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Can 'Coproduction' Address Governance Gaps? Recognizing Unrecognized Practices in Accessing WATSAN Services in Peri-Urban Kolkata

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Abstract

The world appears to be on track to halve the number of people without access to safe clean water. However, in the urban Global South, this success masks regional and local inequalities and this is particularly acute in the growing peripheries or peri-urban fringes of existing cities. These areas are marked by high levels of inequality where the marginal people lack access to basic infrastructural amenities like piped drinking water supply and sanitation. Water supply and sanitation (WATSAN) services in these areas are characterized by lack of public policy-driven initiatives and there now seems to be widespread agreement that in developing countries the state alone will be unable to meet the internationally agreed targets for reducing the number of urban dwellers with no access to these services. On the other hand, recent attempts to involve private investors in this sector have not yielded the desired results of expanding network coverage to low-income urban and peri-urban settlements which are regarded as less profitable than wealthier and more central areas of cities

Within this context, the study emphasizes on building upon innovative planning and governance interventions by conceptualizing peri-urban areas not only as regions marked by high levels of inequality but also active experimentation in new ways to fill in provision gaps. It moves beyond dichotomous public-private debates to explore and recognize the potential of alternative needs-driven WATSAN arrangements for and by the peri-urban poor. Along with an emphasis on understanding and documentation of needs-driven initiatives from below, the paper also explores if WATSAN governance gap can be addressed by abridging (or coproducing) community-led efforts with those of the state not just to fill provision gaps but also to make it operational at scales, while integrating watershed management and activating citizens' rights and entitlements. It inquires if 'coproduction' can be considered as the major innovative strategic

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intervention towards new configurations of WATSAN governance. The theoretical framework of the paper is based upon thorough empirical research findings in peri-urban parts of eastern Kolkata.

Keywords: Coproduction, WATSAN, Water Supply, Sanitation, Peri-urban, East Kolkata Wetlands, Kolkata

Introduction

The world appears to be on track to halve the number of people without access to safe clean water. But in the urban Global South, this success masks regional and local inequalities and this is particularly acute in the growing peripheries or ‘peri-urban’ fringes of existing cities. Rapid urbanisation or urban sprawl today in the Third World is marked by numerous problems and challenges including the burgeoning slums and squatter settlements; lack of citywide infrastructure such as housing, health, sanitation, privatisation and commercialisation of infrastructure; conversion of ecosystem resources affecting the livelihood opportunities of ecologically dependent marginal communities; and the changing nature of the rural–urban divide leading to formulation of ‘peri-urban’ in urban and regional planning discourses (Mukherjee, 2015). ‘Peri-urban interface’ (PUI) can be conceptualised ‘as a specific context where both rural and urban features co-exist, in physical, environmental, social, economic and institutional terms’ (Allen, 2010, 28). It is estimated that approximately 45% of the 1.4 billion people who will join the world urban population by 2020 will live in peri-urbanizing areas (Webster 2004). These areas are marked by high levels of inequality where the marginal people lack access to basic infrastructural amenities like piped drinking water supply and sanitation (WATSAN). Here, WATSAN characterized by uncertain dynamics, interlocking social, technological and ecological or hydrological dimensions of water and sanitation. Moreover, the lack of formal, public utilities can be explained by overlapping jurisdictions in the PUI along with poor clarity and coordination of management responsibilities (Allen, 2003, 2010).

There now seems to be widespread agreement that in developing countries the state alone will be unable to meet the internationally agreed targets for reducing the number of urban dwellers with no access to clean water. This is partly a legacy of decades of supply-led engineering approaches with high operating costs and under-utilized investment, unrealistically high standards of per capita service to formal urban areas and a general disregard for the needs of unregulated or ‘illegal’ urban and peri-urban settlements (Allen, 2010). Often the infrastructure costs of extending a water line and sinking in new pipes are much more expensive than installing a new system all together (Marshall et al., 2009). On the other hand, recent attempts to involve private investors in water supply and management have not yielded the desired results of expanding network coverage to low-income urban and peri-urban settlements which are regarded as less profitable than wealthier and more central areas of cities (Cook & Kirkpatrick, 1988; Johnstone & Wood, 2001).

While publicly or privately operated policy-driven utilities fail to serve the majority of the peri-urban poor, the latter seems to rely mainly on a wide spectrum of needs-driven and demand-driven practices which often remain invisible and hence unrecognized to policy makers and lack formal support strategies and mechanisms (Allen et al., 2006). Again, various actors and stakeholders from the state, private agencies and consumers engage together to 'coproduce' services. The concept of 'coproduction' has found strong ground recently to help us avoid binary and normative categorisations surrounding 'public' and 'private' as distinct entities (Ostrom, 1996). Coproduction describes 'a process where hybrid service provision modalities are produced as a result of the articulation of socio-political, economic, biophysical and infrastructural drivers whose interaction constitutes new practices, thereby producing new meaning' (Alhers et al., 2014, 2). It is an important conceptual tool to capture the spectrum of practices and arrangements through which the peri-urban poor access basic services' (Allen, 2010, 29) including WATSAN. The form, nature of and modalities involved in the coproduction of services vary according to variegated specific contexts. The paper asserts the need and importance of identifying and recognizing unrecognized and neglected networks and explores the presence, potential and challenges of coproduction by capturing the wide spectrum of hybrid practices and arrangements in the hybrid land(water)scape of peri-urban Kolkata.

Kolkata's Peri-Urban Interface: Wetlands on the East

The peri-urban interface (PUI) in the eastern part of Kolkata is dotted with 264 waste water fisheries, agrarian lands and waste-fed vegetable farms that together constitute a hybrid land (water) scape. This is popularly known as the East Kolkata Wetlands.[1]

The sustenance of Kolkata heavily depends upon its interaction with its PUI (Mukherjee 2015a). The city does not have any separate sewage treatment plant. The EKW and Dhapa landfill area absorb 750 million litres (approximately) of waste water and 2,500 metric tonnes of waste generated by the city per day and received by the canals. It is the world's largest resource recycling ecosystem, fully managed by local inhabitants using inter-generational knowledge. Low-cost, traditional and indigenous recycling practices undertaken by fishermen and farmers residing in the area have paved the way for three major eco-environmental practices: wastewater fisheries, effluence-irrigated paddy cultivation, and vegetable farming on garbage substrates (Table 1). The EKW not only treats the waste water and waste at minimum cost but also generates employment opportunities and provides livelihood to around 1,00,000 people living in the core and buffer zones and flocking to *Dhapa* as daily labourers. The sustainable flows between Kolkata and its PUI is an example of the

1. The nomenclature owes to Dhrubajyoti Ghosh, an environmental engineer who first discovered and documented the resource recovery features of the landscape.

mutually –reinforcing relationship between the city and its wider ecological infrastructures (Mukherjee, 2015a, 2015) (Figure 1).

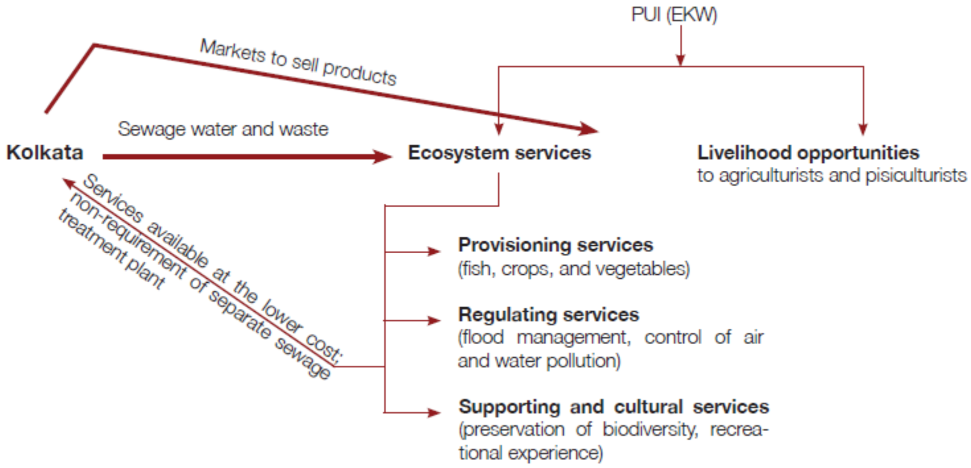


Figure 1: Sustainable flows between Kolkata and its peri-urban interface.

Source: Mukherjee, 2015, 2015a

Land use	Area
Substantially Water Body-oriented Area	5852.14 Hectares
Agricultural Area	4718.56 Hectares
Productive Farming Area	602.78 Hectares
Urban/Rural Settlements	1326.52 Hectares (91.53 ha. Urban +1234.99 ha. Rural)
Total Area	12500.00 Hectares

Table 1: Land use status in EKW

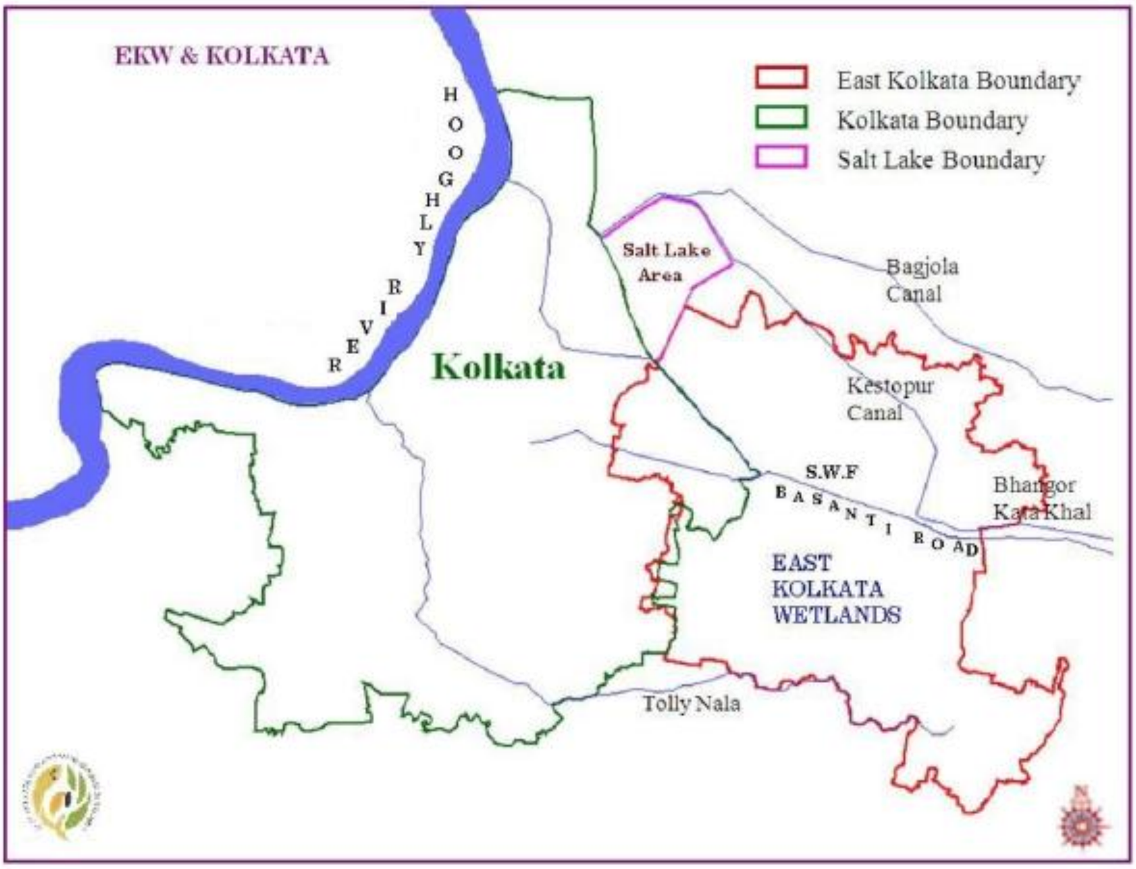
Source: *Kundu et al., 2008, 869*

The evolution of this scape owes back to colonial history and the British project of Kolkata’s urbanization (Mukherjee, 2015). Kolkata’s natural ecology, with the Hooghly River on the west, the saltwater marshes on the east, and the Ganges and her numerous tributaries and distributaries intersecting the whole area, played a key role in the selection of the city as the seat of the imperial capital (Mukherjee, 2009–10). Urbanization occurred in parallel with canal construction and marsh reclamation. The colonial history of excavation of canals (which finally evolved into the city’s Eastern Canal System; Inglis, 1909) and reclamation of marshes offers a unique insight into the growth of an expanding city. While the system emerged to make space for the colonial motive of interconnecting Kolkata with her hinterland, ensuring an unobstructed flow of raw materials and commodities to the city and the port, exploitation of economic opportunities was the most important factor behind Kolkata’s expansion as one of India's largest urban centres. Inevitably, how to deal with the drainage and sewerage problem for the gradually expanding city became a major challenge. The Eastern Canal System (Table 2), along with some additional cuts and excavations (which were then integrated into it), was built to drain the sewage into the saltwater marshes that existed since historical times (Chattopadhyay, 1990; Mukherjee, 2009-10). An underground drainage system for disposing of sewage and stormwater through a combined drainage system of stormwater flow (SWF) and dry weather flow (DWF) canals into the saltwater swamps, which were then finally connected to the Bay of Bengal through the Bidyadhari River was designed by the then sanitary engineer William Clark and completed by 1884. When the Bidyadhari River became absolutely defunct (due to natural reasons and also constant excavation and re-excavation of canals that speeded up the process of silt deposition on the river bed) and was officially declared dead for both drainage and navigation in 1928, the Kulti Outfall Scheme was executed and commissioned in 1943. This led to a gradual transformation in the aquatic environment of the area from saline to non-saline; from saltwater marshes to sewage-fed freshwater wetlands. The eastern marshes were saline in nature, as the Bidyadhari River carried saline water from the Bay of Bengal and spilled over the low-lying area. The silting-up of the Bidyadhari River caused a decrease in the inflow of saline water. Moreover, with the decay of the river, sewage and stormwater came to be diverted into the saltwater lakes through canals, turning them into freshwater lakes. When the Kulti Outfall Scheme was implemented, an adequate water-head was raised for supplying sewage to most of these fishponds by gravity, which resulted in the extension of wastewater fishponds further east and south-east for about 8,000 hectares. The EKW lies between the levee of the River Hooghly on the west and the Kulti River on the east, and is distributed nearly equally between the two sides of the DWF and SWF channels that finally reach the river (Ghosh, 2005) (Map 1). The EKW evolved as an output and input produced and required by the city; it developed as the space of informal, 'untamed' practices by marginal peri-urban fishing and farming communities (Mukherjee, 2015).

Name of the excavated canal	Year of execution
Beleghata Canal	1810
Circular Canal	1831
New Cut Canal	1859
Bhangar Canal (canalized)	1897
Krishnapur Canal	1910

Table 2: Eastern Canal System

Source: *Inglis, 1909*



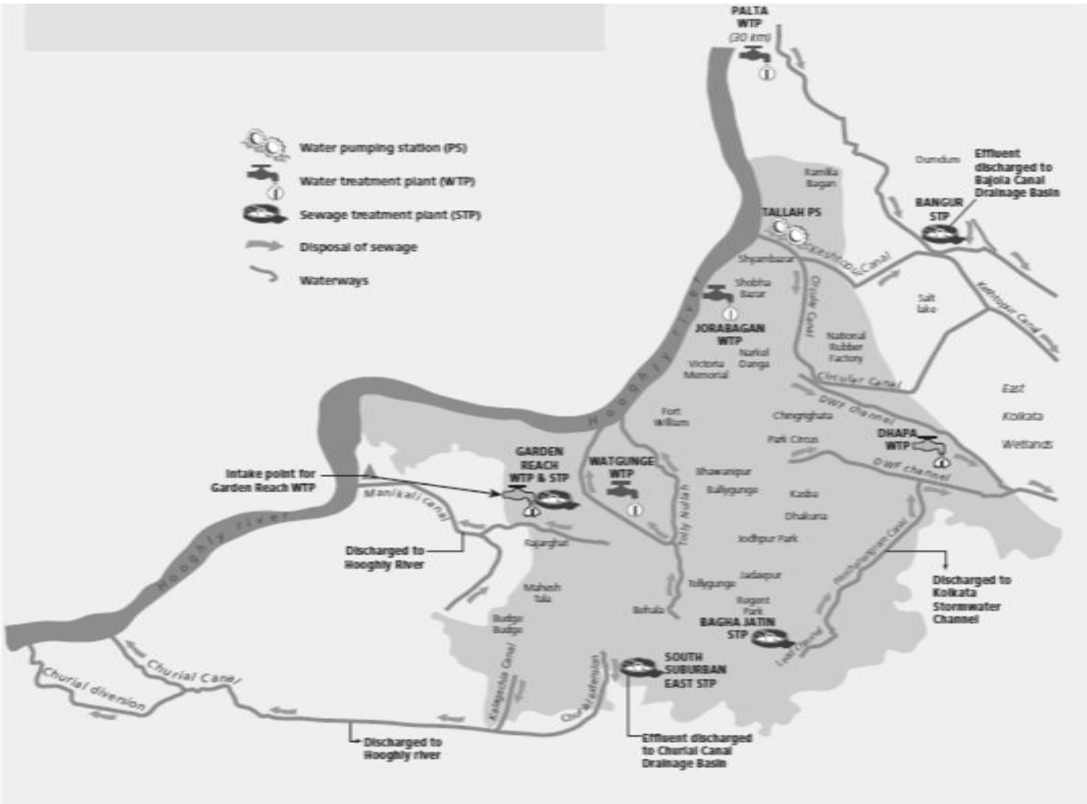
Map 1: The Location of EKW
Source: *http://www.ekwma.com (date of access: 27.11.2015)*

WATSAN scenario: Examining policy-driven and needs-driven arrangements

The city of Kolkata is often described as 'triple-blessed': possessing a river for drinking water, another to dispose of waste, and the wetlands between to treat its sewage and produce its food (Banerjee & Chaudhuri, 2012). Yet, despite these rich advantages, significant disparities exist across the growing population of 14.38 million of Kolkata Metropolitan Area (KMA) — and particularly in relation to the access to and control over water and sanitation services (Census, 2011). Two agencies are jointly responsible for water supply and sanitation of Kolkata: Kolkata Municipal Corporation (KMC) and Kolkata Municipal Water and Sanitation Agency (KMWSA). While the KMC is in charge of water supply to all the wards within KMC, KMWSA covers the rest of the metropolitan area. KMC officials claim to cover 85% of the population by piped supply and 50–55% by sewerage network. [2] The recently published Technical Assistance Consultant's Report of Asian Development Bank entitled India: Preparing for *Kolkata Environmental Improvement Project Phase II* claims that the municipal piped water supply

[2] Series of interviews were conducted with officials of KMC and KMWSA between December 2014 and February 2015 as a part of the project.

system covers almost 92% of the KMC population, the current coverage being higher than the national average of 81% but 8% short of the 100% national target benchmark. However, the water supply service level is distinctly different for the various water supply zones – respectively supplied from Palta, Garden Reach, Jorabagan and Watgaunge Water Treatment Plants or by ground water supply (Map 2). Similarly, the sewerage and drainage service level in the central city area is distinctly different in the outer areas (ADB, 2012). Though water is provided free of charge by the municipality, this piped coverage is disproportionately lower (and almost non-existent) in the peri-urban areas of the city. Here, lower-income communities residing in informal neighbourhoods are instead reliant upon groundwater extraction of poor quality, or the use of water vendors that costs between rupees five and rupees 20 for a jar of 20 litres (0.08 - 0.4 USD approximately).



Map 2: Major WTPs and STPs

Source: *Banerjee and Chaudhuri, 2012, 390*

This unequal distribution of services is perhaps nowhere more evident than in the south eastern peri-urban interface (PUI) of the city, known as the East Kolkata Wetlands (EKW). Here, the vast majority of residents lack access to filtered public piped water supply and instead rely upon a number of other policy-driven and mostly needs-driven and demands-driven arrangements ranging from purchasing water from municipal tankers, private vendors, and NGO-supported community drinking project (water treatment plant) (at lower prices than vendors), or for the poorest households to collecting water from the *bheris* (Figure 2; Annexure 1). [3]

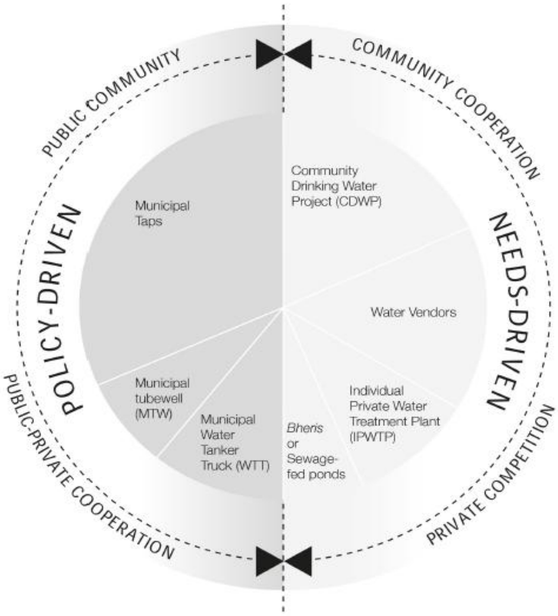


Figure 2: Water practices in peri-urban EKW

***Source:** Mukherjee & Ghosh, 12*

So far as sanitation is concerned, 50% of Kolkata’s population and 55% of the KMC area is covered by sewerage network measuring 1,610 km, and consisting of 1,430 km of piped sewers and 180 km of brick sewer line. The city has no sewage treatment plants (STPs) within municipal boundaries. There are three small plants located outside the municipal limits at Bangur, Garden Reach and BaghaJatin (Map 2) with little capacity of 45 mld, 48 mld and 2 mld respectively. The EKW serves as the only and major natural recycling infrastructure, relying upon low-cost techniques adopted and practised by poor farmers and fishermen following a complex mechanism (Ghosh, 1991; 1997; Kundu et al., 2008; Carlisle 2013; Mukherjee, 2015). The city drains the bulk, over 75% of its rainwater and sewage through channels (functioning since the British period) into the Kulti River (which acts as the major outfall channel) through the EKW. However, despite this significant contribution to the overall ‘environmental sanitation’ of the city, at the household level residents of EKW lack adequate access to sanitation options. Here, individual sanitation practices vary from the use of single and double pit latrines connected to septic tanks, to makeshift community sanitation systems inter-connected to municipal canals (CSIMC), to open defecation (Figure 3). While these options remain limited, cooperative fisheries operating in the area are now highly discouraging open defecation and CSIMC practices as this ultimately degrades the *bheris*. Though fish in

[3] The findings are based on field studies conducted in the three selected areas of EKW: Bidhannagar (ward no. 17), Bantala and Dhapa as a part of the project.

the *bheris* consume fecal matter, recently cooperative members have become aware that this may reduce the prices that the fish are able to generate in the Kolkata market. Some cooperative fisheries like the *Baro Chaynavi* (with 67 members) in Bidhannagar ward no. 17 have begun to allocate funds and/or loans to their own members with zero interest rates for constructing pit latrines in their respective households. 60 out of 67 members have now pit latrines which they have constructed through support from the cooperative.

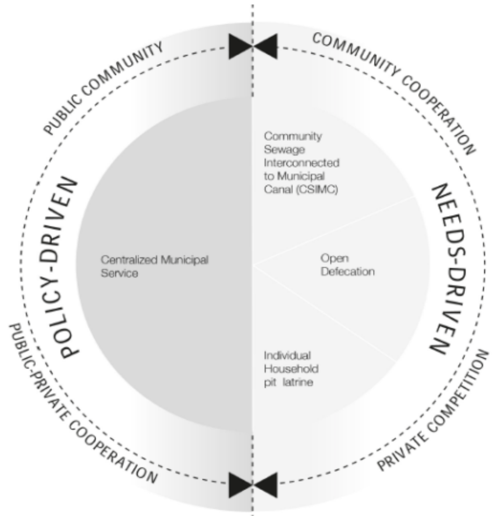


Figure 3: Sanitation practices in peri-urban EKW

Source: *Mukherjee & Ghosh, 2015, 15*

Coproduced practices: Challenges and opportunities

Coproduction i.e. the participation and involvement of more than one organization or stakeholder is present in the delivery of service provisions and more strongly and naturally embedded in the waste water and waste recovery practices carried out in EKW. Coproduced waste water management (CWM) practices in EKW must be contextualized in relation to the wider socio-political forces and legal restructuring which occurred in West Bengal. The *West Bengal Estates Acquisition Act* and *West Bengal Land Reforms Act* were implemented in 1953 and 1955 respectively, to abolish *zamindari* (aristocrat) ownership of land. However, these acts contained exemptions covering tea gardens, orchards and fisheries, and as such individual fish farms in peri-urban Kolkata largely remained intact until recently. In 1995, the *Land Reforms Amendment Act* was passed, at which time the fisheries were covered. This led to the cooperativisation of a number of *bheris*, when private holdings were vested from their owners by the state and transferred to fisheries groups and cooperatives. This led to the decline of large privately owned fisheries; however a number of smaller, household-managed ponds continued to exist. At this time, some of the large fisheries were also directly acquired by the government, through the State Fisheries Development Corporation.

A wide range of dynamic CWM practices involving multi-level stakeholders can be identified in EKW impacting both waste water and waste arrangements. Fishermen and farmers depend on the municipal supply of waste water and solid waste for pisicultural and agricultural activities. Fish production in the *bheris* depends on a number of factors including coordination among various stakeholders ranging from government authorities like Kolkata Municipal Development Authority (KMDA), Kolkata Municipal Corporation (KMC), Department of Irrigation and Waterways (DoIW), Dept. of Environment (DoE), Dept. of Fisheries (DoF) and West Bengal Pollution Control Board (WBPCB) to fish producers associations and fishermen and women (table 2). Since the last one and half decade, it also include external supporting agencies and programmes such as the Asian Development Bank-funded *Kolkata Environmental Improvement Investment Programme* (KEIIP). Vegetables are cultivated in the adjoining dumping ground called *Dhapa* which is owned by the KMC and worked upon by farmers as tenants or sub-tenants, responsible for the entirety of the farming operations and marketing. At present some 325 ha of garbage farms are located within the EKW, and particularly in and around the Dhapa area. There are around 3000 farm plots in Dhapa, ranging in size from 5-30 cottahs (1 cottah = 720 sq. ft). Farmers produce 11-16 different varieties of crops and vegetables (Table 5), with sewage water from the *bheris* used to irrigate the farms.

Table 2: Roles and responsibilities of multi-level stakeholders

Stakeholders	Roles and Responsibilities
KMDA	Operation and maintenance of drainage
KMC	Urban authority for the city, administers part of the EKW and has significant land ownership
DoIW	Management of the sewage canals that carry waste water to the wetlands and associated sluice gates
DoE	Formulation of the wetlands management plan
WBPCB	Monitors pollution and the quality of water discharged from Kolkata
KEIP	Restoration of canals and development of infrastructure that would impact the EKW
DoF	Manages and runs some of the largest fisheries; provides support to the cooperative fisheries and advice on technical aspects of fish production
Fish Producers' Association	Association of fishermen employed in the bheris; plays an important role in determining wage rates along with other social issues
Fishermen and women	Provide skill and labour in fish production; further hierarchies are noted within this group

Source: *Mukherjee & Ghosh, 2015, 18*

Around 8,500 people are employed in the 264 bheries that make up the waste water fisheries in EKW. A further 4,000 people are involved in agrarian activities spanning across the eastern wards of the KMC, ward no. 17 of the BMC, and some gram panchayats. Though there is no estimate on the exact number of waste pickers from the *Dhapa* landfill, it can be roughly assumed that around 25,000 people are engaged in this occupation.

Apart from permanent agricultural, horticultural and fish farm labourers or harvesters, a number of labourers are employed on a contractual basis especially during peak seasons. The fishery workers range from fish harvesters (early morning fishermen completing 3/4 hrs of work per day during harvest time), carriers (men and women transporting goods to the markets, carrying 12-20 kg of fish, and completing 3/4 hrs of work per day during harvest time), guards (men keeping watch for poachers at night, 8-10 hrs of work every day) and weeding labourers (men and women responsible for cleaning weeds and plants in the bheris, completing 6 hrs of work every day). There is variation in both wages and tenurial security for fishermen and women across the three categories of fisheries, determined primarily by their ownership patterns: government, private and cooperatives (Figure 3).

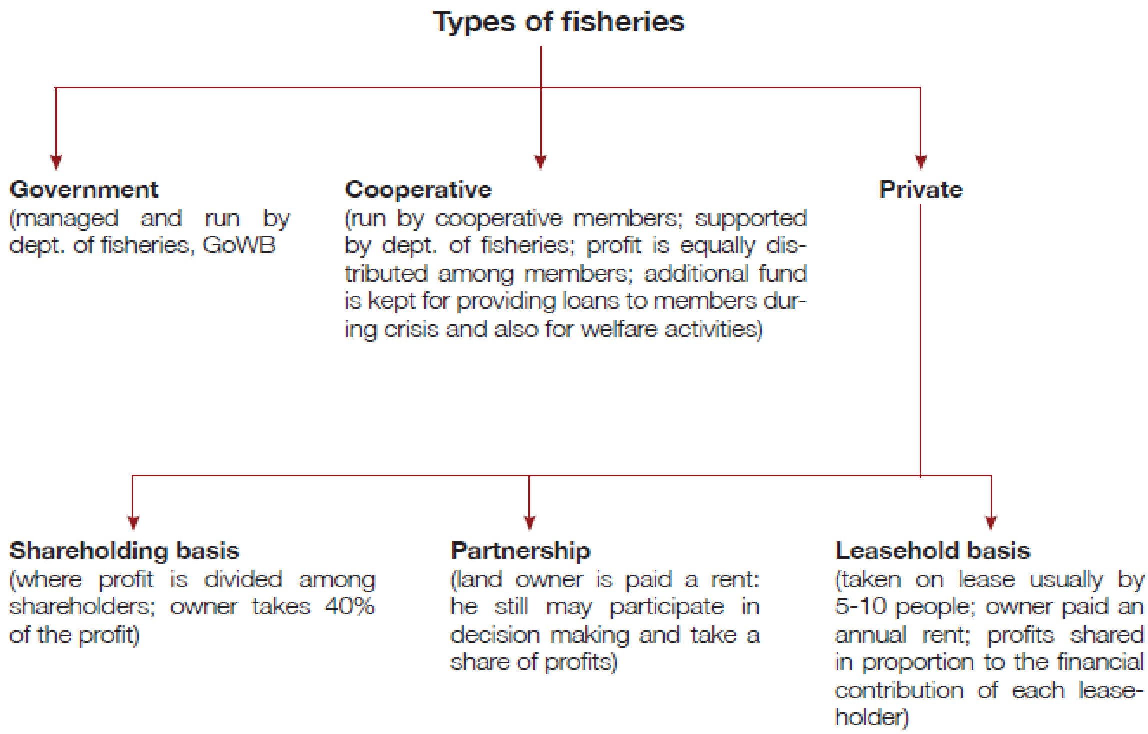


Figure 3: Sanitation practices in peri-urban EKW

Source: *Mukherjee & Ghosh, p. 19*

In recent years a number of threats have been experienced to the detriment of the ecological and socio-economic fabric of the EKW. Cooperative fisheries are increasingly becoming privatized, selling *bheris* to commercial companies operating in the region. This has been particularly problematic for the fishermen making a living in the EKW, who generally receive lower wages from private companies, and suffer from a greater level of job insecurity. Unlike fish farms managed under the cooperative model, private farms focus primarily on the generation of profits and do not engage in the distributive activities of the cooperatives including allocation of funds to members for welfare measures such as the construction of pit latrines, or other community and household goods.

This area has undergone tremendous land-use change due to the rapid eastward sprawl of Kolkata, being one of the lucrative space for real estate speculation of the neoliberal times (Mukherjee, 2015, 2015a; Bose, 2014, 2015). 'It is here, therefore, that the most striking changes can be seen. Yet it is remarkable not only that the wetlands has now been invaded by gleaming new office towers, theme parks, golf courses and shopping malls but also for the manner in which this transformation is occurring, as well as its broader purpose' (Bose, 2014, 136).

In recent times there has been an escalating conflict amongst the KMC, KMDA, DoIW and Fish Producers Association over the operation of the lock-gates on the Bantala sewage canal, which controls the flow and supply of waste water into the *bheris*. Traditionally, the lock gate control at Bantala, which controls the distribution of sewage, should be maintained at a maximum GTS (Grand Trigonometric Survey) of 9 points, which is lowered to 4.5 during the monsoon season. This arrangement ensures that there is an appropriate amount of sewage water flowing into the *bheris* during peak fish cultivation season. At the Bantala point however, the irrigation department has been diverting water into the Kulti River after an accumulation of just 7.5 rather than the regulated 9. This has generated two significant problems. Firstly, it has impeded the flow of nutrients to the fish in the sewage fed ponds, impacting the livelihoods of the fishermen working in the *bheris*. Secondly, the water flowing into the Kulti River has been untreated, affecting the ecology of the river as well as the health and well-being of more than 20,000 people residing in the Sundarbans (Mukherjee & Ghosh, 2015).

Conclusion

The mutuality between the livelihoods strategies of communities living in the EKW and the ecological sustainability of the city represents a key mode of co-production at work in peri-urban Kolkata. Moreover, these practices, while holding a critical impact at the city-scale, have also offered hints for alternate modes of cooperation which could address some of the everyday challenges of water and sanitation for residents of the EKW. For instance, cooperative fisheries in the Bidhannagar area have played an important redistributive function amongst their members, and have been particularly active in supporting educational and financial investments for safer sanitation strategies at the household level.

There is a lack of understanding of the presence and potential of the roles, responsibilities and functioning of multi-level stakeholders for (co)producing collective benefit: ensuring treatment of sewerage at the least cost for municipal authorities, production of fish, crops and vegetables from waste and effluent for fishermen and women and most affordable prices for these edible products for inhabitants of Kolkata (Fig. 1). Again, coproduction is not symmetrical and collaborative but instead tensed and riddled with power asymmetries and diverse political aspirations and there are contestations over which water (and also waste water) flows where, at what pressure and facilitated by which infrastructure (Ahlers et al. 2014) and who has better control over agency (for example the dispute over waste water flows and the control over the Bantala lock gate).

With the losing out of the wetlands to real-estate hubs, the mutually reinforcing relationship between the city and the PUI is transforming into a truncated relationship. The role of KEIP seems to be facilitating foreign funded, state led and bourgeoisie supported environmentalism (Bose, 2014, 2015). Within this context, a nuanced understanding and recognition of the value of coproduced networks might generate the conditions and opportunities to foster greater dialogue and interdependence among multi-level stakeholders to protect the age-old ecosystem of Kolkata. Coproduction as a collaborative venture, and built upon the notion and persistence of co-responsibility can be an effective tool not only to deliver WATSAN service provisions but also address some of the major challenges leading to rapid and rampant conversions in Kolkata's PUI.

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Annexure 1: Water practices in peri-urban EKW

Practice	Type	Characteristics	Approx. Cost	Examples	Additional observations
Municipal taps	Policy Driven	Water is extracted from ground water through electric	Fully subsidized with a	Bidhannagar (no. 17 ward)	While the better-off HHs prefer not to drink the

Practice	Type	Characteristics	Approx. Cost	Examples	Additional observations
		pumps. Water is provided 6 hours a day during the morning, afternoon and evening, and flows freely without the ability for residents to turn this on or off. These are public taps with no private connection, shared by members of at least 4-5 households. The quality of water is poor (saline water with high level iron and phenol content). As such better off HHs prefer not to use it for consumption, but use it for other domestic purposes like washing, bathing, etc.	production cost		tap water, the more marginal HHs (for example contractual labourers in the fish farms) depend on this for drinking purposes.
Municipal tubewells	Policy Driven	The tankers provide treated surface water once a week up to 60-100 litres per family (regardless of the number of family members).	Free supply	Bidhannagar (ward no. 17) Bantala	The tube wells do not function properly after 7-10 years due to technical problems and the decline of the aquifer.
Municipal water tanker trucks	Policy Driven	The tankers provide treated surface water once a week up to 60-100 litres per family (regardless of the number of family members).	Free supply	Bidhannagar (ward no. 17) Bantala Dhapa	Water tanker trucks reach Nawbhanga when municipal taps go defunct for a certain period of time and complaint is lodged to the local councilor. In Dhapa and Bantala this remains the primary practice

Practice	Type	Characteristics	Approx. Cost	Examples	Additional observations
					in the absence of other water supply services
Water vendors	Needs driven	Vendors work privately, either extracting ground water from tube wells, collecting filtered surface water from pressure release points, purchasing water from the community drinking water project, or leaking KMC pipes. They distribute it using bicycles or tricycles to neighbourhoods. HHs purchase the water and have it transferred into their own containers.	The price of water varies between Rs. 5 to Rs. 20 for a jar of 20 litres, dependent upon the distance travelled by the vendor.	Bidhannagar (ward no.17) Dhapa Bantala	With inadequate and poor municipal service coverage, this form of small-scale business is flourishing, with many poor members of peri-urban HHs becoming involved.
Community drinking water project	Needs Driven	A small water treatment plant has been set up through a joint initiative by a private company and an NGO (SAFE) to provide treated water at a very low price. This plant treats surface water and at the same time conserves water through rain water harvesting.	60 paisa/litre	Shukantanaga*rbheri* (within Bidhannagar (ward no. 17)	This project is seldom used directly by peri-urban poor residents as they lack the storage capacity, and often cannot travel 5kms daily to reach the project. Instead, this facility is often used by middle-class HHs in the adjacent areas that also lack filtered piped water connection. It is also used by water vendors and distributors who collect and

Practice	Type	Characteristics	Approx. Cost	Examples	Additional observations
					sell among the peri-urban poor and others at an inflated price.
Small individual/ private water treatment plant	Needs Driven	Individual HHs have set up water treatment plants without permission from the municipality. These plants generally use ground water as the raw source and have the capacity to produce 500-1000 litres of treated water per hour.	Rs. 10 for a jar of 20 litres	Bidhannagar (ward no. 17)	The complex dynamics relating to these distributive mechanisms are yet to be examined.
Bheris (sewage-fed ponds)	Needs Driven	The pond water is consumed directly and used for other domestic purposes.	Bidhannagar (ward no. 17) Bantala Dhapa	Bidhannagar (ward no. 17) Bantala Dhapa	The poorest of the PU HHs depend on this practice.

Source: *Mukherjee & Ghosh, 2015, 13-14*