability to withstand change lies in its actors, the strength of its social networks and its institutions (Lebel et al. 2006). We argue that in the context of the transformation of urban commons, there has been an alienation of both actors and social networks from the ecological landscape. According to the Constitution of India, the state serves as a custodian of the commons while actual ownership rests with communities who access and appropriate from the resource (Justice NK Patil Report 2011). The principle however does not seem to have been implemented in the current context of commons within the country. .

The demands around a resource include the material and the imagined - brought through the agency of culture and the symbolic that revolves around feelings evoked by the resource. The presence of these demands and their realization leads to the circulation of capital in the landscape. This circulation of capital creates possibilities for the improvement of infrastructure around the resource by the people who have access to it. Once the resource is 'tamed' or controlled, it begins to evoke an alternate cultural imaginary of circulation that emphasizes that resources are finite and there is a need to conserve them. It eventually leads to what has been called privately managed scarcity, which leaves access to the resource in the few hands deemed capable of accessing it (Oliver 2006). The resource becomes revalued and re highlighted as a scarce economic good that must be paid for in order to access its services (Smith and Ruiters 2006). This commoditization of services also necessitates the identification of and the commercialization of single services as against the multiple ecosystem services derived from a non-commercialized resource (Muradian and Rival 2012). In this study, we have discussed the initial impetus to conserve the finite resource by bringing it within state governance and attempts to bring in private management of that scarcity. This management includes actors who can pay for services that derive from the ecosystem and excludes those who cannot.

By mapping the users of each lake in this study, we were able to demonstrate differences in provisioning and cultural ecosystem services as well as issues relating to equitable access of the resource. This spatially explicit method seems to have greater sensitivity in capturing diversity in cultural ecosystem services as well as the tradeoffs involved and agrees with previous studies on assessing cultural ecosystem services (Morcillo et al. 2013). We observed that ecosystem services derived from a resource are a product of many experiences and interactions people have with the ecosystem (Tengberg et al. 2012) and hence may not fit neatly into specific categories.

This study also agrees with other similar studies in that it confirms the existence of relics that point to a consumptive use of a lake while showing that there is a transition of the resource into being purely recreational and unequally beneficial. For example, a study conducted at the "Rajapalayam Lake" (a pseudonym for a lake in Bangalore) concluded that the communities surrounding the lake have become alienated from the formerly important resource due to a combination of local neglect of the resource and bureaucratic mismanagement of the lake (Sundaresan 2011).

Following privatization of lakes in Bangalore, changes have been observed in the use and access of these lakes. Privatization of water bodies appears to have resulted in reducing access to certain traditional groups of resource users to the lake, in particular for domestic, traditional livelihood and cultural uses. A potential reason for the conspicuous absence of the use of privatized lakes for these purposes could be the imposition of restrictions in accessing the lake. Restrictions in the form of entry charges as well as the overall focus on recreation and aesthetics, favours the presence of certain groups of users (such as joggers and park visitors) over others (such as grazers and people washing clothes), leading to the exclusion of marginalized communities. People dependent on traditional lake-associated livelihoods and on lakes for domestic and subsistence use often belong to already marginalized communities of village inhabitants and migrant workers, and their exclusion from common spaces is made

complete by policies such as privatization. This loss of dependency on a resource system may lead to decreased social ecological resilience of the system in the long run.

Efforts towards the privatization of lakes in Bangalore seem to follow a discursive shift. From being projected as a public good in surplus that was used abundantly in history into one where the discourse of scarcity took over, lakes are being transformed in the public view into a commodity that can be accessed only by the capable. The discourse on scarcity (Kaika 2006) directs the path of policy towards exclusionary measures such as privatization, which serve to transform erstwhile common spaces with many functions into commodities with one specific purpose, of monetization of ecosystem services. Cultural ecosystem services are perhaps most ignored in these discourses, being a product of dynamic and complex interrelations between humans and ecosystems over extended time scales (Fagerholm et al. 2012; Plieninger et al. 2013). In our study too, this seems to be the case with recreational uses being prioritized over the cultural. However, given that the city's urban character follows a continuum with its erstwhile rural nature (Nagendra et al. 2013), distinctive cultural uses were observed as being part of the social ecological landscape. These seem to be largely ignored in decision-making processes however. Global governance regimes including those of India, have proven to be extremely myopic towards the complexities of socio ecological systems built around natural resources and the potential disruption,certain policy measures have upon them (Smith and Ruiters 2006).

The PPP articulation with its rosy discursive arguments of decentralized service delivery and governance closer to people has in fact a tendency to depoliticize its services and discursively transform its citizens into customers (Smith and Ruiters 2006). It is imperative that these issues be taken into account for inclusive and socially just policy measures aimed at governing common spaces, in such a manner as to provide the maximum benefits of ecosystem services to all who can access the resource. Given the recent resurgence of interest in "People Private -Public- Partnerships" internationally, as well as more locally within India and in Bangalore, lessons from this study indicate that concerns of equity and fairness need to be paramount while engaging with new forms of governance.

Acknowledgments Financial support for this study was provided by a PEER grant from USAID, and from a Department of Science and Technology, Government of India Ramanujan Fellowship to HN. We thank Manjunath B for his assistance with field data collection and analysis, and Sreerupa Sen for assistance with spatial analysis. We also thank Maria Tengö and Johan Enqvist for their feedback on earlier versions of this manuscript.

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