Chapter 7

Views from the Sluice Gate: Water Insecurity, Conflict and Cooperation in Peri-Urban Khulna, Bangladesh

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7.1 Introduction

Management of freshwater, wastewater, storm runoff and river salinity has played a central role in the emergence and evolution of conflict and cooperation in the urban and peri-urban areas of Khulna. This water management largely depends on how and to what purpose the water infrastructure, in this case more specifically sluice gates, have been designed and are operated and maintained, and to what extent these meet the needs and priorities of communities and other stakeholders. Conflicts as well as new alliances and forms of cooperation arise in specific ways, where sluice gate operation is influenced or controlled by powerful groups to support their own interests. Conflicts and cooperation take on different forms and are manifested in stakeholder relations, while their characteristics vary in temporal and spatial scales. Water insecurity of the peri-urban population is closely related to these conflicts and cooperation, as seen across South Asia (Narain et al., 2013; Roth et al., 2018). These water insecurities and conflicts are aggravating because of the compounded effects of urbanization and climate change (Khan et al., 2016).

In rural Bangladesh sluice gates often give rise to conflicts, mainly between farmers and fishers, about the timing of operation and amount of water passing through the sluice (Murshed & Khan, 2009). In this chapter we analyse the dynamics of conflict and cooperation in peri-urban Khulna around a sluice gate at the outfall of the Mayur River passing through Khulna. The sluice gate and the adjoining embankments were constructed primarily for stormwater management, storm surge protection, wastewater discharge and river salinity control for the upstream

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urban areas. The gate was later modified to provide additional agricultural benefits to the downstream peri-urban areas, where the Mayur River was important for agriculture, fish farming and open-water fisheries. Therefore proper operation of the sluice gate has always been vital for peri-urban livelihood sustenance. Peri-urban livelihoods are not only threatened by the absence of an equitable and optimal operation of the sluice gate to meet the urban and peri-urban requirements, but also by urban expansion, loss of water bodies and upstream wastewater discharge. Being converted into housing projects, peri-urban agricultural lands make room for urban expansion. In addition, overall environmental degradation is observed as a consequence of solid waste dumping and wastewater discharge into the river without adequate treatment to remove harmful materials and chemicals (Dasgupta et al., 2016; Khan et al., 2016).

The sluice gate, primarily serving the city but located in peri-urban Alutala (Tentultala Village), created conflicts between urban and peri-urban water users. Conflicts started to emerge around the sluice gate as its control was taken over covertly by powerful urban elites¹ together with local powerful groups, to ensure saline water availability in their shrimp farms. Such gate operation deprived the peri-urban population of freshwater needed for subsistence agriculture and freshwater fisheries. Further, rapid and unplanned urbanization at the cost of lowlands and water bodies also started to pose threats to the natural flow of the Mayur River. Untreated solid wastes and wastewater from domestic, industrial, commercial and clinical sources in Khulna city accumulated in the river, which eventually exceeded its assimilation capacity. Urban wastewater coupled with increased salinity, especially in the dry season, makes the water in the peri-urban area unusable for irrigation and aquaculture. Maintenance of adequate flow in the river through proper gate operation could ensure flushing of the wastewater, but such a gate operation rule was never institutionalized.

In this chapter we explore the different forms of conflicts and cooperation, how and why they have changed over time, and how the communities have mobilized to deal with these conflicts. In our analysis we focus on the sluice gate, its function and control, and implications for the peri-urban communities. We view the hydrological, social and institutional processes as an integrated hydro-social continuum, in which these apparently separate processes interact with and influence one another, and are closely interlinked and intertwined. On the one hand, hydrological requirements and water disasters shape people's lives, livelihoods and social relations. On the other hand, the hydrological system and its alterations are influenced by various socio-economic priorities, institutions and power relations. Similar interdisciplinary approaches to the interlinked social and hydrological processes in relation to negotiations, dialogues and conflict mitigation can be found in the literature (Boelens et al., 2016; Massuel et al., 2018, 2019; Wesselink et al., 2017).

¹People living in the city and having decisive influence on urban policies and programs through their political connection. We more specifically refer to the people with business interests in the urban and peri-urban areas, particularly fish farming in peri-urban areas.

In the rest of the chapter we first describe the approach and methods followed in the study, including an explanation of our hydro-social conceptualization of the setting, methods of research and interventions, rationale for the selection of the study site, and contextualization of our action research approach. This is followed by a description of the peri-urban water insecurity problems and of the critical issues specifically related to the sluice gate, including hydrological and historical contexts, major actors and contestations around the gate. We then present a detailed analysis of major conflict cases, to explore the roles and power of the main actors in these cases centering on the sluice gate, the contradictory interests of the stakeholders, and their varying views of problems and solutions. In the subsequent section we present an overview of our action research to address these issues, reflecting on our experience in dealing with power relations and interest networks.

7.2 Research Approach and Method

Water insecurity in peri-urban Khulna is primarily a consequence of the urban policy that prioritizes urban services and amenities over peri-urban requirements (Khan et al., 2016). The sluice gate at Alutala is an example of such policy priority, in which peri-urban needs are ignored if not absent. The gate, located in the peri-urban area, was constructed to protect the city from storm surges and salinity intrusion, and to flush out urban wastewater and storm runoff. Peri-urban agriculture and freshwater availability were of secondary importance in the original design considerations for the gate. The gate was modified to meet these peri-urban hydrological requirements at a later stage.

Thus, in the analysis of water insecurity, conflict and cooperation in peri-urban Khulna, the role of urban institutions and actors that influence the water flow and discharge in the peri-urban area is important. After the construction of the gate, its control became attractive, as the urban and peri-urban power alliances saw benefits in altering the peri-urban hydrology and water bodies. We therefore view the sluice gate as central to a hydro-social continuum in the analysis of conflict and cooperation in relation to water insecurity, in which water, people, institutions and actors are interlinked and interdependent. Contestation over water and land evolves through hydro-social processes, as the peri-urban space becomes increasingly lucrative in terms of economic returns from these alterations of the hydrological system.

In the research methodology we adopted a predominantly qualitative approach. Semi-structured interviews and key informant interviews were conducted to explore the main conflict cases and to identify key actors and stakeholders. Subsequent focus group discussions with urban and peri-urban communities were carried out to further analyse and understand the historical emergence and evolution of conflicts around the sluice gate. Stakeholder analysis and social power mapping were conducted at two stages to analyse the stakeholder arrangements and power relations. In the first stage, this was conducted at the research sites with smaller focus groups. In the second stage, the stakeholder diagrams and social power maps prepared in the

first stage were triangulated at a workshop with a broader stakeholder group. The research team made several field visits for direct observation of the hydrological setting, water management infrastructure and biophysical issues raised during the interviews and discussions. The research team also collected water samples from the river for laboratory analysis. These direct observations and water quality analyses were verified with secondary hydrological data and catchment information. Outcomes of these analyses and explorations were utilized to create avenues and platforms to improve the capacity of the marginalized communities to negotiate and overcome their challenges to reach more cooperative solutions. This was attempted through a series of community meetings and stakeholder workshops.²

7.3 Research Location

Khulna city, located in the south-western hydrological region of Bangladesh, is home to around 1.4 million people (in 2011) (Bangladesh Bureau of Statistics, 2011). Socio-economic developments in the south-west coastal region are leading to new industries and human settlements in Khulna city and its surrounding areas, and changing the land use pattern and local resources. Export processing industries based on shrimp farming, in particular, are strengthening the economy in Khulna and its surroundings (Khan et al., 2016). Khulna is frequently confronted by severe water problems and disasters, including cyclones, storm surges, floods, high-intensity rainfall, water logging, saline intrusion and river erosion. The increasing trends in the frequency and severity of cyclones, storm surges and high-intensity rainfall events, along with increasing river salinity because of sea level rise, are attributed to global climate change (Khan et al., 2013). Notably, Khulna is among the fifteen most vulnerable cities under the impacts of climate change (Hallegatte et al., 2013; Hanson et al., 2011). The devastating cyclones *Sidr* in 2007 and *Aila* in 2009 have forced people to migrate to the peri-urban areas of Khulna. This in-migration has created additional competing demand for freshwater from already-stressed sources, and has added to wastewater generation. Climate change is also believed to have increased high-intensity rainfall events in the Khulna area (Mondal et al., 2013). These short rainfall spells create spikes of urban floods and release high volume of rainfall-runoff that has to be drained through the Mayur river and eventually through the sluice gate.

²The research presented here was executed in the framework of the NWO/DFID-funded research programme “Conflict and Cooperation in the Management of Climate Change (CoCooN/CCMCC)”. The research team consisted of members from Bangladesh University of Engineering and Technology (BUET) and Jagrata Juba Shangha (JJS), a local NGO. BUET carried out the scientific studies and analysis, while JJS was responsible for community mobilization and action components of the research. This research built on a previous action research project funded by the Canadian International Development Research Centre (IDRC), which explored water security in peri-urban Khulna (Khan et al., 2016). The team was also closely linked with another research project dealing with groundwater security in peri-urban Khulna, which was funded by the Urbanising Deltas of the World program of the Dutch Research Council (NWO).

The Mayur River, which flows through Khulna city and hydrologically connects the urban and peri-urban areas, originates from the natural wetlands *Beel Pabla* and *Beel Dakatia*, and drains into the Rupsha-Bhairab River near Alutala (a peri-urban location) (Fig. 7.1). The Mayur River receives water from a drainage area of about 53 square kilometers, including the Khulna City Corporation (KCC) area. The river serves as an urban amenity, and provides ecosystem services, water for domestic, industrial and commercial uses, and irrigation water for peri-urban farmers. It also provides other benefits, such as recreation and tourism functions, climate and flood regulation, biodiversity sustenance, nutrient re-cycling and waste assimilation.

The Bangladesh Water Development Board (BWDB) constructed the Khulna city protection embankment in the late 1970s. As a part of the embankment system, a sluice gate was constructed at the outfall of the Mayur River near Alutala in the early 1980s (Fig. 7.2). Ten flap gates were included in the original design of the sluice structure to protect Khulna city from storm water flooding, storm surge and salinity intrusion. Flap gates open automatically when the internal water level is higher and close when the external water level is higher. The sluice gate is locally known as “*Dosh* (ten in Bangla) gate”.

As peri-urban agriculture and fish farming became more important, BWDB added ten vertical gates to the original structure for the control and retention of internal water storage. This modification of the structure facilitated peri-urban agriculture with greater freshwater availability in the dry season. The saline and freshwater fish farms in ponds and an abandoned channel of the Mayur River also started to gain interest. Figure 7.3 shows the physiography and landmarks around the sluice gate. As the fish farm owners grew in number and power, they started

Fig. 7.1 Google map showing the Mayur River, Khulna city and the peri-urban area

Fig. 7.2 The sluice gate at Alutala. (Photo Jagrata Juba Shangha)

Fig. 7.3 Google map showing the sluice gate on the main channel (Kazi Bacha River) and fish farms on the abandoned channel of the Mayur River

to control the vertical gate operation to store saline water for their fish farms. This gate control reduced the capacity of the gate to discharge urban wastewater flowing from the upstream urban areas. Thus the operation and management of the sluice gate had both socio-technical and agro-environmental implications for the water use conflicts, many of which emerged after the sluice gate had been designed and constructed without considering the peri-urban water requirements.

The Mayur River was a free-flowing tidal river some 40 years back. Trawlers and large country boats used to ply the river with passengers and goods. Since then, disposal of solid wastes and discharge of wastewater from the urban areas have severely degraded the conveyance and assimilation capacities of the river. The discharge of untreated wastewater through some 22 urban outfalls and the dumping of the solid wastes from the nearby slaughterhouses, markets, bus terminal, hospitals, clinics, automobile factories and industries have filled up the river and increased its pollutant loads. A large slaughterhouse located on the river bank discharges wastewater directly into the river without any treatment. Encroachment of the river has reduced its width, turning it into a narrow wastewater channel at many places such as Rayermahal, Gollamari and Shashanghat. At Gollamari point, the river depth is only 0.3 m (see e.g. Khan et al., 2016).

Because of its reduced retention, conveyance and discharge capacities, the Mayur River has become too polluted to support aquatic lives and peri-urban livelihoods. Water quality analysis indicates that dissolved oxygen, biochemical oxygen demand, total dissolved solids (TDS) and salinity levels along most of the river stretch do not meet the recommended limits for drinking and irrigation water quality set by the Department of Environment of Bangladesh and the World Health Organization. During the dry season, the water level of the river drops drastically and its pollution level rises. Consequently, the fisheries and other aquatic resources in the river deplete, resulting in loss of livelihoods of the peri-urban people. Growing land development businesses in Khulna have filled up open water bodies and peri-urban lowlands. As urbanization has increased the domestic and industrial water demands and depleted the surface and groundwater resources, the competition for these scarce water resources among different user groups in the urban and peri-urban areas has also increased. This competition has created complex water use conflicts between the urban and peri-urban communities.

Drinking water supply in Khulna and its surrounding areas mainly depends on groundwater replenished from the hydraulically connected rivers. Thus quantity and quality of the river water and withdrawal rate from the groundwater aquifers have direct implications for groundwater supply. Secondary data indicate that the groundwater contains a relatively high level of salinity, which often makes the water unpleasant or unsuitable for drinking and domestic uses. Observed salinity levels in the groundwater represented by TDS indicate that groundwater salinity is generally higher during the dry season. Excessive groundwater withdrawal is partly blamed for increased salinity intrusion into the local aquifers. The hand tube wells (HTW) installed to withdraw water from the shallow (upper) aquifer run dry during the summer (March–May) months. Presence of iron and arsenic in excess of the drinking water standard in the upper aquifer groundwater is another constraint to its use. The Khulna Water Supply and Sewerage Authority (KWSA) can supply piped water to only 30% of the urban population. The rest of the urban and peri-urban population depends on shallow HTWs, deep tube wells (DTW) and surface water bodies such as ponds, canals and rivers. The unplanned and rapid urbanization of the city has resulted in a decreasing area of lowlands, ponds, lakes and other water

bodies, as well as a reduction in agricultural land. Urbanization has thus reduced the groundwater recharge areas and increased the peak of storm runoff. Consequently, waterlogging created in many places of the city and its peri-urban areas in the event of high-intensity rainfall causes immense suffering to the people. Inadequate drainage facilities and blockage of drains due to improper solid waste management and maintenance further aggravate the drainage of storm runoff.

The urban storm water and wastewater management priorities together with pressure from the urban environmental activist groups forced KCC to negotiate with BWDB to ensure an optimal operation of the sluice gate that would also meet the peri-urban requirements. At the same time, the peri-urban communities mobilized to protest the control of the sluice gate by fish farm owners. The responsibility of sluice gate operation was eventually handed over to KCC in 2012. KCC formed a Gate Operation Committee (GOC), which included members from KCC, Khulna Development Authority (KDA), BWDB, community representatives and government agencies. The GOC was mandated to decide the gate operation time and duration, in consultation with the downstream communities. In reality, however, this decision was taken jointly by a KCC official who owns agricultural land in Alutala and the local *Union Parishad* chairman.³ Despite this new arrangement for gate operation, apparently in favor of the peri-urban communities, the water quality of the Mayur River did not improve significantly. BWDB, still responsible for repair and maintenance of the gate, keeps deferring funds required for the necessary repairs of the structure. As a result, the sluice gate is not operational as required. Meanwhile, there has been an increased interest in cooperative fish farming among the peri-urban communities, with the blessing of local political leaders. Fish farm owners in the abandoned channel are moving to other parts of the river where the water quality is better, while peri-urban farmers are adapting to less water-demanding crops.

7.4 Conflicts Around the Sluice Gate

7.4.1 Function of the Sluice Gate

Livelihoods and ecology in peri-urban Khulna have been largely dependent on the connectivity between the Rupsha-Bhairab and Mayur rivers. Construction of the embankment and the sluice gate disrupted local livelihoods and agricultural practices. Flow of the Mayur River not only links the peri-urban area with the upstream urban area hydrologically but also relates these two spaces, separated by a policy divide, through several shared issues and concerns. Khulna city residents enjoy the priority in formal policy making and implementation through KCC and other public agencies, while the peri-urban communities, in the absence of formal policy recognition,

³Smallest rural administrative and local government unit in Bangladesh. A Union consists of several villages.

struggle to have their needs attended to. Regulation of the Mayur River flow through the sluice gate has direct and indirect implications for these shared issues and concerns.

While the sluice gate primarily serves the urban area for wastewater and storm water management, the downstream peri-urban concerns of water quality, water availability and water logging are ignored in gate operation. Degrading river water quality has forced the peri-urban communities to rely more on groundwater for drinking and irrigation. The gate operation, often influenced by powerful groups, marginally favors local forms of collective action such as co-operative fish farms, but only at the mercy of local political leaders. The main areas of conflict around the sluice gate are summarized below.

7.4.2 Urban Versus Peri-Urban Needs

The urban and peri-urban areas linked by the Mayur river have distinctly different water use priorities. Mitigation of wastewater pollution and storm water flooding are the important concerns for the city, whereas availability of freshwater for irrigation, domestic use and fisheries is important for the peri-urban area. The sluice gate was designed and constructed to serve urban priorities. The GOCs formed by both BWDB and KCC operated the gate in favor of the urban needs. Khulna city is situated on higher ground upstream of the river. Therefore, to maintain flow and usable water level in the urban segment of the river, the gate has to be operated in such a way that water is not discharged through the gate too fast. This results in a relatively high water level in the downstream peri-urban areas, often causing flooding and water logging in areas near the gate. The wastewater generated in the city is flushed to the Rupsha river through the sluice gate. In order to dilute the internal polluted water, saline water is brought in during high tides by forcing the external flaps open, which is against the design operation mode. While the saline water fish farms, mostly owned by urban businessmen, utilized and manipulated this opportunity, the peri-urban communities were largely deprived of their freshwater needs. Saline water is also brought in to kill the internal water hyacinth growth. The “gate man”, appointed by BWDB and later by KCC, holds the key for gate operation as per the instruction of the GOC. However, the actual operation of the gate by the gate man is often influenced by the fish farm owners.

7.4.3 Open-Water Capture Fisheries Versus Fish Farming

Prior to the construction of the sluice gate, open-water capture fisheries was the main source of livelihood for the peri-urban communities. Only 20–30% of the population owned agricultural land and had crop farming as their primary means of livelihood. Construction of the city protection embankment and the sluice gate disconnected the floodplains of the Mayur river and its tributaries from the Rupsha

river. This obstruction severely affected the fisheries resources in the internal water bodies. Since open-water fishing in the much larger Rupsha river needed higher investments, most open-water fishers were forced to start small-scale aquaculture in leased ponds and lowlands adjacent to the river. Large-scale fish and shrimp farming started in the early 1990s in the leased *khas* lands⁴ and illegally grabbed lowlands. Most of these farms were financed by politically empowered urban businessmen and run by powerful local groups. This alliance of power and money dominated fish farming in the area and started to control operation of the sluice gate in its favor. This dominance also forced many people to either give up small-scale fish farming or work as day laborers in a large farm.

7.4.4 Peri-Urban Agriculture Versus Fish Farming

Large-scale saline water fish farming also affected the livelihoods of the small farmers. Commercial fish farms started to spread in the abandoned channel of the Mayur river, encroached canals and lowlands. Although some of the encroachments and illegal grabbing of *khas* lands were evicted occasionally, re-encroachment took place as soon as there was a change in the position of the government official implementing the eviction order. The large fish farms influenced the operation of the sluice gate to bring in saline water to their farms. Such control of the gate deprived farmers of the irrigation water they needed. At the same time, polluted discharge from the fish farms and increasing soil salinity around the fish farms posed threats to crop cultivation. This situation changed later: as the peri-urban community mobilized to protest saline water fish farming, the commercial fish farms started to lose their interest because of degrading water quality, and a community representative was included in the GOC.

To explore the role and involvement of the stakeholders around sluice gate operation, we conducted a stakeholder analysis in two stages. A social power matrix was prepared to understand the power relations between these stakeholders. First, a list of key stakeholders (given below) was prepared through key informant interviews and focus group discussions.

1. Peri-urban community, fishers, farmers
2. Peri-urban fish farms
3. Gate Operation Committee (GOC)
4. Khulna City residents
5. Khulna City Corporation (KCC)
6. Bangladesh Water Development Board (BWDB)
7. Local Government Institutions (LGI)
8. Khulna Development Authority (KDA)
9. Khulna Water and Sewerage Authority (KWSA)
10. Department of Environment (DoE)

⁴Land owned by the government, and available for allocation according to government policy.

11. Department of Agricultural Extension (DAE)
12. Community Based Organizations (CBOs)
13. Non-Government Organizations (NGOs)
14. Water and Goods transport businesses
15. District Administration (DA)
16. Khulna University (KU)
17. Khulna University of Engineering and Technology (KUET)
18. Bangladesh University of Engineering and Technology (BUET)
19. Media (local and national)

Subsequently, a series of smaller group discussions at the local sites and a larger meeting in Khulna were conducted to collectively understand the key stakeholders' involvement. In these discussions, the key stakeholders were identified in four groups according to their primary role in gate operation and management: users, decision makers, implementers and experts, and were placed in three tiers: co-operating, co-thinking and co-knowing, according to their degree of involvement. Co-operating stakeholders are the most closely involved in the issue, through active interaction with the other stakeholders. Co-thinking stakeholders take part in passive consultation with other stakeholders but do not interact actively with others. Co-knowing stakeholders are only aware of the issue and do not actively participate in the interactions. A stakeholder diagram (Fig. 7.4) shows this distribution.

Fig. 7.4 Stakeholder alignment around sluice gate operation and management

On the basis of these, the social, political, institutional and bureaucratic power of the stakeholders to influence the operation of the sluice gate was further explored. The social power matrix (Table 7.1) shows the arrangement of the stakeholders according to their position with regard to an equitable and optimal operation of the sluice gate, and their level of social power to influence any change.

The stakeholder diagram and the social power matrix together represent the manifestation of the conflicts around the sluice gate in stakeholder positions and power relations. Despite KCC having the most active role and interest in the issue, its organizational capacities are largely limited because of a passive role of BWDB, which still owns the physical structure and is responsible for its repair and maintenance. Although the GOC has been mandated on the basis of an apparent consensus to operate the gate, its actual actions and implementation of decisions are influenced behind the scene by the LGIs, who also have stakes in the fish farms. The DA often plays a strong role in evicting the canal grabbers, but does not have a significant role in gate operation. Public agencies like KWASA and KDA are involved with drainage of greater Khulna, but not with sluice gate operation. DoE monitors the salinity and water quality parameters for river conservation, and can assist in establishing a gate operation rule. DAE works at the Union level to advise on eco-friendly, climate-resilient and sustainable agricultural practices. It can assist farmers by suggesting alternative suitable agricultural practices according to the available quantity and quality of water. The peri-urban communities, more specifically farmers and fishers, are most severely affected because of the construction and inequitable operation of the gate. They also struggle unsuccessfully in the margins of the social power structure.

The analysis of stakeholder positions and social power also revealed the opportunities for cooperative and collective action and for improving the gaps in stakeholder relations. These understandings were utilized in the action components of the research.

Table 7.1 Social power matrix for stakeholders influencing sluice gate operation

		Support			Opposition	
		Active	Passive	Fence-sitters	Passive	Active
Stakeholder Power	High	KCC	DA	GOC	LGIs	Fish farms
	Medium	CBOs, NGOs	City residents DoE	BWDB		
	Low	Peri-urban Communities, Farmers, Fishers	KUET, KU, BUET, Media, KWASA	KDA, DAE, Water & Goods transport		

7.5 Dealing with Sluice-Related Conflicts

7.5.1 *Sluice Gate Operation*

The research team has been actively involved at various stages in advocating an equitable operation of the sluice gate and institutionalizing a gate operation rule acceptable to all stakeholders, starting from the previous IDRC-funded research. A particular focus of the research was on mitigating conflicts around the sluice gate through capacity building of the marginalized peri-urban communities. From the very initial period of sluice gate construction and operation, different stakeholders derived different benefits from this water infrastructure. The varying demands on its operation resulted in conflicts among the stakeholders. From time to time, measures were taken to reconcile parties in these conflicts. For example, the gate was erected to flush out urban stormwater and prevent salinity intrusion with a design of one-way water drainage, which created irrigation water scarcity in the dry season. Later, considering the water need for agriculture, BWDB constructed vertical gates that enabled the sluice gate to allow and retain water inside the gate by averting one-way drainage. Another area of cooperation made by BWDB was handing over the operation and management of the sluice to KCC. As KCC provides all public services including water supply, drainage, and wastewater management within the city, the structure was handed over to them to minimize bureaucratic procedures and to accelerate and upgrade public services for city people. The research team in the previous IDRC-funded project was instrumental in facilitating this transition. Although the peri-urban community was not a central consideration, this cooperation led to the selection of a well-off farmer of Alutala, who is also an official of KCC, as the secretary of the GOC. The village leaders expected that he could play a role in creating cooperation between local farmers and fishermen.

During our long-term engagement with the issue we see indications of an improved level of satisfaction among the peri-urban residents regarding the operation of the sluice gate. This improvement is partly because of the changes in gate operation favoring agriculture (including vertical gate to allow water into the river) and partly because of the shift in agriculture to less water-demanding crops. The combined problem of salinity and urban wastewater has resulted in a shift in cropping choices away from rice to less water-demanding winter crops. This is evident from farmers cultivating sesame, melon, bitter gourd etc., which require less water. Farmers cultivate *aman* rice once in a year during the rainy season. Informal interviews with farmers and residents suggest that this shift in agricultural practices has reduced the number of conflicts in water demand. Noticeably, shrimp farming by urban elites in the peri-urban areas has also decreased, due to protests by local farmers and fishermen. However, the cost of transformation in peri-urban agricultural practices as an option for conflict resolution needs to be analysed from an economic viewpoint as well. It might be economically viable to replace rice cultivation with winter vegetables, considering the demand for vegetables in the city.

The research team facilitated bringing all parties together on a common platform and formulating a gate operation rule to optimize the water needs of all stakeholders. After understanding the water requirements of different stakeholders and their power relations, the research team met with them separately to discuss the gate operation issue. Jagrata Juba Shangha (JJS), a local organization with a good network, was successful in building rapport and establishing open communication. In the next step, the stakeholders were brought together for a dialogue on the issue. It was, however, challenging to engage with the fish farm owners in the process for two reasons. First, they were reluctant to communicate with the local communities because of protests against the fish farms and a subsequent law suit. Second, the fish farms were already relocating to other parts of the river because of degrading water quality. Thus, although the fish farm owners participated in the dialogue, they did not have any strong opinion. Rather, members of the LGIs and local political leaders, who previously had stakes in the fish farms and manipulated gate operation, saw new opportunities in community co-operative fish farms, and supported gate operation in their favor. As the gate remains relevant mostly for wastewater discharge and flood regulation, all parties eventually agreed and decided through interactive discussion that the gate should be operated in such a way that the water level remains 2 ft below the bank of the river in the downstream peri-urban area. This would be an acceptable solution for farmers and fishermen, and for groundwater recharge as well.

Our most recent investigations (in 2020) found that the GOC has become less active, since the KCC official and a peri-urban farmer representing KCC in the GOC have been replaced by another person who is higher in authority. Currently the gateman directly follows his orders for gate operation without consultation in the GOC. The new KCC official in the GOC, having a higher authority and not having a personal stake in the peri-urban area, is less interested in community consultation. The other GOC members also feel less comfortable to communicate with a person of higher authority. At the same time, the local communities are losing interest in the negotiation platform and dialogue, as the water quality of the river has become so poor that it has become unusable for any purposes. Hence the conflicts around gate operation are becoming moot.

7.5.2 Capacity Development

The objectives of the capacity development activities were to build the capacity of the stakeholders to understand peri-urban water security concerns and use the research outcomes and learning to sensitize state actors, professionals and communities. JJS, the local partner in the research team, played an active role in this regard. The capacity of JJS itself was first developed through its participation in various meetings, workshops and training programs of the project. These included capacities to analyse and mediate conflicts, and a more holistic understanding of the socio-technical complexities. Then JJS became instrumental in developing the capacities of the local communities through (livelihood-related) trainings and by facilitating

them to develop their own water management plan. This water management plan was central to a common understanding of the optimal gate operation. A water management forum or platform was also created, involving all important stakeholders of the Khulna area where the community could present their plan and negotiate for some tangible outcome. Capacity needs were assessed in stakeholder workshops and meetings with peri-urban residents through discussion and exchange of ideas.

A capacity development initiative was carried out in Tentultala village in Alutala, because of its peri-urban location and multiple water-related problems. As the most marginalized group, the villagers were the primary recipients of the capacity building interventions. This enabled them to interact and negotiate with decision-makers more effectively and meaningfully in the water management forum. Stakeholder interaction in the forum was important to inform the decision-makers of the peri-urban needs. The village is not under the city administration, but far away from the center of the Union Parishad. Due to its unfavorable location, services from KCC or from the rural governance system (i.e. *Union Parishad*) do not reach the inhabitants of the village. Figure 7.5 gives a closer view of the peri-urban area, where the sluice gate is located. This resource map, prepared by the local community, indicates their main resources of interest such as rivers, canals, fish farms, agricultural land, embankments and roads. Notably, the community highlights the encroached canals, a series of cross-dams placed for fish farms along the abandoned channel of the Mayur River, and the locations of a proposed sluice gate and DTWs.

Tentultala Village is situated approximately ten kilometres away from Khulna city. According to a Bangladesh Bureau of Statistics (2011) census report, there are 668 households in this village. The village depends upon a single water source (river) for daily water demands. The Rupsha and Mayur rivers are flowing on the

Fig. 7.5 Resource map of areas around the Alutala sluice gate

south-east and north-west sides of the village. As a result, this village is seriously vulnerable to water-related natural disasters like floods. Generally the villagers are engaged in crop cultivation and fish farming as their main and secondary occupation, respectively. Around 80% of the villagers in Tentultala are engaged in cultivating crops like rice, fruits and vegetables. Most farmers do not own land. Crop cultivation started in Tentultala after the establishment of the embankment and the sluice gate. Before construction of the sluice gate, people used to cultivate only one crop in a year (in the *aman* season). Later, villagers could produce three crops each year: rice was produced twice (*robi* season and *aman* season), and vegetables were produced in the winter season. People depend on rainfall for irrigation in the *aman* season. But in the *boro* season they use shallow boring for irrigation.⁵ According to the villagers, shallow boring for irrigation purposes is not very effective because of the high iron content of the groundwater.

The main complaint of the Tentultala villagers is that the gate is mainly operated considering the benefits or privileges of other upstream peri-urban communities (e.g. Chak Ahsankhali). The elevation of Tentultala village is 6 feet higher than the upstream areas. Those areas would be flooded if Tentultala villagers were allowed to get sufficient water for their crops. For these reasons, gate operation is mainly conducted considering the privileges of the upstream communities. The fishermen group is also affected by the improper management of the sluice gate, as they cannot get sufficient water for fish farming. Further, water logging is a serious threat for Tentultala. The drainage system in this area is poor; there is no proper drainage system which considers the direction of water flows. The only canal is supposed to be connected with the main river, but usually becomes disconnected from the river due to encroachment and illegal grabbing by powerful political leaders and fish farms. Improper sluice gate management is another cause of drainage problems.

Against this background, collaborative action towards capacity development for securing water in the peri-urban area under the CCMCC project was initiated by the partner organizations of Bangladesh (BUET and JJS). To solve all conflicts, a participatory water management plan and a water forum involving upstream and downstream dwellers, KCC, BWDB, *Union Parishad* and *Upazila Parishad*⁶ were considered to be important, and capacity development of the stakeholders for preparation of the plan was attempted. A number of steps were followed to develop the water management plan of Tentultala. Various capacity building initiatives were taken by JJS to enhance the capacity of the people. The project has provided necessary information and technical support to the community for developing the plan. Several discussion sessions were held at the community level, with the participation of both male and female members from various sections. During the process,

⁵Aman and boro are rice seasons. Aman rice is generally sown in the rainy season and harvested in winter. Boro rice is sown in winter and harvested before the rainy season.

⁶Sub-district council and the middle tier of the local government system in Bangladesh. An Upazila consists of several Unions.

experts developed a deeper understanding of the conflict dynamics, and more practical understanding of mitigations measures through the stakeholder interactions.

A number of multi-stakeholder platform formation meetings, workshops on negotiation, and cooperation for water management were arranged during the project period to identify the water-related problems of the peri-urban communities, to develop action plans for negotiation with the targeted stakeholders, and to manage water-related conflicts for efficient water management. The people of Tentultala have identified many problems of their area through discussions and exercises. The identified problems are drinking water (tube-wells), water logging and canal encroachment, road communication, electricity, cyclone shelter, community clinic and sanitation. Then they prioritized the issues and identified three major issues related to water: (i) water logging and canal encroachment; (ii) scarcity of safe drinking water; (iii) water pollution of the Mayur/Kazi Bacha rivers. After prioritizing the issues, the community identified the related stakeholders and institutions that can contribute to resolving their issues. The project team created an opportunity for the community to discuss these issues through a stakeholder consultation meeting, where they presented their water management plan. In the consultation meeting, participants gave suggestions to improve the plan. The project then assisted the community to finalize the plan, which consisted of the following main components:

Water logging and canal encroachment: the community planned to remove barriers on the canals and to stop canal encroachment and illegal land grabbing through discussion and the submission of a memorandum to the *Upazila*, District and *Union Parishad* administrations. They initiated advocacy with BWDB to build a sluice gate in the area of *Boro Khal* for draining out excess water in the rainy season as well as for irrigation in the dry season. The people also planned the formulation of a sluice gate management rule for smooth operation of Alutala sluice gate.

Scarcity of safe drinking water: to mitigate the drinking water crisis, the community identified seven sites for installation of DTWs. The community talked with the Department of Public Health Engineering (a government agency responsible for drilling DTWs in rural areas) and *Union Parishad* Chairman for allocating seven DTWs in their proposed area.

Water Pollution of the Mayur/Kazi Bacha River: the Tentultala community has developed a plan for safe disposal of wastes in the Mayur River, to be discussed with KCC. An interface meeting was organized with KCC, DoE and other related organizations to discuss the treatment of clinical, industrial and slaughterhouse wastes before discharging to the Mayur River. The project team created the opportunity for the community to discuss the issues with the relevant authorities.

The process followed in preparing and implementing the water management plan is schematized below (Fig. 7.6):

Fig. 7.6 Steps followed in preparing and implementing the small-scale participatory water management plan for Alutala

7.5.3 Implementing the Plan

For implementing the plan, some processes were initiated to achieve the desired goal. The community will benefit in the long run if the prepared plan is implemented in a sustainable manner. The processes addressing the three major issues are summarized in Table 7.2.

Table 7.2 Main processes in the implementation plan

Major issues	Process
Water drainage system	Community advocacy group organizes meetings with authorities and departments
	Community conducts advocacy with <i>Upazila</i> administration for stopping canal encroachment and illegal land grabbing
	Community conducts advocacy with BWDB to prepare a sluice gate in the area of <i>Boro Khal</i> (in front of CSS)
	Community submits memorandum to <i>upazila</i> and district administration and <i>Union Parishad</i> for stopping canal encroachment and illegal land grabbing
	Continuous progress and strategy review, follow-up and monitoring
Scarcity of safe drinking water	Community advocacy group organizes meetings with authorities and departments
	Community conducts advocacy with district and <i>Upazila</i> DPHE and <i>Union Parishad</i> for installation of safe drinking water options
	Community people submit application to <i>Upazila</i> chairman and DPHE for installation of deep tube-wells
	Continuous progress and strategy review, follow-up and monitoring
Water pollution of the Mayur River	Advocacy group demands treatment of polluted wastewater before drained to the Mayur River
	Advocacy group negotiates with DoE for regular monitoring of the Mayur river water quality
	Community links with mass media on this issue
	Continuous progress and strategy review, follow-up and monitoring

In a Peri-urban Water Forum meeting in Khulna, the village community presented the peri-urban water management plan through a social and resource map of Tentultala, prepared by themselves. In the water management plan the community identified the existing problems of the area and enlisted the responsible department for further discussion. They also fixed a timeline to address the issues. Aside from these, individual stakeholder meetings with DPHE and BWDB were organized to discuss the small scale-participatory water management plan of Tentultala village.

The following outcomes and achievements of the action research are highlighted:

- The *Union Parishad* installed a DTW near the sluice gate;
- The *Upazila* administration took initiatives to remove canal barriers (cross-dams) and evict illegal grabbing;
- KCC appointed a permanent gate operator for operation of the sluice gate;
- Female and male community leadership was developed, to participate in local, regional and national level dialogue.

7.5.4 Legal Remedy

Community Cooperative Fish Farming Project

The commercial fish and shrimp farming in the Mayur River, started by the urban elites in the early 1990s, directly hit the fishermen community of Alutala through eviction from their inherited livelihood. The frustrated fishermen community got organized and established a movement to protest this commercial shrimp farming at the cost of freshwater fisheries. In response, the urban elites filed a case against their protest. Some local NGOs (e.g. *Shomaj Progati Shangha*, Action Aid) and human rights organizations stood by their side with legal support to rehabilitate and re-establish their right to the Mayur River. The NGOs consulted with, and also involved, BWDB and the Department of Fisheries to assist the peri-urban fishermen community. Eventually the case was dismissed in favor of the fishermen community, though the social conflict between the poor fishermen and the local influentials who failed to cultivate shrimp continues to exist there. In response to the unfavorable gate operation, the community started a fish farming project (the concept came from small households) by leasing *khas* land with an informal and unauthorized political approval about 10 years ago. They have officially applied for taking the land on lease with the DC (District Commissioner, the government authority) but have not yet received formal approval. The benefits are small: through this fish farming project, each family gets only BDT 2500 in a year.⁷

River Encroachment

Another legal victory came recently, when the High Court ruled to remove all illegal structures and encroachments along the Mayur River, some of which KCC had already started implementing. This case was filed by a local NGO. From these two instances, it can be said that NGOs as mediators can often empower local communities. Such legal courses take time but ultimately reduce many disputes and provide sustainable resolutions. The research team has been a passive partner in these legal processes. Representatives of various NGOs often took part in our workshops and meetings. We supported their activities and provided moral support through our presence in the field during the last 10 years. We also met with two mayors of KCC during this time period and apprised them of our activities, which were appreciated and encouraged by both of them. Such engagement at various levels provided a moral support to the process of conflict resolution.

7.6 Conclusion

Conflicts around water, livelihoods, and ecosystem services and functions in peri-urban Khulna largely emerged from inequitable design and operation of the sluice gate. These conflicts are expressed in the relationships between the stakeholders and

⁷ 1 US Dollar = 85 Bangladeshi Taka (BDT)

actors beyond the peri-urban space and vary with time. The original design of the structure prioritized urban requirements while ignoring peri-urban and ecosystem needs. With no provision for ecological and hydrological continuity across the embankment and the gate, the fisheries, agriculture and other associated peri-urban livelihood sources were severely affected. For gate operation as well, urban storm-water and wastewater discharge had a priority over peri-urban water requirements. Later, the degrading water quality of the Mayur River, partly caused by unmanaged urban wastewater and partly by manipulated gate operation, also gave rise to the conflicts in the peri-urban area. Climate change has a clear relation to the water conflicts, which is evident from the additional stress of salinity intrusion induced by sea level rise and high-intensity rainfall events causing water logging. Soil and groundwater salinity has increased with river salinity, affecting agriculture, fisheries and drinking water sources.

An optimal gate operation to meet peri-urban needs is challenged by several factors. First, the peri-urban area is not a formal administrative entity in either urban or rural governance. Thus the unique transient nature of hydro-social processes in the peri-urban space is not addressed in policies or conflict management strategies related to the sluice gate. The peri-urban space is seen as only a contextual extension of either urban or rural issues. The sluice gate was constructed to provide very specific protection and services to the urban area only. The broader and long-term considerations for integrating the social, hydrological, ecological and environmental needs, particularly also for the downstream peri-urban communities, were missing in the technical design. Second, the roles and interests of peri-urban stakeholders around gate operation change as the peri-urban space undergoes transitions. These changes in stakeholder relations often re-align with the social power structure and lead to new forms of conflict and new power alliances. Legal recourse may temporarily settle disputes that are beyond mediation through dialogue and negotiation. The unmitigated intrinsic conflict shifts the stakeholder and power relations to a new equilibrium. Third, urban policy actors and implementing agencies such as KCC and BWDB dominate gate operation. Representation of the peri-urban communities in the decision-making process is nominal and ineffective unless there is a stake of the urban institutions or their representatives in peri-urban issues. Fourth, conflicts between public agencies may worsen peri-urban water insecurity and force the communities to seek alternative means of livelihood. The current minimally-functional state of the gate is a result of its dual responsibility and control: KCC decides only on gate operation while BWDB, despite having no interest in the gate, is still responsible for its repair and maintenance. There is no formal space for coordination or dialogue among these agencies, along with the LGIs and peri-urban communities.

Capacity development of the marginalized peri-urban communities proved to be effective for engaging them in dialogue and negotiation with policy actors and implementing agencies for conflict mitigation around the sluice gate. Such capacities include a shared knowledge of the hydro-ecological system in relation to their lives and livelihoods, stakeholder relations, organizational norms and practices, and preparation of an integrated and strategic water management plan. Sustainability of

the engagement of the peri-urban communities with policy actors and stakeholders, and dialogue on a collaborative platform, however, depend much on the active role of a third mediating party, such as a local NGO. The dubious roles of powerful stakeholders like LGIs, who have stakes on both sides of the conflict around the sluice gate, politically empowered locals, and fish farm owners may also undermine the effectiveness of the platform for dialogue and negotiation. Early engagement with key policy actors like the KCC, mayor and LGIs also proved to be helpful to create joint ownership of shared issues and concerns, and to align the multi-stakeholder platform for collaborative action.

We conclude this chapter with the following key learnings from the action research. First, continued advocacy with responsible authorities for successful implementation of a participatory water management plan eventually bears fruit, although the process is time-consuming and requires sustained efforts. Second, strengthening of cooperation between communities, government departments, local administration and local government is essential to solve community issues and problems. Such strengthening can occur through the engagement of a neutral actor, which in this case was our local partner, JJS. Third, ownership of a dialogue platform builds on trust, mutual understanding and respect for each other's positions, not only on negotiations and demands. Close engagement of a local facilitating party trusted by all is crucial in this process and its continuity.

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