

***Community and institutional responses to the
challenges facing poor urban people in Khulna,
Bangladesh in an era of climate change***

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January 2012

BWPI Working Paper 163

**Brooks World Poverty Institute
ISBN : 978-1-907247-62-0**

Creating and sharing knowledge to help end poverty

Abstract

Poor urban people in Bangladesh are already experiencing numerous climate-related problems because of their multiple forms of vulnerability and multiple sources of deprivation. Their problems differ greatly, both within and across settlements and cities, and so do the practices by which they are trying to tackle them. Various factors – physical, tenure-related, socio-political and institutional – contribute to this great variety of problems and practices. In this paper, we focus on Khulna City to identify the challenges facing Khulna's poor people, understand the practices they are developing, and examine the role that institutions are playing in supporting/constraining these practices. Khulna is third largest city of Bangladesh, located in the southwest region, where the consequences of climate change are expected to be particularly severe. In order to capture the main features of Khulna's diverse low-income settlements, we examined two of the most common forms of settlement – a public (*Supraghat*) and a private (*Magbara*) settlement.¹ A quantitative mini-survey was followed by detailed qualitative interviews and participatory exercises. In many ways Khulna's poor are responding well to their problems, such as through adjusting their livelihoods and reducing risks through individual and collective actions, and built environment changes and adaptation. People have more opportunities for advancement in public than private settlements, in terms of both developing more effective practices and having comparatively fewer constraints. However, several factors are constraining what they can achieve, such as geography and settings, lack of socio-political platform, ineffective support from public institutions, aid and NGO dependency, and limits to their own agency and structures. The paper concludes by arguing that improving the formal and informal processes of urban governance is central to strengthening the capacity of people in low-income settlements to cope with both existing problems and the intensified problems created by climate change.

Keywords: adaptation practices, Bangladesh, climate change, Khulna, urban poverty

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¹ We have anonymised the settlements and all persons cited in the text.

Acknowledgements

The authors gratefully acknowledge contributions (shaping the research methodology and designing the fieldwork) from ClimUrb core team members Professor Simon Guy (Head of School of Environment and Development, The University of Manchester), Professor Syed Hashemi (Director of BRAC Development Institute, BRAC University), Dr Khairul Islam (Country Representative, WaterAid Bangladesh) and Professor Ainun Nishat (Vice Chancellor of BRAC University).

The authors are thankful to Kabita Chaudhury, Md. Mamunur Rashid, Saiful Islam and Shameem Reza Khan and for their hard work in conducting the fieldwork.

The authors thankfully acknowledge the financial support from the ESRC-DFID Join Scheme for the research project '*Community and institutional responses to the challenges facing poor urban people in Bangladesh in an era of global warming*' (RES-167-25-0510).

1. Introduction

The study examines the following four questions concerning poor urban people and settlements in Khulna City, Bangladesh:

- What are the socio-economic and livelihood challenges facing Khulna's poor people, and how are and will they be compounded by climate change?
- What adaptation practices are people developing to tackle these challenges?
- What role do institutions play in supporting or hindering these practices?
- What are the policy implications, based on existing adaptation practices and institutional support?

The study involves both a review of available literature and official documents and plans, and extensive primary data collection and analysis (key informant interviews, dialogues and a detailed study of two selected settlements). The analytical framework informing the study is presented in Roy et al (2011). In brief, we differentiate challenges and adaptation practices in response to three forms of climatic events/processes: rapid-onset events; gradual-onset processes; and cascade effects (IOM, 2010). While we acknowledge the multiplicity of sources of deprivation for the urban poor (Baud et al, 2008; Mitlin and Satterthwaite, 2004), we argue that poor urban people are also actors in their own right. Many of them have survived extreme weather events in their villages, taken the challenge to embark on a journey of uncertainty in urban areas, and been struggling to survive the urban life with very minimal support beyond their own immediate contexts. This helps us to appreciate their agency, which in turn offers possibilities for effective policy making.

The primary data collection involved a combination of quantitative and qualitative research methods. First, we conducted a mini-survey in two selected settlements to collect basic information regarding household characteristics, livelihood patterns and poverty status (Chen and Schreiner, 2009). We categorised the households into three groups: very poor; poor; and non-poor. We also undertook participatory exercises (settlement mapping; problem identification and ranking; and institutional mapping) to identify the problems they face, the support they receive and the independent measures they take, as households and as groups. We then conducted detailed qualitative interviews of selected households, key informants, and institutions, to accumulate rich case study data. To supplement these settlement-specific data, we also studied the available academic literature and official documents, and held a dialogue with representatives of the case study settlements, public officials, and members of the civil society and academic community. The detail presentation of these data is available in Jahan et al (2012) and Roy et al (2012).

To appreciate what is happening in Khulna, we must place the city in a broader context. Researchers have long argued that the persistent levels of urban poverty in developing countries are a consequence of deprivation in a number of areas, most notably insecurity of tenure (Payne, 2004; 2001; Mitlin, 2001; see also *Environment and Urbanization* 1989 1(2)). Many poor urban households live in illegal, and thus insecure, low-income settlements. It has been observed that only when their tenure is relatively secure, do they invest in shelter and basic service provisions so that improvements in other areas of deprivation can take place

(Baud, 2000). While poor urban people are well known for their agency in tackling their problems, both individually and collectively (Satterthwaite, 2009a), their meagre resources cause severe constraints on what they can achieve by local-level actions. To achieve more, they have to enter into partnerships with external actors. It has been suggested that an effective coalition between diverse institutions is perhaps the most important mechanism to address poor people's resource constraints (Lee, 1998).

However, governments in many developing countries are still neglecting poor urban people's right to shelter. In Bangladesh, for example, the 1999 National Housing Policy provides little legislative protection to the urban poor (Rahman, 2001).² In parallel, the government has been maintaining a policy priority to eradicate rural poverty (Banks et al., 2011), whilst neglecting the deepening problems of poor urban people in the national-level climate change policies, such as the National Adaptation Programme of Action (NAPA) (GoB, 2005) and the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) (GoB, 2009). Now that the threats of climate change have become a reality, a massive 16 to 20 million poor people are facing displacement from rural to urban areas by the turn of this century (Renner, 2008).³ These figures need to be treated as indicative and with caution, as exactly what will happen in future is very unclear. They nonetheless pose a difficult challenge for policy makers, as the urban governance structure of Bangladesh has not been sufficiently developed to address the rise of urban poverty (Panday and Panday, 2008). In effect, the absence of governance capability has reduced the municipal government's ability to develop a meaningful partnership with diverse actors concerning low-income settlements. This, in turn, has left poor urban people's agency and structures and the mediating institutions less prepared to adapt to the consequences of climate change impacts.

In a recent paper we have identified at least two interrelated ways in which poor urban people are likely to experience more harm due to perturbations or stresses that are being or will be caused by climate change and variability (Roy et al., 2011). First, poor urban communities are places where physical (spatial and external) and social (internal) vulnerability coincide (Simon, 2008; Douglas et al 2008). Second, the drivers of urban change (e.g. industrialisation, economic growth, rural to urban migration of poor people; and residential and economic segregation based on income, access to resources and facilities) contribute to creating inequalities and different realities for poor urban people. The urban government structure is usually unable or unwilling to address issues in existing poor urban communities, let alone developing in step with the process of urban change (Satterthwaite, 2009b). So, much of the physical growth and economic expansion involving poor urban people takes place outside any official rules and regulations, and in particularly vulnerable locations, e.g. floodplains. In this way, the coincidence of vulnerable places and vulnerable people continues and the level of inequalities rises.

² The policy was further revised in 2004, but awaits approval, due to various deadlocks arising out of the volatile political situation in Bangladesh. It also remains to be seen how much of the policy is translated into action at ground level and whether it can bring about any significant change for the urban poor (Ahmed, 2007).

³ GoB (2009) estimates that 'six to eight million could be displaced by 2050 and would have to be resettled' (p. 14).

Building on our Khulna case studies, in this paper we argue that neither the international approaches nor the national-level strategies and actions on climate change adaptation adequately address the challenges of poor urban people. At the city level, people suffer differential political realities and access to external support, based on whether they live in public or private settlements. This ultimately shapes what they can do to tackle the problems they face. At the national level, the lack of a low-income settlement policy makes poor urban settlements often invisible and disregarded in official documents and plans. At the international level, there is a lack of mechanisms through which poor urban people could benefit from growing levels of international funds to support adaptation measures in developing countries.

2. Khulna case studies

Khulna is the third largest metropolitan city of Bangladesh. It stands on the banks of the Rupsha and the Bhairab rivers. The Khulna City Corporation (KCC) covers an area of about 47 km² and had about one million inhabitants in 2010 (McIntosh, 2008; PREGA, 2006). Khulna obtained its status as a formal town after the establishment of the municipality in 1884 during the British colonial regime and as a City Corporation in 1990. During 1884–1947, the city's population grew very little, but in 1947 at Partition, a huge flux of Indian Muslims migrated to the city and its population rose to about 42,000, a four-fold increase in just five years (KDA, 1998). During the late 1950s and early 1960s, Khulna became an important centre for industrial development. Many industries, such as newspaper mills, shipyard, jute mills and shrimp processing, were established. But after the independence of Bangladesh in 1971, while the population of Khulna continued to grow, the industrialisation process stalled (Parvin and Mostafa, 2010). Since the early 1990s the local economy has revived somewhat, due to the growth in shrimp farming and processing activities and the establishment of Khulna University.

Yet, as a region, Khulna's share of GDP remained quite low, at 11.70 percent compared to Dhaka (37.23 percent), Rajshahi (20.52 percent), Chittagong (19.32 percent), Barishal (5.87 percent) and Sylhet (5.36 percent) in 1999-2000 (GoB, 2008). The city's economy is likely to experience a massive boost when the Padma Multipurpose Bridge is constructed (expected in financial year 2014-2015). This will reduce the travel distance by road to Dhaka by 100 km, and is expected to help increase the GDP by 1.2 percent per annum (The Financial Express, 2011). Many speculative developments have already begun, and the price of land has shot up. The city has the third highest number of people living in poor urban settlements, after Dhaka or Chittagong (the two other cities being studied as part of this research).⁴

⁴ In 2005 the number of people living within poor urban settlements in the Dhaka, Chittagong and Khulna City Corporation areas were 3.42, 1.47 and 0.188 million, respectively. They represent 37.4, 35.4 and 19.5 percent of the population of the corresponding cities (CUS, 2006). In contrast, the Household Income and Expenditure Survey (HIES) 2005 reveals that the incidence of urban poverty in the three cities were 20.2, 27.8 and 40.4 percent of the city population, respectively (BBS, 2007). Assuming that both estimates are correct, it seems a greater share of poor urban people live in low-income settlements in Dhaka and Chittagong than in Khulna.

In climate change terms, the city is in one of the country's most vulnerable locations. It is located in the southwest of Bangladesh, where the consequences of climate change are expected to be particularly severe. As a deltaic plain, the land is flat and poorly drained. The Khulna metropolitan area is only about 2.5m above the mean sea level. In a recent report, the Institute of Water Modelling (IWM, 2010) identifies the following vulnerabilities for the city:

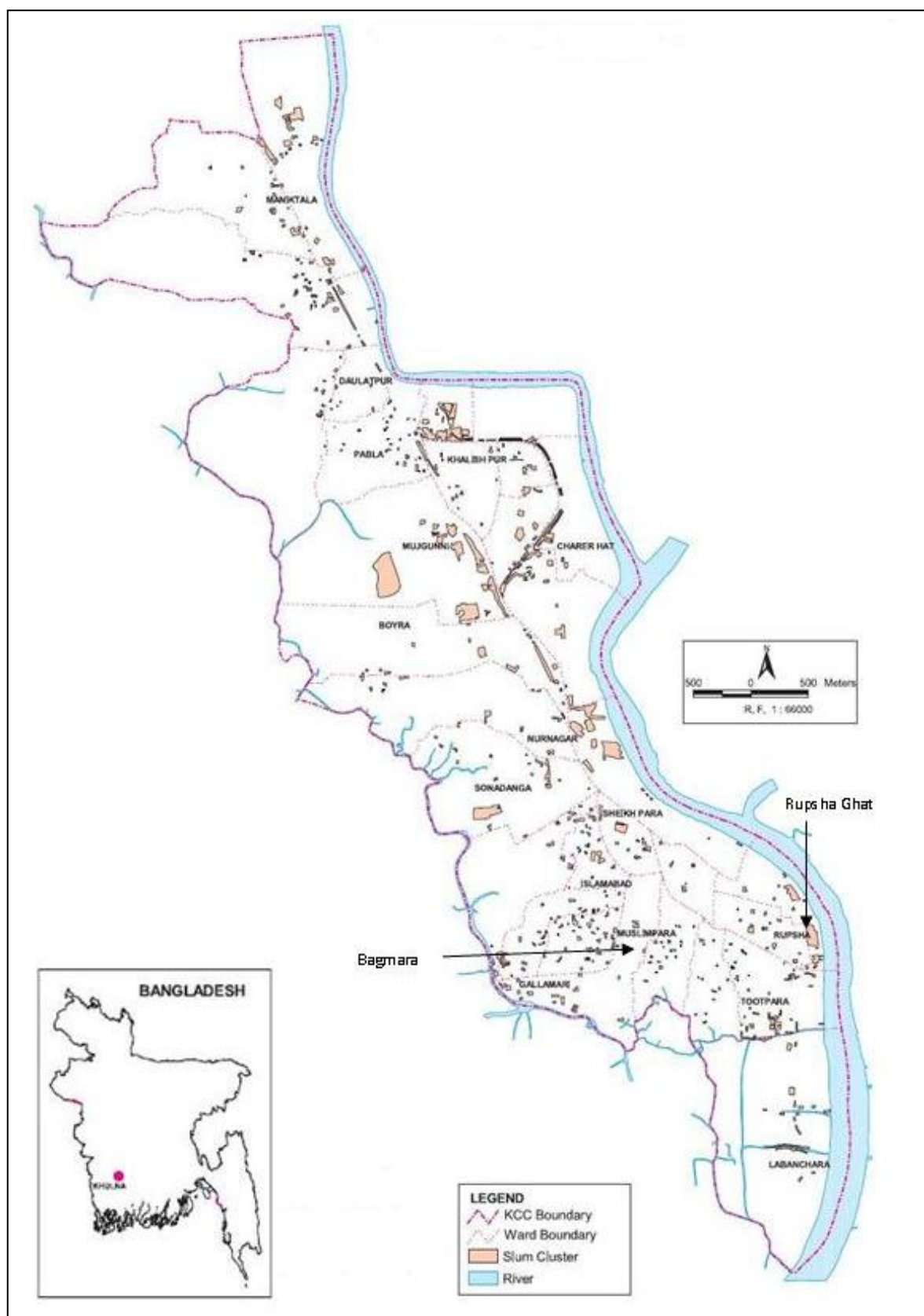
- A rise in extreme rainfall incidents (50, 100 or 150 mm rainfall in six hours) by 2050.
- A plausible sea level rise of 20-40 cm by 2050. A subsidence rate of 9.55 mm per year may exacerbate the impact.
- Even though no formal study on increase of heat waves and heat stress in Bangladesh has been undertaken, the yearly trends of rise in temperatures are already being observed.
- A rise in intensity and frequency of both coastal flooding (from sea water), and inland flooding (from river/rain water).
- Rising salinity and increased scarcity of safe water. At all but one water intake location, the salinity levels are likely to increase and exceed the 1ppt chloride (the upper threshold for drinking water). There will be increased river salinity (0.6 ppt chloride) at all locations around Khulna.
- Even with some drainage improvements, by 2050 30 percent of the city will experience water logging above 30cm once in every 10 years.

The impacts of climate change-related trends are already becoming evident in Khulna. In the past 10 years, nearly all the city's population has been affected by one or more major problems, such as river floods, cyclones, waterlogging, and salinity. Around 81 percent were affected by severe cyclone, 11 percent by river floods and five percent by waterlogging (IWM, 2010). Commonly, poor urban people suffer most as a consequence of these impacts. Like other cities of Bangladesh, Khulna is home to a large number of low-income people living in poor quality dwellings/shacks in cramped conditions in vulnerable locations. A 2005 survey estimated that about 0.19 million poor urban people (about 20 percent of the city's population) live in 520 low-income communities in Khulna (Angeles et al., 2009) (Figure 1). These communities vary greatly in terms of area covered and number of residents. But the challenges, such as finding ways to earn a living, surviving with substandard levels of civic facilities, and living with persistent threats to tenure security, are common to all.

There are at least three ways climate change may compound these challenges:

- (i) **Sudden-onset events**, e.g. floods, cyclones and catastrophic river erosion. Large areas of Bangladesh's coastal area located south of Khulna are and will be highly vulnerable to the threat of sudden-onset events for the foreseeable future, and climate change may well aggravate the situation. The most recent examples of such events include cyclones Sidr (2007) and Aila (2009), which have driven thousands of people into Khulna city (Mehedi, 2010).
- (ii) **Slow-onset processes**, e.g. coastal erosion, sea-level rise, salt water intrusion, rising temperature, changing rainfall patterns and drought. Many cities and towns of Bangladesh, including Khulna, are significantly exposed to slow-onset processes.

Figure 1: Location of low-income settlement clusters in Khulna City (CUS, 2005)



Source: CUS (2006)

According to IPCC (2007), a one-metre rise in sea level will inundate 20 percent of Bangladesh's land mass, which includes urban areas such as Khulna.

- (iii) **Cascade effect** (a chain of events due to an act affecting a system), e.g. environmental degradation, increased urbanisation, reduced human security and international migration. Climate change will displace an estimated 12 to 15 million people in Bangladesh by the turn of this century. Most of them will be poor people from rural areas heading for urban areas, putting additional stress on the low levels of facilities in existing low-income settlements and on the capacity of their providers. This is already happening in Khulna city, with increased migration following cyclones Sidr and Aila.

How these events, processes and impacts are affecting and will affect Khulna's poor people has been examined here by studying two settlements. The decision to study two settlements was made in order to ensure that we captured the main features of the diverse settlements in the city. Their selection was based on a reconnaissance survey of five potential case study settlements (shortlisted in consultation with Khulna-based non-government organisations [NGOs] and civil society organisations [CSOs]) and an assessment of their suitability as case study sites using six predefined criteria.⁵ In addition, we held a dialogue with members of the local academic community, policy makers, civil society organisations and members of the selected settlements for a broader testing of methodology and findings. The event was attended by 50 representatives from 20 organisations.

We finally chose Magbara and Supraghat as the two case study settlements (Figure 2). They represent two common poor urban settlement types in Khulna – a private and a public settlement, respectively.⁶ The Magbara settlement (Figure 2A) has evolved over the past decade on a number of closely located privately-owned land holdings. It is interesting to note that the owners have developed a common type of rented dwellings for low-income people. We have chosen six such settlements, based on their proximity to each other, as well as six criteria, as mentioned above. The length of tenancy in the settlements is usually quite short, with the average being two years and longest being nine years. At present there are 70 households and 311 residents in the studied six settlements in Magbara; all are Muslims.

Supraghat (Figure 2B), on the other hand, evolved over the past 30-40 years on land partly owned by the government and partly by a religious organisation – the Khulna Baptist Church

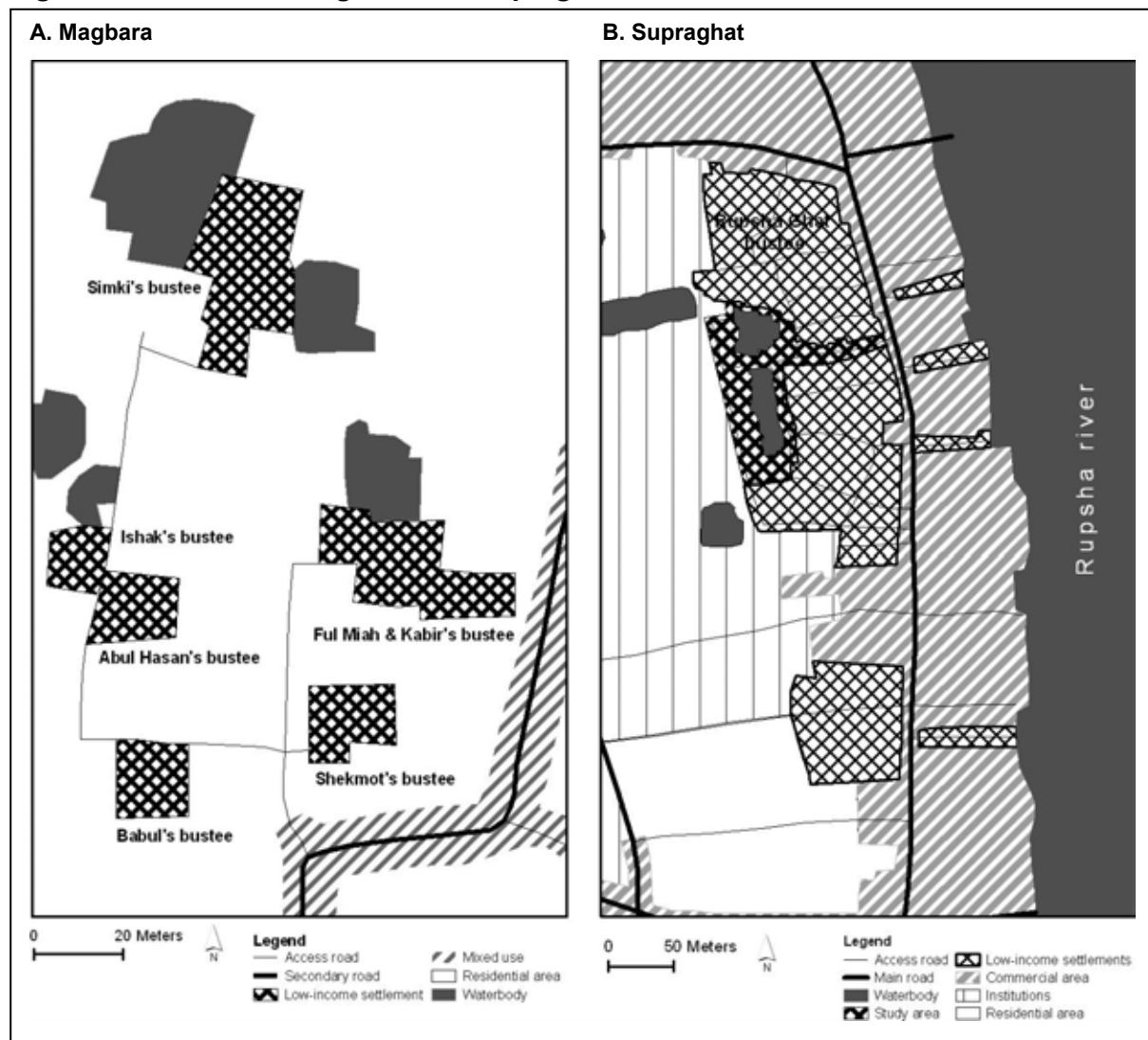
⁵ These are: (i) socio-economic diversity – to ensure selection of settlements where there is a variety of socio-economic groups, so we can learn about a variety of livelihoods and perspectives; (ii) presence of adaptation practices – to ensure that we can study challenges to poor urban communities as well as the practices that they develop to adapt to those challenges; (iii) presence of institutional structures – to be able to understand institutional roles in poor people's adaption practices; (iv) diversity of tenure/security – this is to ensure that we do not pick a community that has a secure tenure or only one form of tenure structure; (v) not atypical – to ensure that we are able to capture the dynamics of multiple forms of livelihoods and complex forms of community organisations; and (v) existing environmental problems – so as to help us understand how the existing problems could be compounded by climate change.

⁶ About 12.5 percent of low-income settlements in Khulna were located on public land in 2005 (Angeles et al., 2009)

Association (KBCA). Most of the residents enjoy unauthorised land ownership, either by being the original settlers or by purchasing (informally) the possession of the land from the original settlers or their successors. It is the biggest settlement in Khulna by population size and the fifth largest by area covered. In 2005, it was home to 3,700 households and 15,875 residents on an area of 2.48 hectares (CUS, 2006). With a population density of over 6,400/hectare, it is a particularly dense settlement. It is too large for a quantitative case study; therefore we studied only a section of it. We strategically selected the area where environmental problems are particularly severe, and which possesses a greater socio-economic diversity. There are 145 households in the selected section of Supraghat, with 24 Christian and 121 Muslim households.

The two settlements, therefore, give us two different perspectives on problems facing poor urban people in Khulna. As a rented private settlement, Magbara presents a snapshot of transition into urban life by recent migrants. In contrast, Supraghat covers almost the entire lives of dwellers in a public settlement, giving a rich account of livelihood diversity, community-based practices and physical adjustments to dwellings. As the rest of the paper shows, the two perspectives vary greatly, with dwellers in the public settlement showing more innovation and resilience than the dwellers in the rented settlement.

Figure 2: Contexts of Magbara and Supraghat Settlements



3. Vulnerability in low-income urban settlements in Khulna

Vulnerability is the degree to which a system or unit is likely to experience harm due to exposure to perturbations or stresses. It is important to distinguish between vulnerability *to* something, and vulnerability *from* something (Summer and Mallett, 2011). Alwang et al. (2001) argue that when we talk about an outcome, e.g. malnutrition, homelessness, bankruptcy – we are talking about vulnerability *to* that particular outcome, whereas when we talk about the relationship between vulnerability and risk, we are talking about vulnerability *from* exposure to (whatever) risk. Sherbinin et al. (2007) add a third dimension, namely factors constraining/shaping people's capacity to respond. They argue that vulnerability is typically identified in terms of three elements: (i) system exposure to crises, stresses and shocks; (ii) inadequate system capacity to cope; and (iii) consequences and attendant risks of slow (or poor) system recovery. This perspective suggests that the most vulnerable individuals, groups, classes and regions or places are those that: (a) are most exposed to perturbations or stresses; (b) are most sensitive to perturbations and stresses, i.e. most likely

to suffer adverse outcome from exposure; and (c) have the weakest capacity to respond and ability to recover, due to factors governing the local settings and the wider contexts.

In analysing the vulnerability of people in the case study settlements to climate change, therefore, we have focused on three aspects: people's exposure; potential outcome; and the underlying factors shaping their exposure and outcome. We have also opted to use a slightly modified typology of vulnerability. Existing literature differentiates vulnerability into a physical (external) and a social (internal) category (Moser et al., 2010). However, we found it useful to expand the social vulnerability into: politico-legal vulnerability; and socio-economic vulnerability, given the importance of these dimensions in the lives of poor urban people in Khulna. Indeed, our identification and ranking of the challenges that people in the case study communities are facing, reveal that people are more concerned about politico-legal issues such as eviction (in public settlements) or socio-economic issues such as unemployment (in private settlements) than anything else (Table 1).

Table 1: Problems facing people in Magbara and Supraghat by type and level of priority (denoted by rank)*

Magbara		Supraghat	
Problem	Rank (no. of votes cast)	Problem	Rank (no. of votes cast)
Seasonal unemployment	1 (59)	Eviction threat	1 (34)
Low quality and scarce open market sale (OMS) rice	2 (52)	Drug selling and addiction	2 (14)
Inadequate/poor quality sanitation	3 (32)	No community clinic	3 (9)
Lack of footpath	3 (32)	Inadequate/poor quality sanitation	4 (6)
Problem with mosquitoes	4 (31)	Blocked drains	4 (6)
Scarcity of fresh drinking water	5 (28)	Polluted pond water	5 (5)
Heat stress	6 (25)	Risk of fire hazard	5 (5)
Lack of cross-ventilation	6 (25)	Inadequate educational support	6 (4)
Bad smell (air pollution)	7 (21)	Financial stress	6 (4)
Lack of playing fields	8 (20)	Lack of employment	6 (4)
Lack of bathrooms	9 (18)	Early marriage	7 (3)
Waterlogging	9 (18)	Limited coverage of old age pension	8 (2)
Excessive cold in winter	10 (12)	Lack of awareness among residents	8 (2)
Problem with snakes/insects	11 (10)	Lack of dustbins	8 (2)
Frequent electricity load shedding	12 (8)	Poor mother and child nutrition	8 (2)
Lack of relief support	13 (7)	Problem with mosquitoes	9 (1)
Problem with thieves	14 (2)	Waterlogging	9 (1)
Non-stop rains	15 (0)	Overcrowding	9 (1)
		No community centre	9 (1)
		Limited income compared to need	9 (1)
		Indoor air pollution from cooking fumes	10 (0)
		No widow's pension	10 (0)
		Inadequate primary health care	10 (0)
		Sedimentation in the channel connecting the sluice gate	10 (0)
		Heat stress	10 (0)
		Higher rates of disability	10 (0)

Note: * Based on two participatory problem identification and ranking exercises in Magbara and Supraghat settlements. There were 20 participants in Magbara, each casting 20 votes. Similarly, there were nine participants in Supraghat, each casting 10 votes. The numbers in parenthesis indicate the total vote cast for the corresponding problem. The higher number of votes in Magbara than Supraghat was a result of more votes allocated per person and more participants.

Of course, people face a whole range of other problems, depending on the profiles of both the settlements and their residents. Some of the problems that we identified in the two settlements are common, while others are different. The common problems mostly relate to the broader socio-economic and environmental factors, such as poor sanitation, food price rises, heat stress and cold waves. Arguably, these broader problems will affect almost all low-income urban people in the country, not just in Khulna, as our research in three other cities – Dhaka, Mymensingh and Bhairab – reveals. It is important to note that poor urban people can do very little to influence the cause of some of these broader problems, notably food price rises.⁷

Other common problems, such as heat stress and cold waves, are partly a result of climate variability and change, to which the contribution of poor urban people is also negligible. For example, our data suggest that poor people's consumption of domestic energy in Khulna is limited to using one light bulb and a ceiling/table fan (in summer); some very poor people could not even afford this. They cook only once a day, using biomass such as tree bark and firewood. Thus the talk of mitigation, which dominates international climate change policies, has little relevance to Khulna's poor. Instead, what is more important and relevant is the numerous practices by which these people are adapting, not just to their local problems (e.g. waterlogging) but to the more generalised problems, too.

We now discuss in more detail the various types of vulnerability to which these generalised and specific problems relate, and the corresponding exposure, outcome and underlying factors shaping them. These are summarised in Tables 2 and 3.

3.1 Physical vulnerability

We find evidence of high levels of physical vulnerability in Khulna's low-income settlements. But there are variations in its nature and extent, both within and across settlements. All the available evidence on climate change suggests that these problems will become more common and more severe in coming years. We identify the following five forms of physical vulnerability in Khulna:

a) The settlements have close proximity to coasts and water bodies. The entire Khulna city is close to the coast, and this increases the risk of salinity in the groundwater. The effect is felt most keenly by poor people, as they depend on extracted groundwater, commonly using shallow tube wells. Deep tube wells (which pump out water with less salinity from deep below the ground) are more costly and fewer in number. People (especially women, who usually collect water) often spend much time and money (walking, queuing, and paying others) on collecting drinking water from deep tube wells. They use water from shallow tube wells for

⁷ There are many reasons contributing to the rise in food price. The rapid expansion of bio-fuel production is arguably one of the key reasons behind global food price increase (Boddiger, 2007). Fear of food insecurity sparked by the global shortfall in staple food production led to temporary ban on export of food grains from certain countries affecting food grain imports to Bangladesh (Timmer, 2010). The government continues to struggle to regulate the market, and the coverage of the Open Market Sale (OMS) remains limited to only rice, leaving poor people exposed to rising price in other items (Demeke et al., 2008; Ninno and Dorosh, 2002).

washing and cooking (which increases the passive intake of sodium). 'Increased salinity of drinking water is likely to have a range of health effects, including increased hypertension rates' (Khan et al., 2008: 385).

Proximity to water bodies, such as ponds, on the other hand, is partly related to how the settlements were developed in the first place. The ponds were created by digging up soil to raise dwelling plinths. In the public settlement, we identified another strategic reason for creating the ponds – to stop settlement expansion by illegal occupants. Nevertheless, these water bodies become a destination of all sorts of waste and a source of air and water pollution. Hot and humid conditions make this water a breeding place for mosquitoes and other disease vectors. To Patz et al (2005), infectious agents (such as protozoa, bacteria and viruses) and their associated vector organisms (such as mosquitoes, ticks and sandflies) are devoid of thermostatic mechanisms. Their reproduction and survival rates are thus strongly affected by fluctuations in temperature. There are correlations between disease rates and weather variations over weeks, months or years and in close geographic associations between key climate variables and the distributions of important vector-borne diseases.

b) The settlements have lower relative elevation compared to the surrounding area, which increases the risk of inundation and waterlogging. Inadequate and improper drainage systems compound the problem, resulting in frequent and prolonged waterlogging incidents. If the logged water is polluted, which is invariably the case, the spread of waterborne disease could affect people's recovery process.⁸ Some parts of the Supraghat are at least 1.5 metres below the level of surrounding area, while change in relative elevation is not noticeable in Magbara. Both settlements are characterised by inadequate drainage systems, but the problem is acute in Supraghat. There are two main sources of drainage problems. First, the house and street level connections are mostly kept open and connected to the trunk systems, with inadequate gradient. Second, residents put rubbish into the drains, partly because there is no waste management system in place and partly due to their own ignorance and carelessness.

c) Poor sanitation is a consequence of an inadequate number of poorly constructed community latrines. In Supraghat, for example, a latrine complex with four toilets and a bathroom is shared by 80 households (about 400 people). In rush hour, the waiting time could be as long as 15 minutes. Many people could not wait that long, so they have constructed personal hanging latrines over the pond, despite the practice being banned by the municipality. Excessive use of community latrines frequently results in septic tank overflows and having no time to clean the latrines. As the overflow pipes are linked to the pond, every now and then (especially during rainy season) raw sewage escapes to the pond, adding more pollution load to the water. The situation in Magbara is even worse, as the community latrines are worse constructed. In some cases, there is no slab on the ring latrines, so the sewage overflow is more random and bad smell is a constant problem.

⁸ A respondent from Supraghat reports 'whenever there is heavy rain, we get waterlogging. This year (2010) in October we had three to four days of non-stop rainfall. The dirty water from the pond came up to the verandah. Fortunately, the water stayed for only three to four hours, but it nonetheless damaged the floor and generated nuisance and bad smell and we could not go out'.

d) Use of temporary techniques and materials for dwelling construction makes the dwellings relatively vulnerable. Low-income dwellings are mostly built as temporary structures, using materials such as thatched bamboo partitions, *golpata* (palm leaf) or tin (corrugated iron sheet) roofs – the use of bricks is limited at best to plinth and walls and only by some non-poor households. There are few examples of two-storey dwellings, but the first floor is always made of wood planks on wooden/bamboo beams. Thus, poor urban dwellings have low resistivity to cyclones and poor insulation against heat or cold. The materials also deteriorate fast, affecting the quality of the living environment, especially when it rains heavily and/or for long duration. Thus, strong winds, heavy rainfall, hot summers and cold winters – all cause great concern for the dwellers. In summer a related problem is that people cannot store food, even for a few hours. As they only cook once a day, sometimes they eat semi-rotten food, often resulting in gastro-intestinal problems and other related illness.

e) Narrow lanes and inadequate circulation spaces exacerbate physical vulnerability. Low-income settlements are characterised by unusually high population densities (e.g. 6,400 people/hectare in Supraghat). Such high densities are achieved partly by inadequate circulation and open space and partly by squeezing people into small spaces. This in turn results in very narrow lanes, unsuitable for emergency evacuation and rescue operations. Such situations are usually a characteristic of large public settlements, where people always try to extend their boundaries. In many cases, finding a place to install community facilities becomes impossible. While the practice of boundary extension is rare in private settlements, the owners often construct new dwellings without increasing basic service provisions.

f) Subsidence and soil erosion is a consequence of low-lying land being filled up with rubbish and/or constructing dwellings on subsidence/erosion-prone locations, such as on a raised platform over, or on the edge of, water bodies. Many dwellings have generated cracks, and the bamboo columns that support raised platforms over the ponds have deteriorated, due to highly polluted water. People are fearful about the longevity of their homes and investments.

Table 2: Vulnerability of Khulna's poor to impacts of climate change

Domain	Type	Exposure	Outcome
Physical	<ul style="list-style-type: none"> - Close proximity to coasts and ponds - Lower relative land elevation - Poor sanitation - Temporary techniques and materials for dwelling construction - Narrow lanes and inadequate circulation space - Subsidence and soil erosion 	<ul style="list-style-type: none"> - Increased river and groundwater salinity - Increased contact with stagnant and polluted water bodies - Increased contact with raw sewage - Increased risk of inundation and waterlogging - Rapid spread of vector-borne diseases - Slow recovery from impacts of flooding and/or waterlogging - Faster deterioration of dwelling quality 	<ul style="list-style-type: none"> - Intake of saline water increases incidence of hypertension and related illness - People are having to eat less tasty food cooked with saline water - Time and sometimes money spent to collect deep tube well water - Overcrowding, lack of privacy and increased social tension - Fewer options for emergency rescue and relief operations - Low resistivity of dwellings against cyclones and flooding - Poor insulation and protection of dwellings against heat, cold and rains - Inadequate open and green space - Limited/no cross-ventilation provisions
Politico-legal	<ul style="list-style-type: none"> - Tenure insecurity 	<ul style="list-style-type: none"> - Political opt-outs and exclusion - Political and market-driven displacement 	<ul style="list-style-type: none"> - Poor quality and temporary dwellings - Poor augmentation of productive capacity of land and dwellings
Socio-economic	<p><u>a. Economic impacts</u></p> <ul style="list-style-type: none"> - Forced displacement/migration - Dependence on rural/peri-urban ecosystem services - Weather-sensitivity of urban livelihoods <p><u>b. Health impacts</u></p> <ul style="list-style-type: none"> - Overcrowding - Heat stress and cold waves - Food price rises <p><u>c. Psychological impacts</u></p> <ul style="list-style-type: none"> - A confused and rootless life for environmental migrants 	<ul style="list-style-type: none"> - Oversupply of casual labour - Fluctuating shrimp production - Collapse of demand for traditional construction material - Changing timing of, and higher risk of damage to, seasonal agro-products - Fewer options to avoid or cope with health risks - Physical discomfort and illness, with impact on household income and wellbeing - Food insecurity and falling household savings - Falling nutrition levels, hence less capacity to cope - Confusion about where the future of migrant people is – in cities or in their ancestral land in villages 	<ul style="list-style-type: none"> - Sudden fall in household income for migrant families - Skill, knowledge and social connections lost, due to migration - High unemployment among women - Seasonal unemployment - Spread of anti-social activities - Skill and income underemployment - Too much concentrated land use - Over-stressed basic services – little/no time for maintenance - Increased social tensions and conflicts - Sleeplessness and difficulty at work - Respiratory diseases, gastro-intestinal problems and fatigues - Cold, flu and diarrhoea outbreaks - Falling fish/meat consumption and rising incidence of having 'only rice' as the main meal - Trauma – mortality/injury during cyclones - Depression and despair – no access to rural ecosystem services in cities; being detached from family members; and children's school dropouts - Financial stress – everything costs money in cities - Cultural shock – women doing socially undermining jobs, such as housemaid

3.2 Politico-legal vulnerability

We find evidence of political and legal factors to increase people's vulnerability, mainly through affecting their security of tenure. All poor urban people in Khulna suffer from tenure insecurity in one form or another, depending on the type of settlement they live in. For settlements established illegally on government or other organisation's land, the fear of eviction affects how people do/do not invest in household- and settlement-level upgrading and climate proofing. There is no low-income settlement policy in Bangladesh, which creates an opportunity for local powerful people to grab these lands, in turn escalating eviction threats. At the same time, there are other 'friends-of-the-poor', such as powerful people who extend their support to poor urban dwellers and claim their personal political benefits, leading to political unrests and confrontations. People in Supraghat have explained how they staged demonstrations in front of the local press club and outside residences of the mayor and ward councillors when they heard that part of the settlements had been secretly sold to a local businessman by a member of the KBCA. They also explained how other local businessmen had helped them to fend off the take-over attempts by the alleged buyer.

For settlements established 'legally' on private land, the tenure security is subject to regular payment of rents, and in some cases maintaining a good relationship with the landlord, but the tenants do not have the necessary security. The word 'legally' needs to be treated with caution; the low-income poor urban dwellings are not usually constructed with Khulna Development Authority's (KDA) approval, and in that sense these dwellings are informal, if not illegal. Tenancy in these settlements is vulnerable to market forces, as the landlords may decide to develop the land for other purposes, such as real estate developments, or sell it off. A tenant cannot usually improve the quality of the living environment by investing on his own; indeed a tenant has no incentive to do so.

Political factors can also affect, both positively and negatively, how people live in public settlements and secure their livelihood. The community-based power structure and street-level political leaders can both help reduce vulnerability and create tension, leading to increased vulnerability. Similarly, vested outside interest groups can influence the vulnerability of specific groups or of all dwellers. Some residents of Supraghat have reported being the victim of politically motivated dispute resolutions. In contrast, others reported that powerful people have helped them to keep drug addicts away, at least temporarily.

Looking from a private settlement viewpoint, an absence of political influence can do more harm than good. For example, the dwellers of Magbara have failed to maintain any direct connection with the powerful political and civil society actors. They are not even included in the voter list and so cannot exercise their voting power. This lack of political connection has resulted in at least two limitations/problems. First, they have become citizens without legal recognition, and consequently the political powerful actors remain apathetic about the needs of these settlement dwellers. Second, as a consequence of a lack of connection to the political powerful actors, they have established links to various other intermediaries. Not only do these intermediaries seek material gains, they also are less powerful when it comes to realising the dwellers' legal and political rights.

Table 3: Factors underlying vulnerabilities of Supraghat and Magbara settlements

Common for both settlements	Specific to Magbara	Specific to Supraghat
Physical vulnerability		
<ul style="list-style-type: none"> - Hot and humid conditions cause faster deterioration of food, especially that cooked with saline water - City-wide ban on deep tube well installation forcing people to rely on shallow tube well water - Lack of effective solid waste management - No waste water and sewerage treatment facilities - Inadequate urban drainage - Reduced water holding capacity of rivers, due to increased sedimentation on river bed - Use of poor quality, low-cost and easily replaceable materials, and 'self labouring' practice by the owners to minimise cost - Informal design practices in the absence of any building codes - Exclusion from formal neighbourhoods, often marked by high partition walls - Use of porous and degradable rubbish as landfill materials - Heat stress, cold waves, intense rainfalls, cyclones, flooding 	<ul style="list-style-type: none"> - Landlords often installing only shallow tube well, thus forcing dwellers to source drinking water from public deep tube well located far away from home - Poor location and construction of latrines, often with uncovered pits, causing raw sewage leakage - Dumping of rubbish as a means to fill ponds free of cost - Lack of or improper internal drainage system - Overstressed sanitary facilities - Landlords avoiding/delaying regular maintenance of dwellings - No or limited scope/incentives for tenants to make physical adjustments to dwellings - Rent maximisation attitude of landlords by slotting in more rental units - Lack of periodic soil replenishment by landlords 	<ul style="list-style-type: none"> - Inadequate coverage of existing deep tube well facilities - Deliberate creation of ponds to prevent illegal settlement expansion - Ponds treated as recipients of all sorts of waste, septic tank overflow and open defecation (by hanging latrines) - Inadequate gradient and frequent blockage of drains by household wastes - Poor maintenance of sluice gate facilities - Lack of ability and willingness to raise land elevation to the level of the surrounding area - Inadequate and poorly maintained latrines - Fear of eviction, resulting in circumscribed investments in dwellings and built environment - No permanent construction allowed above ground floor - A tendency among residents to push boundaries into neighbours' territory - Informal subdivision of land parcels - Extension of dwellings on subsidence/erosion-prone areas (e.g. over ponds) - Emptying of ponds (to catch fish) without any measure to prevent banks from collapsing
Politico-legal vulnerability		
<ul style="list-style-type: none"> - Lack of a low-income settlement policy causes poor settlements to remain invisible in official plans - Lack of a socio-political platform 	<ul style="list-style-type: none"> - Informal rental practices - Open to market forces - Poor access to external support (e.g. from NGOs) 	<ul style="list-style-type: none"> - People own dwellings, but not the land - Invisible land selling/grabbing practices - Politicised governance
Socio-economic vulnerability		
a. Economic impacts		
<ul style="list-style-type: none"> - Cyclones, storm surge, salinity - Urban jobs requiring different skills from rural agricultural jobs - More money is needed in urban areas for basic needs than in rural areas - Falling nutrition levels and spread of disease in shrimp ponds - Neglect of urban poor in national/regional ecosystem management activities 	<ul style="list-style-type: none"> - Having to pay rent on top of other costs - Limited scope to initiate home-based enterprises 	<ul style="list-style-type: none"> - Virtually closed to newcomers, unless they squeeze into relatives' homes - Job syndicates do not usually welcome newcomers - 'Dadon' (advance business credit) culture keeps small entrepreneurs tied to powerful business people - Excessive dominance of shrimp processing activities
b. Health impacts		
<ul style="list-style-type: none"> - Failure to regulate land use and dwelling construction by the city authority - Temporary structure with poor attention to protection against rainfall, heat stress and cold waves - Poor attention to cross-ventilation - OMS schemes mainly offering rice, often of poor quality - Government failure to regulate price of essential food items 	<ul style="list-style-type: none"> - Landlords usually quick to build additional huts, but slow to increase basic facilities - Private tenants have no rights and little incentive to make physical adjustments - Private tenants have limited scope to smooth consumption, as they get minimal external support and cannot produce home-grown food 	<ul style="list-style-type: none"> - Informal land subdividing practices - Highly dense settlement lacking green infrastructure and open spaces - The opportunity to grow their own vegetables is often lost, due to too much densification - Theft and polluted pond water act as barriers to livestock rearing
c. Psychological impacts		
<ul style="list-style-type: none"> - Lack of external support to environmental migrants 	<ul style="list-style-type: none"> - Political exclusion 	<ul style="list-style-type: none"> - Syndicate culture – migrants need to build trust to enter into job syndicates

3.3 Socio-economic vulnerability

Unlike physical and politico-legal vulnerabilities, socio-economic vulnerabilities are more idiosyncratic, i.e. they are more sensitive to the characteristics of individual households. Our data reveal that the socio-economic vulnerabilities of Khulna's poor are manifest through economic, health and psychological impacts, as explained below.

a) Economic impacts. A significant proportion of Khulna's low-income people were forced from the coastal region of southwest Bangladesh, due to cyclones Sidr and Aila. The destruction of rural livelihoods due to these natural disasters triggered both short-term displacement and long-term migration to urban areas. The displaced households reported a drastic fall in their income and earnings. At the same time, they needed more money to pay for basic needs in urban areas. In most cases, they failed to earn enough and experienced financial hardship. Apart from forced displacement/migration, these cyclones have also caused damage to services provided by the affected ecosystem (which includes the *Sunderbans*), directly affecting people's livelihoods. People reported: (i) a fall in labour demand in some forms of economic activity, such as shrimp production (Box 1), and a collapse of demand for traditional building materials, such as *golpata* (Box 2); and (ii) an oversupply of unskilled labour.⁹

In effect, cyclones Sidr and Aila had exacerbated problems that were already being caused by two kinds of slow-onset events affecting the coastal regions of Bangladesh: increased salinity and a rise in sea level. Increased salinity, for example, is gradually reducing yields of paddy and other weather-sensitive crops.¹⁰ Moreover, the relatively recent expansion of saline water shrimp farming has exacerbated the state of salinity of the soil in general. Consequently, many poor rural people who were dependent on traditional agriculture-based occupations have become jobless. Shrimp farming has led the local economy to be dependent on a product that in itself is also vulnerable.¹¹ Many poor urban households in Supraghat have diversified into casual labouring in shrimp processing in one form or another. On the surface, this diversification may seem promising, as the industry showed

⁹ For example, Nobil, a construction contractor/worker in Magbara, says: 'After Aila, many unskilled people from villages came to join the construction work. While the employers did not want to recruit them, we bluffed them and helped these unskilled labourers get job and learn skills'.

¹⁰ One of our Supraghat respondents, Ali, says: "four or five years ago we got about three tonnes paddy per hectare of land. But now we get only one fourth of that amount". Elsewhere, Ali (2006) has estimated a decline in rice production of up to 24 percent, due to soil degradation (a combined effect of increased salinity and shrimp farming) during 1985-2003.

¹¹ A recent study by INTERACT finds that the salt and chemicals in the shrimp *ghers* (ponds) pollute the soil, saturating it with salt and sulphur. Large-scale shrimp farming in southwest Bangladesh is becoming less productive over time because the nutrients in the pond soil are becoming depleted, the land becomes polluted, and shrimp diseases are becoming more common. The land remains under water for a long time, there is no sun, no air – so the plankton (that shrimps feed off) are not growing as before. The long-term viability of shrimp farming is therefore in question. Similarly, climate change may mean that exporting frozen shellfish by air, as happens with Bangladeshi shrimp, becomes prohibitively expensive. Shrimp processing is another ambivalent area, in that it employs people – especially women – but the labour practices can be exploitative (Lönnqvist et al., 2010).

Box 1: Impact of cyclone Aila on shrimp processing activities

Cyclone Aila hit the southwest of Bangladesh badly, affecting Sathkhira and Khulna districts. Aila was the fifth most severe cyclone in Bangladesh, affecting 3.94 million people (Dasgupta et al., 2010). It also destroyed the *ghers* (earthen ponds) of numerous shrimp farms.

During the two years following Aila, shrimp processing activities have fallen sharply. The number of shrimp traders remaining in the business has fallen from about 401 in 2009 to about 200 in 2011. On average, women engaged in shrimp cutting/cleaning have worked 160 fewer hours per month during this period, as the following estimate suggests:

During 2008-2009, the 20 member companies of the Supraghat Shrimp Trading Association processed about 576,000 tonnes of shrimps of various types. This figure came down to 38,400 tonnes in 2009-2010. On average, one tonne of shrimp requires 100 hours of shrimp cutters'/cleaners' time. This gives a fall in demand of 1920 hours @ 160 hours/month. Assuming an hourly rate of TK 5, we get an income reduction of TK 800/month for all shrimp cutters/cleaners in Supraghat.

Source: Interviews with Istiaq (a supplier of processed shrimp) and Anu (owner of a shrimp trading house).

While many of the destroyed *ghers* are yet to be rebuilt, our respondents (e.g. Anu) believe that the supply of shrimps will catch up with pre-Aila levels by 2011. This is partly due to the fact that shrimps are farmed over a vast area, and *ghers* in many areas remained operational. For example, in 2004 the total shrimp farming area was 115,900 hectares, compared to 1,330 hectares in 1975 (Sarwar, 2005). In comparison, Aila (2009) destroyed *ghers* of about 21,400 hectares (ARP, 2009). In addition, following the recent rebuilding of damaged embankments, many of the damaged *ghers* are also being reconstructed and returning to production.

While visiting the Dakop area of Khulna (in February 2011), we noticed a strong public antipathy amongst poor rural people towards a reoccurrence of shrimp farming. But it remains to be seen whether people's resistance can stop powerful people. As Lönnqvist et al. (2010:17) observe, 'the shrimp farmers and investors use musclemen (hired thugs) to intimidate people to give up their land for shrimp'.

Thus, while shrimp production may be returning to pre-Aila levels, the temporary fall in supply during the two years following Aila has reduced the working hours of women engaged in shrimp cutting/cleaning activities. Shrimp suppliers working at the bottom level of the supply chain have also felt the consequence of the short-term fall in supply. According to Istiaq (one of our respondents), only those suppliers who have: (i) received good support from shrimp traders and exporters; and (ii) maintained good business ethics, such as considering the business as a holy activity and always returning the rolling credits as promised, have been able to remain operational during this difficult period.

Box 2: Collapse in demand for traditional construction materials

A number of factors have contributed to trigger a fall in the supply of traditional building materials, such as *golpata* (palm leaf), and ultimately a change in economic activities by people like Rafiqul in Supraghat. According to Amjad, a long-time wholesale trader of temporary building material, cyclone Sidr (2007) caused massive damage to the Sundarbans, especially affecting *golpata* production. In the following year, the government issued a one-year ban on *golpata* harvest to allow the damaged *golpata* plants to recover. Meanwhile, the chars (land created by sedimentation) have begun to be increasingly inundated during high tide – perhaps a sign of sea level rise.

The combined effect of these three factors (destruction by Sidr, government ban and increased inundation) was a reduction of *golpata* supply in the years following Sidr. This happened at a time of increased demand for temporary building materials, as people needed to repair/reconstruct their damaged homes (caused by cyclones or due to normal wear and tear). The price of *golpata* rose sharply and many people opted for readily available, more durable materials, such as brick and tin (corrugated iron sheet).

For poor urban people, there were two other incentives to use these durable materials: (i) they are more fire-resistant than *golpata* – indeed, in Supraghat, after the last fire incident in 2006 the ward councillor led a campaign to replace *golpata* with tin/brick in order to reduce risk of fire; and (ii) whenever people's dwellings are destroyed by critical incidents, such as fire or cyclones, an important component of external support tends to be the supply of durable building materials, such as tin.

All these factors meant that people like Amjad, who specialised in the construction of traditional dwellings, found it increasingly difficult to maintain their economic activities. For Amjad, after Sidr, there was simply not enough work, so he was forced to give up the dwelling construction work and picked up construction labouring work instead. But labouring in construction is less rewarding in terms of income. He earned TK 150 per day as a construction labourer, compared to TK 3,000 to 5,000 per individual dwelling (usually completed in three to four days by three workers) as a dwelling construction contractor. Unfortunately Amjad sustained an injury while working as a construction labourer and incurred a massive debt financing his treatment. He never fully recovered – he is now able to walk, but cannot do hard physical labour. He had to give up the construction labouring work and has now become a beggar.

resilience to cyclone Aila. But the irony is that it is the rich and non-poor households who have benefited from this resilience. For ultra-poor and poor households, the seasonality of shrimp processing and a short-term fall in the supply of shrimps following rapid-onset events mean that they are becoming dependent on a very vulnerable economic activity. A fall in shrimp production has ultimately led to a temporary fall in work availability for fish cutters/cleaners. People reported a rise in social problems (e.g. drug addiction; women engaging in illegal occupations) as a consequence of rising unemployment (Box 1).

Sea level rise, apart from being a cause of increased salinity, has led to shrinkage in the supply of traditional building materials such as bamboo and *golpata* (palm leaf). In effect, this led to a change of economic activities by some poor urban people engaged in the construction of traditional dwellings. To make matters worse, they found their new economic activities (e.g. labouring in construction) to be less rewarding (as they are new to this activity) and more competitive (as the demand for unskilled jobs went up, due to a rise in labour supply following rapid-onset events).

b) Health impacts. Our discussion with people helped us identify few key health effects. First, increased salinity is causing a scarcity of safe drinking water (see Section 3.1). Second, both case study settlements are characterised by high population density and low per capita floor space. Our data show evidence of increased demand for basic services affecting the quality of service (e.g. frequent breakdown of tube wells; septic tank spillover; no time to clean the latrines) and overcrowding (quarrelling and shouting). In the private settlement, in particular, there has been an influx of Aila-affected people. While the landowners have speedily erected new dwellings to provide accommodation for these migrants (thus securing market gains), they have not installed new services for them. This has resulted in the same number of facilities being used by an increased number of people.

Thirdly, the price of essential food items is rising. While this may be a global phenomenon (as noted in Section 3), the effect nonetheless is increasing food insecurity and thus the vulnerability of poor urban households. People claim that their daily expenditure on food has tripled. They are finding it difficult to make savings, and their nutrition level is falling, as they are rationing their meat/fish consumption. We witnessed incidents where young children were having an inadequate quantity of 'only rice' as a main meal.

Two other health effects that people have reported are: (i) growing incidents of heat stress and consequent health problems, such as sleeplessness and difficulty at work, respiratory diseases, gastro-intestinal problems and fatigue; and (ii) severity of cold waves and consequent health problems, such as cold and flu, and respiratory diseases. These types of vulnerability have a strong negative correlation with dwelling conditions.¹²

c) Psychological impacts are most vivid and acute amongst recent environmental migrants. In general they remain confused about where their future is – in cities or in their ancestral land in the villages. They see their life as floating – literally, they floated in the sea when their houses and possessions were submerged and destroyed by the storm surge; and metaphorically, they are floating now in Khulna from one rented dwelling to another. Many have been separated from their family members. Their children have dropped out of school, with girls given early marriage and boys put to work. The migrants find it hard to find jobs where they could use their rural skills. While men may quickly become engaged in some unskilled daily labouring, women find it harder to be economically active. Back in their village these women usually grew vegetables and reared livestock, thus helping to smooth consumption. But in urban areas there is no use for these rural skills. It takes time for these women to accept such socially undermining jobs as housemaid (Box 3).

¹² The dwelling condition is measured in terms of four categories – good, adequate, poor and very poor, and using six criteria: (i) rooms – size, security of doors and windows, and maintenance; (ii) walls – built and maintenance; (iii) plinth – materials used and maintenance; (iv) roof – built and maintenance; (v) open space – availability and maintenance; and (vi) cooking space – location (indoor/outdoor), tidiness and provisions for cross-ventilation.

Box 3: Psychological impacts on environmental migrants

A common consequence of rapid-onset events, such as cyclones Sidr and Aila, is forced migration from rural to urban areas. In Khulna these migrants faced at least three types of problem:

- Uncertainty about their future. Omar, an Aila migrant in Magbara, says: 'If I could have TK 25,000, I could set up a tea-stall in the Khulna city! I could raise my daughters well! I do not know if I ever will be able to save this huge money. I do not know what I will do in future'.
- Difficulty for female migrants to use their rural skills (of goat rearing and vegetable growing) in urban jobs (e.g. maidservants). One participant in a female focus group discussion in Magbara settlement says: 'We are tenants here, we are seasonal birds. Today we are here; tomorrow we will be somewhere else. Why should we raise chickens or farm vegetables? If ever I have my own house, I will think about these.'
- Physical injuries and mental trauma. For example, Humaun in Supraghat explains how he broke his spine and ribs during Sidr. He has spent over TK 30,000 and it took him more than a year to recover only partially. He can no longer undertake hard physical labour, such as rural agricultural work. His state of trauma is reflected in his words: 'When we go to village, we get scared, even by the sight of cloud in the sky. In cities, there are places where we can take shelter'. During the process of migration and resettlement in Khulna, his two children dropped out of school. A girl, aged 18, has got married early; and a boy aged 14, has been put to work.

3.4 Resilience and adaptation practices to reduce vulnerability

Poor people in Khulna are already, consciously and/or unconsciously, adapting to climate change impacts, both in physical and behavioural terms. At the conceptual level, their adaptation practices resonate with the works of Agrawal (2010) in terms of adjustments to livelihoods, Chatterjee (2010) in terms of changes to the built environment and use of networks, and IOM (2010) in terms of forced migration. In the specific context of Khulna, the construction of poor people's practices is dependent on a number of factors, such as the social and economic resources of households and communities, their physical location, and institutional access. These factors collectively influence people's ability to maintain core functions in the face of changing contexts (i.e. resilience, Satterthwaite et al., 2009) and to adopt the right measures by making appropriate adjustments and changes (i.e. adaptation, UNFCCC, 2007).

We have therefore discussed the adaptation practices of Khulna's poor under three broad domains: *built environment* (to address physical vulnerability); *mobilisation and political action* (to address politico-legal vulnerability); and *socio-economy* (to address socio-economic vulnerability). While we identified as many as 41 individual practices under these three domains, the fact remains that the adaptation benefits of these practices are mostly indirect (Table 4). This is hardly surprising, as our data have clearly shown that climate change is not the primary concern of Khulna's poor (Table 1).

We observe **built environment** adaptation to take place under five broad categories (Table 4). In Supraghat, we have found evidence of the following five types of built environment

adaptations: (i) incremental upgrading of dwellings, including improvement of basic service provisions; (ii) climate proofing of dwellings and business premises; (iii) green infrastructure as a source of food and for communal/personal shade; (iv) public space for domestic use and income generation; and (v) communal pooling. Note that the use of green infrastructure is mostly confined to places where the early settlers have been living as a homogeneous group, having no boundary wall and with the dwellings placed so as to allow an uninterrupted flow of space. By contrast, in Magbara the dweller-led built environment adaptations are limited, due to lack of ownership by tenants. We noted only some basic adjustments, such as constructing earthen stoves on slightly higher ground to protect them from rainfall, and rotating the cleaning of latrines. There are some settlement-level practices, such as community kitchen (which reduces the impact of cooking fumes to individual dwellings) and some green infrastructure, but these are landowner-led.

In terms of **mobilisation and political action**, a much wider gap in people's resilience and adaptation practices is noticeable between the private and public settlements (Table 4). We observe mobilisation and political action to revolve around two issues: (i) addressing threats to tenure security; and (ii) securing and improving basic services. Mobilisation to address tenure insecurity takes different forms in different types of settlement. For example, in public settlements the entire community gets mobilised, even at the slightest hint of eviction threat (see Section 5.2.1). In contrast, in private settlements it is the tenants who helped the landlord to access credit, in exchange for long-term tenancy rights (Box 4).

Box 4: Innovation in tenants–landowner cooperation in Magbara settlement

Bilkis Begum is the owner of one of six Magbara settlements. She has formed an extraordinary informal arrangement with two of her tenants – Shafiq and Moriom.

Since 2003, Shafiq and Moriom started living in Bilkis's settlement. Bilkis is a widow with two young daughters, and needed a secure livelihood. Constructing rooms to rent out in her fallow land seemed an excellent choice. However, she needed hard cash to construct rooms. She approached Moriom to obtain loans from available micro credit NGOs.

As a middle-class woman, Bilkis could not access this loan but, being poor, Moriom could. So Moriom started taking loans and handed the money over to Bilkis, who gradually constructed 24 new rooms with partial flow of capital from Moriom. Bilkis would ensure payment of weekly instalments via Moriom.

We did not find that Moriom receives any material benefit from Bilkis in return for being used to access credit. Instead, we found a strong relationship between these two women, based on trust and loyalty. When asked, Moriom said, 'When I was sick, Bilkis donated blood for me, when my husband could not earn, Bilkis lent me rice.' This arrangement between Moriom and Bilkis is informal and active to date.

Similarly, mobilisation to secure and improve basic service provisions also takes place in various ways: (i) forming community based organisations (CBOs) and coalition with the service-providing institutions; (ii) through a civil society organisation (CSO) advocating and acting as a pressure group for low-income people to both city- and national-level service providers and policy makers; and (iii) disaster preparedness through a Community Disaster Management Committee (CDMC). Again, we see greater mobilisation in public settlements than in private settlements. However, the activities of CDMC have not yet reached people in

Supraghat, and the CSO activities have also only just begun. Moreover, CDMC is not linked to the Bangladesh government's Comprehensive Disaster Management Programme (CDMP). The CDMP is the national-level umbrella programme through which external funding is channelled. But its focus on poor urban people is limited to 45 pilot settlements in Dhaka, Chittagong and Sylhet, and on issues concerning earthquake and other (unspecified) urban hazards (GoB, 2010). This highlights the lack of a socio-political platform for Khulna's poor (see Section 5.3.2.).

Finally, we observe **social and economic adaptation** to take place under four broad and mutually dependent domains: livelihoods; mobility; productive assets; and networks (Table 4). More resilient households tend to develop practices under multiple domains. But different types of households make different forms of adaptation, depending on their skills, their access to resources and the contexts in which they live. Clearly, some forms of adaptation are more effective than others. For example, self-employment is a more effective form of livelihood practice than working as a daily labourer, although it does involve more risk (Maligalig et al., 2009). But the ability to develop and maintain self-employment (i.e. resilience) is dependent on a complex set of factors, including the length and type of tenancy and attitude to risk.

Consequently, we see that long time residents of public settlements, especially those who own dwellings, are far better positioned to develop effective socio-economic practices compared to recent migrants in rented private settlements. Despite having to live in constant fear of eviction, the majority of people in public settlements own their dwellings; they do not need to pay rents and can initiate home-based self-employment, thereby making best use of women's labour. In Supraghat, we noticed on several occasions that women are running the home-based businesses. They can do these activities during their spare time and without having to travel outside the settlement, thus saving both time and labour¹³. Commentators have frequently pointed to the importance of women's time- and labour-saving activities as an effective form of adaptation (Baud, 2000). Having been long-term residents of the settlement, the dwellers of public settlements have also developed stronger and wider social networks. These have enabled them to benefit from microfinance institutions, such as Rotating Savings and Credit Association (ROSCA) and NGO services. In contrast, dwellers in private settlements have at best been able to diversify their jobs; we have not found any evidence of home-based business here. While they have developed good social networks to support their survival, they remain heavily reliant on relatively less powerful intermediaries with vested interests (see Section 5.2.1).

¹³ For example, Kulsum is running a home-based tree bark selling business; Nirmola is running a grocery shop; Ambia is running a home-made pickle selling business; and Minoti is doing home-based private tuition.

Table 4: List of adaptation practices developed by Khulna's poor

Domain and category	Type	In Magbara	In Supra-ghat	Adaptation benefits
Built-environment				
Incremental upgrading	- Building/fixing 'one wall at a time' (i.e. phase-wise construction and maintenance) and gradually incorporating more durable materials	-	✓	- Prevents worsening of physical vulnerability through slow but gradual improvements to the dwelling quality
	- Saving first, investing in built environment upgrade later	-	✓	- Promotes resilience through providing financial security and promoting better living conditions
	- Investing in NGO-provided services, both individually and as a group	-	✓	- Promotes resilience through gradual improvement in personal and community health, building human capital and transforming social relations to address underlying social and political vulnerabilities
	- Rapid construction of dwellings by private landlords to house influx of migrants	✓	-	- Promotes market responses to address the shelter needs of environmental migrants and to give the in-migrants a base to rebuild their life in cities
Climate proofing of dwellings and business premises	- Allowing cross-ventilation	✓	✓	- Promotes comfort against heat stress; reduces indoor air pollution from cooking fumes, thereby reducing risk of respiratory diseases in children and elderly people
	- Preventing rain/flood water from entering into house by raised plinth, better floor treatment and better drainage	✓	✓	- Promotes resilience through ensuring safety of household assets and preventing illness caused by dirty water and damp, soggy conditions
	- Protecting equipment and products	-	✓	- Promotes resilience of weather-dependent livelihoods by preventing damage to equipment and other productive assets
Green infrastructure as a source of food and for personal/ community shade	- Creating uninterrupted flow of shaded space when living as a group	-	✓	- Provides comfort against heat stress; transforms social relations to address underlying social and sometimes political vulnerabilities
	- Allowing edible plants to grow on roof top and over access roads	✓	✓	- Enables consumption smoothing; green infrastructure also has psychological benefits
	- Sharing shade with neighbours	✓	✓	- Provides comfort against heat stress and transforms social relations to address underlying social vulnerability
Public space for domestic activities and income generation	- Streets as business yard (processing, selling and storage of tree bark)	-	✓	- Promotes resilience through livelihood diversification and security to withstand weather-related shocks
	- Streets as places of communal gathering and leisure activities	✓	✓	- Transforms social relations to address underlying social and political vulnerability
	- Streets as domestic space – washing, bathing, cooking, taking comfort from heat stress	✓	✓	- Restores quietness to the domestic space, making it more conducive for relaxation and comfort away from day-to-day stresses, including those caused by weather events
Communal pooling	- Unblocking drains	✓	✓	- Prevents potential damage caused by waterlogging incidents; transforms social relations to address underlying social and political vulnerability
	- Collective maintenance of common facilities	✓	✓	- Promotes resilience through enhancing the possibilities for common facilities to withstand weather-related shocks
	- Informal social protection and other intra-community groups	-	✓	- Transforms social relations to address underlying social and political vulnerability
	- Community kitchen	✓	-	- Prevents indoor air pollution and the additional heat stress caused by households cooking indoors
Mobilisation and political action				
Addressing threats to tenure security	- Formation of community pressure groups	-	✓	- Transforms social relations to address underlying politico-legal vulnerability
	- Landlord-tenants cooperation to access microcredit	✓	-	- Promotes resilience of the private sector to harness external support more innovatively in responding to the shelter needs of environmental migrants
	- Business owner-worker cooperation to	-	✓	- Promotes resilience of people and businesses by keeping weather-dependent

Domain and category	Type	In Magbara	In Supra-ghat	Adaptation benefits
	access micro-credit			enterprises in operation following weather events and through enhancing job and financial security for both owners and workers
Securing and improving basic service provisions	<ul style="list-style-type: none"> - Coalition with NGOs/donors - Formation of informal groups - Representation in civil society organisations 	<ul style="list-style-type: none"> - - - 	<ul style="list-style-type: none"> ✓ ✓ ✓ 	<ul style="list-style-type: none"> - Promotes resilience through better access to basic services and livelihood diversification, giving more capacity to withstand weather-related shocks - Transforms social relations to address underlying politico-legal vulnerability - Promotes resilience through improved access to information
Community-based disaster management	<ul style="list-style-type: none"> - Formation of spontaneous groups to tackle problems - Participation in disaster management training/committee - Raising disaster awareness from within the settlement 	<ul style="list-style-type: none"> ✓ - - 	<ul style="list-style-type: none"> ✓ ✓ ✓ 	<ul style="list-style-type: none"> - Transforms social relations to address underlying politico-legal vulnerability - Promotes access to external knowledge of hazards and local disaster history - Builds awareness and self-reliance within the community about local disaster trends
Socio-economic				
Livelihoods	<ul style="list-style-type: none"> - Developing self-employment - Switching employment from climate-sensitive to climate-resilient job category - Engaging in multiple jobs, showing sensitivity to climate variability - Smoothing consumption - Maintaining power structure and job syndicates 	<ul style="list-style-type: none"> ✓ ✓ - - ✓ 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ ✓ 	<ul style="list-style-type: none"> - Promotes livelihood diversification and security to withstand weather-related shocks - Promotes opportunities arising from changes in the urban job markets - Promotes resilience through increased demand for seasonal agro-products in urban areas - Promotes resilience through access to basic services and opportunity to build human capital through growing levels of external support (e.g. from NGOs/donors) - Secures political and community support to reinforce claims on land and participation in economic activities, which in turn helps to absorb both climatic and non-climatic shocks
Mobility	<ul style="list-style-type: none"> - Migration to urban areas - Keeping in touch with places of origin - Keep moving homes until owning land and building own dwellings 	<ul style="list-style-type: none"> ✓ ✓ - 	<ul style="list-style-type: none"> ✓ ✓ ✓ 	<ul style="list-style-type: none"> - Helps to escape the dire consequence of collapse of weather-dependent rural livelihoods - Restores damaged social connections due to out-migration and heals psychological impacts suffered by out-migrants - Enhanced tenure security paves way to improved resilience through investment in built environment and human capital
Productive assets	<ul style="list-style-type: none"> - Sub-letting of spare rooms - Seeking informal mortgage (e.g. NGO-financed construction in exchange for rent-free tenancy for a certain period followed by for-rent tenancy for the NGO) - Owning rather than renting space - Investing in back-ups 	<ul style="list-style-type: none"> - - - - 	<ul style="list-style-type: none"> ✓ ✓ ✓ ✓ 	<ul style="list-style-type: none"> - Promotes opportunities arising from informal land ownership, such as having to pay little or no rent, ability to use land productively, and ability to smooth consumption through growing vegetables and rearing livestock - Prevents sudden collapse of weather-dependent and weather-sensitive business and livelihood practices
Networks	<ul style="list-style-type: none"> - Operating at different levels of local politics - Building and consolidating a diverse body of support networks - Engaging in community-based organisations 	<ul style="list-style-type: none"> ✓ ✓ - 	<ul style="list-style-type: none"> ✓ ✓ ✓ 	<ul style="list-style-type: none"> - Promotes resilience through building and consolidating a diverse and multi-actor support network for accessing immediate relief and recovery and long-term recovery and loss redistribution, both during and after weather-related shocks

4. Role of institutions for adaptation practice

Institutions are broadly identified here encompassing three main categories: public (e.g. national and municipal government); community-based organisations (CBOs) and non-government organisations (NGOs); and private (e.g. markets, corporations, economic elites and intermediaries). We look at how different forms of institution interact and influence each other to support Khulna's poor. In particular, we analyse how poor people's adaptation practices are influenced by the availability of institutional supports and, crucially, by the entitlement and reactive claims of individuals and groups to access and use these supports.

With regards to public institutions, except for KCC and ward councillor's office, support to Khulna's poor from other public institutions¹⁴ is either lacking or distribution- neutral at best (i.e. they do not offer special consideration to the poor). Even KCC's role is rather unimportant, as its list of services does not include construction of community latrines, nor can it construct access roads narrower than 1.5 metres¹⁵. Access to available services is subject to the settlements being officially recognised (through providing the holding numbers and collection of holding tax), the land being owned by the government and availability of funds. In this context, Supraghat appears to be a special case, as despite being established illegally on public/religious institutional land, its dwellers possess holding numbers¹⁶. In Magbara, we noted that land owners had to hand over the required land to the KCC before they could construct the road and the drain that run alongside the road.

KCC also does not follow a progressive pricing mechanism for some of its services, such as collection and disposal of refuse and waste, as evident in its pay-for-service scheme in Supraghat. Poor people usually consider services such as this as a public good and are not willing to pay whatever minimum the cost may be (Rakodi, 1999). This probably explains why the pay-for-service scheme in Supraghat failed. People also complained

¹⁴ The public institutional framework of urban governance for municipal corporations such as Khulna is classified under four broad headings (Panday and Panday, 2008): municipal government (e.g. Khulna City Corporation, KCC); special development agency (e.g. Khulna Development Authority, KDA); special purpose authority (e.g. Khulna Water Supply and Sewage Authority, KWASA); and special government bodies (e.g. formerly Water and Power Development Authority, WAPDA, now Bangladesh Power Development Board, BPDB and Bangladesh Water Development Board, BWDB). In addition, public hospitals and schools are operated through Ministry of Health and Family Welfare and Ministry of Education respectively.

¹⁵ This includes construction of roads (wider than 1.5 metres), bridges and culverts; the removal, collection and disposal of refuse and waste; the provision of water supply (prior to establishment of KWASA); the provision and maintenance of street lighting; the registration of births, marriages and deaths; the eradication of mosquitoes; the issue of different kinds of certificates; the provision and maintenance of public parks; and dispute resolution (personal communication with Ward 22 councilor).

¹⁶ This has been possible mainly because the KBCA that owns part of the settlement has kept up to date with their land records through paying regular tax (source: personal communication with the KBCA chairman).

about KCC being ad hoc and having a bias towards wealthy areas in its maintenance of street lighting and eradication of mosquitoes. Above all, people are very critical about the inadequacy of KCC funds and the image-creating attitude of the elected representatives. A common comment from many residents is that politicians come, make promises, spend money, take photographs and then disappear.

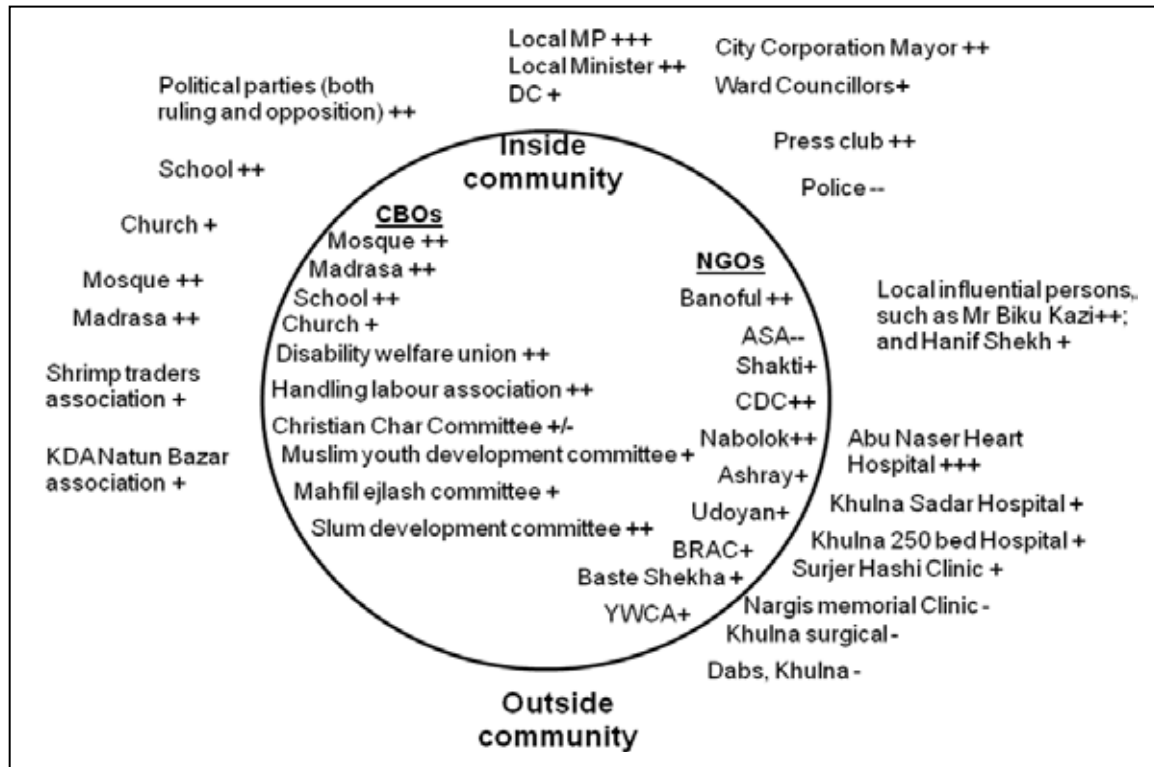
According to the current Ward 22 councillor, KCC has recently transferred some of its responsibilities to other government departments, such as water supply to the newly created Khulna Water Supply and Sewage Authority (KWASA), and electricity supply to Bangladesh Power Development Board (BPDB). Consequently, while people are dependent on public institutions for some services (e.g. electricity), if available, for many other services they are now mobilising their own collective actions (through forming CBOs) and creating partnerships and alliances with NGOs and donor-funded projects. Indeed, we identified as many as 10 CBOs and 12 NGOs/donors working in Supraghat providing a range of services. But people have varied levels of satisfaction with the service/support they receive from these and other institutions (Figure 3).

Unfortunately, the formation of CBOs and access to NGO services are not always possible in private settlements, as observed in Magbara. The landowners usually hold negative views about CBOs, such as that they exist to create groupings and unwanted politics. Landowners also do not usually cooperate with NGOs, fearing that their presence would mean transferring some control and ownership to tenants and the NGOs. In Magbara we also found contrasting cases: even when landowners are willing to obtain services through NGOs (as these are free), the NGOs are often reluctant to extend their services to private settlements. There are, however, exceptions, as we found NGO-provided services in some private settlements in Khulna (e.g. Mr. Jamal's Lane and Dr. Oli's Lane near Supraghat).

It is noteworthy that KCC's role has not totally vanished in this messy CBO/NGO/donors landscape. In fact, KCC is acting as an enabler here. On the one hand, it is acting as the authorisation body for NGOs to work in low-income settlements in general. On the other, it is a partner in the multi-donor-funded project, 'Urban Partnership for Poverty Reduction' (UPPR) project¹⁷. While we identified some limitations in this partnership,

¹⁷ UPPR is a DFID-UNDP-GoB flagship project in Bangladesh to improve the livelihoods and living conditions of three million urban poor and extremely poor people, especially women and girls. It is a seven-year project (2008-2015) with a budget of \$120 million. It succeeded the Local Partnerships for Urban Poverty Alleviation Project (LPUPAP, 2000-2007). UPPR project has set as its objective to support poor urban families in 30 cities (six City Corporations and 24 'A' category pourashavas). In Khulna, the project has set the target of doubling the number of communities supported through the LPUPAP, from 125 to 250 communities, where a community is defined as 200-300 households. The households are categorised into a number of primary groups, each comprising 10-15 neighbouring households. Two leaders from each primary group (mostly selected) form a Community Development Committee (CDC). The leadership of a CDC operates through four office bearers (mostly selected): a president, a vice-president, a secretary

Figure 3: Mapping of important institutions in Supraghat settlement



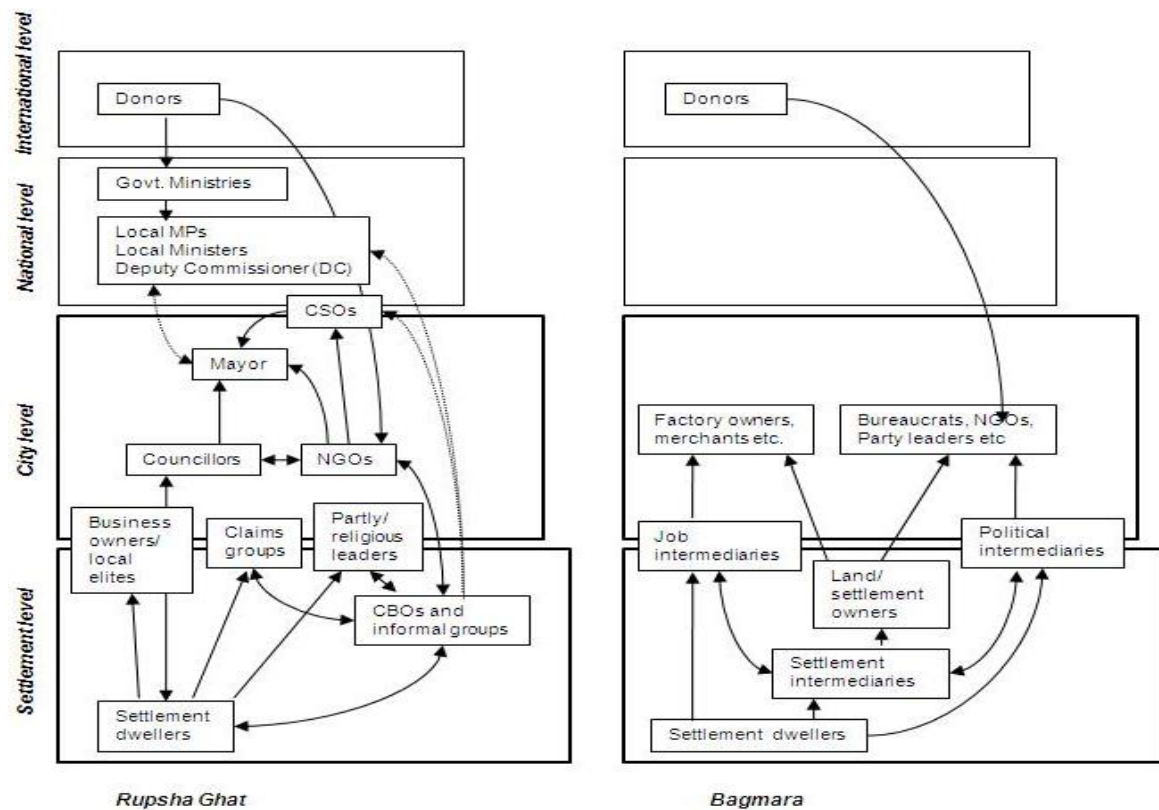
Note: This is based on a participatory institutional mapping exercise undertaken at Supraghat, involving nine participants – six men and three women. The participants were asked to identify the institutions that support them and to distinguish them in terms of whether they were located within or outside the settlement. They were also asked, as a group, to evaluate the quality of the service they received from these institutions. They expressed this by the following symbols: +++ (very good); ++ (good); + (ok); - (bad); and - - (very bad).

especially the way KCC is involved in it (see Section 5.3.4), in principle, the project has good intentions. It has brought the kind of support to poor urban people that the municipality or NGOs have not been able to provide, such as construction of roads narrower than 1.5 metres and other small-scale facilities. It has also adopted a demand-driven (by the community) model with poor people's participation (GoB-UNDP, 2008).

and an accountant. The president and vice-president of each CDC within up to three Wards come to form a CDC cluster. This is a plan to form a CDC federation, involving representatives from all CDC clusters, but this has not yet materialised in Khulna. Each CDC maintains three accounts: a settlement improvement fund (SIF); an operation and maintenance fund; and a savings account for its members. In addition, a CDC cluster maintains a social and economic fund (SEF). UPPR allocated funds for settlement improvements and socio-economic developments through a Community Action Plan (CAP) developed in participation of the CDC members (source: personal communication with the UPPR Khulna office).

Finally, poor urban people's adaptation can also be facilitated by a range of other goods and services supplied by the private sector, such as microfinance services (e.g. micro-credits, ROSCA and micro insurances), business credits (e.g. rolling credits and advances from shrimp traders and saw mill owners), mobile phones (e.g. for rapid/push selling of fresh fish in summer), consumers (e.g. of generator-based electricity), and suppliers (e.g. of tree bark by saw mill owners). Added to these market factors are the local power structure, which includes elites and powerful people – ranging from street-level politicians, to different types of intermediaries, and finally to national-level politicians, such as MPs and ministers representing the Khulna city/region. People access different levels of power structure for different types of support. We observe that while dwellers of public settlements may be able to access all levels of power structure, dwellers of private settlements are only able to access up to the level of intermediaries (Figure 4). Thus, the scope of institutional support for people in a private settlement is limited compared to those in a public settlement.

Figure 4: How Magbara and Supraghat dwellers connect to power structures



5 Understanding adaptation practices of the poor in Khulna

5.1 Great variety in the way climate change shapes people's livelihoods

Our research reveals that climate change impacts are both generalised (e.g. heat stress; food price rises) and highly context-specific (e.g. impacts on specific livelihoods; flooding of some settlements, but not others). A range of local factors – physical, tenure-related, socio-political and institutional – makes some challenges more significant in some settlements than others. These factors also shape the way people prioritise and adapt to the challenges they face (as discussed in Section 3).

Being an established settlement, with residents having unauthorised land ownership, Supraghat offers diverse livelihood opportunities to its dwellers. Its proximity to the river Rupsha and to a range of trade, industries and markets that grew along the river bank has made it even more suitable for livelihood diversification. Indeed, we note more than 25 different livelihood activities, including different types of self-employment, in 145 households here (Table 5). It is particularly noteworthy that people's livelihood choices have been directly or indirectly influenced by climate factors. For example, some people have taken multiple employments, in which they showed a great sensitivity to climate variability, e.g. street vending of seasonal products, applying sophisticated marketing

strategies in different seasons, including using mobile phone for quick/push selling of fresh fish during hot summer weather.

Table 5: Employment by type in Magbara and Supraghat

Occupation	Magbara		Supraghat	
	No.	%	No.	%
<i>Business and self-employment (total)</i>	12	7.1	70	17.6
Shrimp processing	0		42	
Fish selling	0		9	
Vegetable selling	8		4	
Grocery	0		4	
Electricity supply	0		1	
Food/tea selling	0		1	
Furniture making	1		3	
Raw materials	0		0	
Metal and useable waste product selling	2		0	
Other (e.g. home-made products; street vending)	1		6	
<i>Skill-based labourer (total)</i>	9	5.3	38	9.5
Carpentry	1		34	
Motor mechanic	0		2	
Painter	1		0	
Plumber	1		0	
Electrician	1		2	
Weaver	3		0	
Baker	1		0	
Umbrella maker	1		0	
<i>Casual labourer (total)</i>	81	47.9	127	31.9
Shrimp cutting/cleaning	0		90	
Construction	27		15	
Rickshaw/van pulling	17		12	
Transportation	0		2	
Housemaid	32		4	
Other (e.g. restaurant worker; Iman of mosque)	5		4	
<i>Formal employment (total)</i>	4	2.4	22	5.5
Government	0		2	
Private/NGO	4		20	
<i>Begging (total)</i>	3	1.8	3	0.8
<i>Unemployed (total)</i>	60	35.5	138	34.7
<i>Total</i>	169	100	398	100

Magbara, on the other hand, offers a different perspective on livelihood practices, encompassing both rural and urban dimensions. Here we have identified a limited diversity of livelihood practices (Table 5) and examples of employment switch-over. We perceive this as part of a process of adapting to urban life, as many of the residents are

newcomers in Khulna. A major portion of these newcomers are displaced by cyclones and storm surges or river erosion. Their migration process is complex, and we find examples where households have tried to settle in faraway places, like Cox's Bazar, before eventually settling in Khulna. They usually go through a four-phase process: (i) deciding to migrate (taking the hardest decision to relocate); (ii) building a threshold for survival (establishing initial support networks); (iii) getting employment (establishing links to local power structure); and (iv) continued survival (in cities). In some cases, the migration process can be facilitated by some prior arrangements, which were probably not meant for migration per se. For example, we observed that some families sent their children to Khulna to study in high schools, thus investing in human capital and perhaps making the first step towards migration should rural life become unsustainable in the future. Then, when cyclone Aila destroyed their homes, migration of the entire family was relatively easy.

Once in town, the newcomers make use of social networks they have already established to get their first job, mostly in rickshaw pulling. They then gradually move to other economic activities, such as labouring in construction. They react to opportunities as they come, which might be as a consequence of climate change, but can also be subject to changing urban jobs due to other factors. For example, the expansion of construction works using permanent material, where a large number of Magbara dwellers are employed, is partly related to a decline in traditional dwelling construction due to climate change, as noted above. However, it is interesting that none of Magbara households are involved in shrimp processing. This suggests that poor urban people operate in a small employment catchment area.¹⁸ We also found evidence that the shrimp processing industry operates with tight syndicates – even shrimp cutters/cleaners work in groups led by a *sarderni* (female leader). Newcomers are not welcome unless they are networked to the syndicate. This may explain why people outside Supraghat are rarely engaged in shrimp processing.

5.2 Adaptation is under way

5.2.1 Risk reduction through individual and collective actions

We have identified about 40 different types of adaptation practices in the two settlements (Table 4), broadly indicating: (i) how people reduce risk through their own actions; and (ii) how they engage with external institutions to reduce their risks. Each of these two strands branches out to several domains/categories to develop specific adaptation practices, depending on many factors: tenure, origins, livelihood, income and social networks. In both settlements, we observe that people are mostly trying to reduce risks on their own, both individually and collectively.

¹⁸ The distance between Magbara and Supraghat is about 2 km, or 15 minutes travel by rickshaw/*charger* (battery-driven auto rickshaw), costing TK 10 one-way.

Focusing on individual practices first, we note that these predominantly involve livelihood diversification, networks formation and consolidation, and adjustments to dwellings. We see a complex process of emergence and diffusion of the practices, involving both existing knowledge and innovation. To an extent, existing knowledge is an innovation enabler, but not all practices achieve the characteristics of innovation – that is, adding new dimensions to the practices (Mendoza and Thelen, 2008).

For example, switching from self-employment building low-cost dwellings using traditional materials such as golpata (palm leaf) to become a labourer in construction requires knowledge of the diminishing prospect of the former and the expansion of the latter profession, but it does not involve innovation. In contrast, developing from working as an onboard cook in a fishing trawler to becoming the owner of a company supplying generator-based electricity to shrimp-processing houses requires knowledge (e.g. about the demand for electricity), skills (e.g. ability to fix and operate generators) and innovation (capturing the opportunity of the generator-based electricity supply). Remarkably, this business innovator household has also undertaken several other innovative adjustments to its dwelling (Box 5).

It is interesting to see that more effective practices, such as business and self-employment, are taking hold mostly in Supraghat. Even tenants who have recently migrated from rural areas following cyclone Sidr have developed self-employment, thanks to the settlement's proximity to the geographic concentration of the thriving shrimp-processing industry. In many cases, it is the women who are running the home-based businesses, in turn contributing greatly to household income.

In contrast, in Magbara there is very little opportunity to develop home-based practices, such as home-based businesses or undertaking physical adjustments to dwellings. The landowners simply do not allow such activities to take place; the tenants also have no incentive to add to other people's homes. What we have found more effective here is the use of networks, involving various intermediaries. But, even in terms of diversity and variety of networks, people in Magbara are far less connected to local power structures in Khulna compared to Supraghat (Figure 4).

Box 5: Innovation in built environment adaptation

One of the non-poor household respondents shows a clear strategy in making savings and investing them in initiating and then gradually expanding a business to supply generator-based electricity to shrimp-processing houses. The household shows an excellent combination of technical skills and entrepreneurship at the household level.

The business idea was innovative and unique from the beginning. A generator-based electricity supply business could not be better placed than in an industry that requires continuous electricity amidst growing load shedding.

The start-up was accidental. Haleem was an apprentice learning how to fix and repair trawler engines. He was sent by his employer to attend a client in a neighbouring district town. His work was perfect, the client was impressed. The client coined the idea of the above business in partnership, with two of them buying two machine parts. Haleem agreed and a successful business venture began.

Haleem's wife was making monthly savings after the birth of their daughter, in order to gradually accumulate the marriage costs, such as dowry and wedding feast. These savings were invested in the business. The business was a success, and his wife began saving again.

Six months later, the business partner asked if Haleem would buy his share, so that he could go abroad. Haleem agreed, and again drew on his wife's savings. He also took some microcredit to pay the business partner the cost of his share.

Within the last two years, Haleem has expanded his client-base from an initial 10 to 100. He has replaced his old machine with a new one to meet the increased demand. He has also bought a back-up automated generator. All these have come from their savings and strategic re-investments (e.g. selling the old machine when buying the new ones).

Meanwhile, the household has bought land, including a dwelling in Supraghat. They have reconstructed their house, showing excellent attention to climate proofing, as the following image-based description shows.

Haleem pictured with his generator



Figure a: Front and back side (seen from inside) of the dwelling



Figure b: Roof, floor and backside views of the dwelling



Collective actions, on the other hand, are more concerned with improving the quality of the built environment (including access to and management of civic facilities), tenure security, and social organisation and mobilisation. We see a complex pattern of

spontaneous, as well as more structured, approaches to group formation in support of collective actions, as listed below:

- (i) *Community pressure groups.* Whenever there is a threat of eviction, a settlement-wide mobilisation takes place to engage with the higher political level, e.g. the local minister, MP, mayor and ward councillor. This engagement is secured through staging symbolic demonstrations in front of press clubs and outside offices and residences of these political leaders. These groups are however, episodic, not established.
- (ii) *Rival intra-community groups.* These groups are formed to Supraghat resist intra-settlement disputes, such as between Christian and Muslim dwellers in. We see a hierarchical flow of engagement with external bodies. It begins with individual groups engaging with the local power structure on their side. Usually the representatives of the corresponding local power structure talk to each other to settle the dispute. In extreme case, higher level leaders are called in to intervene. Some incidents even lead to official trials or 'court cases' before being eventually settled.
- (iii) *Formal groups* If the aim is to improve the quality of infrastructure and basic services, or to access micro-credits, then we see a more formal group formation. It begins with the formation of primary groups comprising of 15-20 closely located households within a settlement. The group members are usually picked irrespective of their tenure, origin and religion, but mostly confined to female members of the participating households. There is an upward engagement of the primary group leaders to represent their group, settlement and ward to the service providers. The process is usually dictated by the terms of the service providers, such as NGOs and development partners working in partnership with the City Corporation (e.g. UPPR).
- (iv) *Informal groups.* We noted a variety of informal groups, such as ROSCA, youth association, community development committee, religious/cultural groups, and informal social control groups. Some of these groups, e.g. ROSCA, are formed involving the most trusted individuals to distribute financial benefits and risks across members. These are exclusively either female or male groups, limited to either close relatives or colleagues at work. In contrast, there is an element of spontaneity and diversity of intent in youth associations, community development committees and religious/cultural groups. These groups are often male-dominated. Finally, the informal social control groups (Silver and Miller, 2004) are formed to tackle politically and socially sensitive issues, such as threats of muscle men and drug users. This takes the form of informal engagement of residents with police and/or local power structures (e.g. political leader and powerful elites). It usually involves affected people reporting their concern to more powerful members in the neighbourhood (defined either due to their political affiliation or because of their status, seniority and respectability) to be raised at the appropriate level.

- (v) *Claims groups*. These arise where a primary purpose of the group is to advance the claims of its members to power and/or resources (Thorp et al., 2005). Examples include construction and handling labour associations, and associations of poor people with special needs, such as the disabled people. These groups are usually run by elected committees, are often linked to party politics, and often allow street-level political leaders and sometimes elite employers to hold vital posts. They often extend their support to informal groups on matters that require the influence of external power.

People in public settlements appear to be more active in developing practices that involve various community-based as well as external institutions, such as the City Corporation, NGOs and private bodies. Indeed, we noted all five kinds of group activities taking place here. Moreover, they have been able to involve external institutions, both as a group (e.g. through the CDC of UPPR) and as individual households (e.g. through personal influence and networks). While some forms of household-level engagement have resulted in public money being spent for private benefits (e.g. when CDC money is spent to install a private deep tubewell), the practice has nonetheless reduced the risks of the household in question directly. Indirectly, by allowing its neighbours to access the private facilities, the recipient household may be reducing the risks to the wider community.

In private settlements, however, the involvement of external institutions is very limited. In fact, we have identified only two examples of formal group formation – for micro-credit (by NGOs ASA and Unnayan) and the mother's club (by NGO Rupantor). Fascinatingly, one of the landowners has opted to secure micro-credit via one of her tenants to build more dwellings in her settlement (Box 2, Section 3.3). In effect, the tenant has taken the loans for false reasons, but then handed them over to the landlord. What is more interesting is that some settlements in Khulna (e.g. Mr. Jamal's Lane and Dr. Oli's Lane near Supraghat) with similar tenure arrangement to Magbara (i.e. established on privately owned land) have been able to secure municipality/NGO support in improving water supply and sanitation facilities to their settlements. But all six settlements in Magbara have relied on owner-provided services. It is perhaps the powerlessness on the part of the landlords that has resulted in the absence of NGO-provided services in Magbara settlements. But our research in Bhairab city reveals that the landlords actually blocked NGOs from constructing community latrines in the Moddho Rishi Para settlement.

With the scope to engage with external institutions being limited, people in Magbara have opted to develop special networks with other intermediaries – the shelter intermediaries (e.g. the landlords), the job intermediaries (e.g. rickshaw garage owners, timber merchants, factory owners), and the political intermediaries (e.g. street-level politicians, construction labour association). These intermediaries often seek material

gains from individual people in exchange for their support, but they are less powerful than external institutions when it comes to providing long-term benefits to the entire settlement. So, private landlords can influence the degree to which, and ways in which, their tenants relate to external organisations such as NGOs and other intermediaries. This is not the case on public land.

5.2.2 Tenure is central to facilitating or constraining adaptation

Tenure security does not just give people a secure place to live. In poor urban contexts, it also leads to different types of dwelling- and land-related investments and possible impacts on people's adaptation practices. In Khulna, we observe two types of tenure structure, with different forms of insecurity and associated consequences. In private settlements, we see unauthorised construction of dwellings (e.g. without approval of design) by legal owners, in which poor people live as tenants. Such tenure may be secured as long as: (i) the tenants pay regular rents and maintain a good relationship with the owners; (ii) the rental market remains viable, so the owners do not opt for alternative developments, such as real estate; and (iii) the regulatory authority (e.g. KDA) does not intervene and destroy the unauthorised structures.

Of the three tenure security factors, the first is more relevant and urgent for private renters. Rent makes up a significant portion – on average 13 percent – of the monthly household income. Private renters have virtually no right and little incentive to undertake physical adjustments to the dwellings or to the settlement. The landlords also influence how people use electricity, as they usually install one meter for a block of dwellings, and households are charged a flat rate. While one lightbulb and one black-and-white television usage per household is included in the rent, any additional appliance will incur an extra charge. For example, one fan will cost an additional TK 100/month. Very poor households find it difficult to afford a fan; this exposes them to heat stress during the summer. We saw some tenants hanging fabric partitions beneath the ceiling to reduce indoor temperature during hot summer weather and to prevent dew falling on beds during the winter. But these partitions do not usually cover the entire ceiling, so the practice is not that effective. In the meantime, landowners try to minimise costs and delay improvements in existing settlements.

In contrast, in public settlements like Supraghat we see a mixture of three tenure arrangements: dwelling owners (authorised); dwelling owners (unauthorised); and tenants. Authorised owners are those who have received word-of-mouth assurance from the legal owner, such as the KBCA. Unauthorised owners are those who either bought the possession of the land and/or dwelling without the knowledge of the legal owner, or who occupied the land without authorisation. The tenure of both authorised and unauthorised owners is insecure, in that none of them has legal ownership of the land. If the land is partly owned by an institution, like the KBCA, there is always the possibility

that the institution will sell the land to a powerful third party, leading to eviction. If the land belongs to the government, the source of insecurity comes from attempts of local political leaders to establish or expand their control and authority and make financial gains. So, whenever there is a change in the national or local political power, the danger of eviction escalates.

Notwithstanding these fears, dwellers of public settlements believe that there are at least four reasons why they would be relocated, if not reinstated, following an eviction: (i) they received verbal political support in favour of their residency at Supraghat. This happened in 2006 when a fire burnt down the settlement for the second time in 10 years. Having lost their most important asset – their homes – people noticed a massive rise in external support (rescue and relief). Most significantly, the ward councillor asked people to stay where their homes were. In effect, this gave a signal to people that they could claim possession of the land, at least temporarily; (ii) they have been given holding numbers by, and are paying the holding tax to, the City Corporation; (iii) they have been living here for more than 30 years, so they have earned the right to live here by virtue of length of tenure; and (iv) NGOs and even KCC (in partnership with the UPPR) have made a significant improvement by constructing infrastructure here, and these organisations will speak for them. While the validity of such claims remains to be tested, the hope has already encouraged households to invest in dwelling construction (even double storey) and improvement. We also note other ways this (perceived) security has influenced people's adaptation practices. For example:

- People have been using land productively in two ways: (i) by sub-letting part of the house; and (ii) by initiating home-based businesses and enterprises, leading to livelihood diversification and strengthening of their income base.
- They have been making savings (by not having to pay rent), and using their savings for initiating and expanding self-employment.
- Some people even built their dwellings three times, as their homes were burnt down by fire twice.
- People have made many adjustments to their dwellings, homesteads and the community. They have planted trees; covered drains; treated roofs, facades, plinths and floors; and invested in securing access to basic services, such as water supply and sanitation.
- People have mobilised and formed groups to resist eviction and to access and improve provisions for basic services and essential infrastructure by negotiating with NGOs and the City Corporation.
-

However, there is no hiding from that fact the people are living with the constant fear of eviction. The built environment adaptations are therefore circumscribed. One could argue that more improvements would be possible if people's tenure were more secure – not least, that they could elevate the land to the level of the surrounding area by

investing in plinths, and develop permanent dwellings with concrete roofs and floors. This could reduce their physical vulnerability drastically. However, the likelihood of more secure tenure is slim, as the government of Bangladesh does not seem to recognise the need for low-income settlements in urban areas. We discuss this in more detail below.

5.2.3 Built environment changes and adaptation

Changes to the built environment can be directly related to a reduction of physical vulnerability. The changes may come from different sources, ranging from individual households to higher level authorities operating at the city level (e.g. KDA) and national level (e.g. Bangladesh Water Development Board [BWDB]). In discussing how built environment change is supported or hindered in Khulna, we begin with higher level authorities and then return to settlement-level activities.

The higher level authorities, such as KDA, act as regulatory bodies, rather than promoting direct changes to the built environment. Indeed, as we observe in Khulna, these higher level authorities seem to ignore the existence of low-income settlements. For example, in the current Khulna Development Plan, the area comprising Supraghat is designated as a 'mixed use/ industrial area'. The list of permitted activities does not mention low-income settlements, so the plan does not recognise the existence of the Supraghat settlement. Similarly, the area that includes Magbara is designated as 'mixed use/residential area'; again, the list of land use permitted here does not include low-income settlements. Thus, these settlements do not exist in official documents – even though they are crucial to the economic life of the city and the welfare of thousands of people.

Some of the higher level authorities, however, have made important background improvements to the wider geographical settings within which the case study settlements are located, and these improvements have directly benefited the settlements. For example, BWDB has constructed the town protection embankment that forms the western edge of Supraghat settlement.¹⁹ The significance of the embankment is quite visible: during high tide, the land level of the settlement remains at least 1.5 metres below the level of the river water. The water is controlled via a sluice gate, which also allows any logged water to be drained out quickly, subject to: (i) the drains being unblocked by the affected people with municipal support (when available); and (ii) no waterlogging during high tide. Although Magbara is not as physically connected to the embankment and the network of sluice gates, it is nonetheless served by them – if the embankment fails, the entire city and the settlement will be inundated.

¹⁹ The design of the embankment is quite sophisticated, according to the executive engineer of Khulna Division Two. The backside of the embankment was initially filled up with soil dredged from the riverbed and later turned into major road. There are as many as nine sluice gates preventing the river water from flowing into the city during high tide and allowing the logged water, and waste water, to be drained out to the river during low tide.

Beyond these drainage-related benefits, the construction of the embankment has led to the growth and agglomeration of a range of commercial and industrial establishments alongside it. This has benefited Supraghat massively; indeed the livelihoods of as many as 75 percent of the households are linked to employment generated in establishments along the embankment. The commercial and industrial activities in turn are benefiting from improved regional connectivity. For example, an improved road network connects to areas where the shrimps are produced. The Padma Bridge will also produce a step-change in connectivity for the entire southwest region.

The municipality-led improvements to the built environment include the establishment of a holding tax for residents, and the provision of utilities, such as electricity, and construction of technical infrastructure (access roads and drains that run alongside the roads). In terms of quality, these facilities are often marked by limited coverage, inappropriate design and poor construction and maintenance. But even just the physical presence of the municipal authority can work as a catalyst for positive change in these settlements. It means that other service providers, such as NGOs, feel more comfortable to extend their services in these settlements. Since 2000, the municipal authority has also been working as a partner of the donor-funded project (LPUPAP during 2000-2007 and its successor, UPPR, during 2008-2015) to alleviate urban poverty in selected cities, including Khulna, by promoting both physical and social improvements for low-income people. While we remain critical that the nature of NGO- and donor-funded projects may be creating a culture of NGO- and aid-dependency (see Section 5.3.4), we acknowledge that some positive changes are occurring.

At the moment, it is the residents of public settlements like Supraghat who are benefiting most from these municipality-/NGO-/donor-led changes to the built environment. The institutional presence has created a sense of tenure security amongst residents, and many of them have now constructed their own dwellings. Owning their dwellings mean a lot to people, as we saw a complex but constrained process of dwelling-based investments and adaptation practices taking place in Supraghat.

As a private settlement, Magbara has so far failed to benefit from external institutional support. However, Magbara does reveal a completely different, market-led, aspect of built-environment adaptation – the private landlords have been very quick to provide shelter for a large influx of Aila-affected migrants by constructing new dwellings. The potential significance of this practice becomes clearer when we consider the growth trends of low-income settlements in Bangladesh – virtually all new low-income settlements are going to be built on private land (Banks et al., 2011; Angeles et al., 2009). Magbara presents just one snapshot of how market innovations will be shaping future changes to built adaptation in poor urban settlements in Bangladesh.

5.2.4 Adapting livelihoods

For low-income residents in Khulna, climate change is one additional factor to an already complex and dynamic livelihood context. The concept of livelihood goes beyond how individual people are employed. It also includes activities such as household-level income and expenditure, savings and credits, and investments to, and returns from, various forms of capitals (Rakodi, 1999). To understand adaptation to livelihoods, we therefore concentrate on four issues: (i) how households minimise risk to, and strengthen their income base; (ii) how they make savings and smooth consumption; (iii) how they accumulate, protect and make use of productive assets; and (iv) how they build, consolidate and access their social capital, especially their support networks.

Minimisation of risk to people's income base is conceptually different from strengthening the income base. At the most basic level, the former refers to maintaining a steady income and the latter to making more income, often by taking on more additional risk. There could be three possible outcomes when the two aspects are combined. In order from high to low desirability, these are: households making more income; maintaining their income base; and failing to maintain a steady income. We find examples of all three outcomes in both settlements, although the number of households making more income is significantly higher in public than in private settlements. The main reason for this is that earning more involves either or all of the following three actions: self-employment; moving up the employment ranks through demonstrating leadership or by gaining skills and experience; and acquiring additional earning members in the family.

But self-employment, particularly in home-based business, is hard to establish in private settlements like Magbara. Tenants cannot use domestic space to develop home-based enterprises. Also, they do not stay long enough to be able to move from being an employee/worker to setting up a business in a rented space elsewhere. Thus, in Magbara more income is secured either by moving up the employment ladder and/or by getting an additional household member to work. We have one example of a construction worker who has become a *sarder* (leader) of a roof-casting labour group (gained through demonstration of leadership). In terms of the other three issues concerning livelihoods adaptation, we make the following observations:

- People in public settlements, especially dwelling owners, can make savings (by not paying rents). They also have more scope to smooth consumption through accessing free of cost, or paying little for services provided by NGOs and the municipality, such as water supply, sanitation and mother and child healthcare.
- Owners sometimes use their dwellings productively by subletting part of them. People also invest in productive assets, such as owning rickshaws, vans or equipment.

- People draw on a range of support networks. We found a positive correlation between extent of networks and level of income, with non-poor households having the most diverse networks. Factors such as inclusion in the voter list play an important role in people's ability to establish networks with higher level political leaders.

5.3 Constraints to adaptation for Khulna's poor

5.3.1 Geography and settings

The entire population of the city is exposed to the potential impacts of sea-level rise and other related problems, such as salinity, flooding and waterlogging. To a significant degree, all of Khulna's residents, both rich and poor, are dependent on the effectiveness of national-level decisions about water management and major engineering projects to improve physical structures (embankments, major sluices, etc.). But there are at least three ways in which the wider geography and physical settings make poor urban dwellers in Khulna particularly vulnerable to the impacts of extreme and severe weather events.

First, poor people often lack the capacity to improve their physical environment. As in Supraghat, we saw that people were unable to elevate the land to the level of the surrounding area, so the problem of waterlogging persists. With the settlement being illegally developed, neither the legal owners nor the settlers are interested or indeed able²⁰ to solve the problem now. Illegal occupancy has also resulted in a haphazard process of land sub-division, and dwelling constructions with limited circulation space and on vulnerable locations. A few examples of two-storey dwellings are emerging, but no permanent structure is allowed here, so the roof and the first floor can never be made of concrete. A poor quality living environment is also a common characteristic of both Supraghat and Magbara, marked by damaged huts, blocked drains, polluted pond water, overflowing septic tank, lack of cross-ventilation and ineffective under-roof treatment. In Supraghat, this is partly driven by the dwellers' lack of capacity, with very poor households living in the poorest of conditions. In Magbara, this is partly dependent on the capacity and willingness of the landowner – with more able and caring landowners often offering slightly better provisions. But in general the physical environment is characterised by multiple forms of vulnerability.

Second, the settlements suffer from reduced connectivity to their formal neighbourhood, as they are confined within walls. These walls are present in both settlements, but are

²⁰ The majority of Supraghat residents own their dwellings, but not the land. There have been massive investments made in civic facilities (e.g. tube wells, common latrines, access roads and drains) by NGOs and through partnerships between donors and the City Corporation (e.g. the UPPR project). It is unrealistic to bury these investments in the name of raising the land elevation without actually evicting/relocating people from the settlement.

more conspicuous in Supraghat than Magbara. Indeed, the construction of a 20 feet high wall topped with steel wire between Supraghat and the officers' quarter of the Bangladesh Bank Khulna branch symbolises the massive level of segregation and inequalities. The wall was constructed to prevent the spillover of anti-social behaviour from the settlement to the bank's premises. In doing so, the wall has blocked the dwellers' emergency exit and evacuation routes during incidents such as fire and earthquake. Indirectly, such social segregation may have led to a rise in anti-social behaviour (e.g. drug addiction) within the settlement, further undermining its social status. The high security wall, reduced connectivity to surrounding areas, narrow lanes and inadequate street lighting – all have combined to make certain parts of the settlement a safe meeting place for drug addicts. After dark, groups of young people mingling in certain spots have become a common scene in Supraghat.

Thirdly, environmental migrants to Khulna face a different kind of insecurity – their inability to return to their places of origin. Geographically, Khulna city is not located far from the villages from which these people have migrated – for example, it is only two hours by public transport to Dakop, an Aila-affected area. But the prospect of agriculture-based rural livelihood is diminishing, due to growing saline intrusion and frequent destruction by severe cyclones. Consequently, these migrants have no choice but to live in Khulna. People in both case study settlements have expressed their confusion and uncertainty about where their future is – in Khulna city or in their ancestral land. In particular, Aila-affected people living as tenants feel that they have been forced into a floating life in Khulna. At the same time, they hear stories that the sea level will rise further, bringing more saline intrusion, river erosion, and cyclones and storm surges. They are all but giving up their long-held desire to go back to their villages and are accepting life in the low-income settlements. Our discussion with people in the two settlements reveals that during extreme weather events they will depend on their network of friends, family members, local elites and elected officials in Khulna city, rather than in rural areas. They are mentally ready to accept the fate of others here, and nobody mentioned returning to their village (Table 6).

Table 6: Prioritisation of contacts during extreme and severe weather events*

Situation	Priority action	Important contacts to respondent**
Flooding and/or cyclone causing damage to people's home so that they need to take shelter outside	<ul style="list-style-type: none"> • Stay at home and move with in neighbours and relatives in Supraghat • Move to Mr. Hanif's madrasa and seek his advice • Contract Mr. Manu (former ward councillor) • Move to government school • Stockpile dry food, e.g. beaten rice and puffed rice • Use rickshaw to relocate important goods to safety • Put goods on elevated platform • Gather family members and pray to Allah • Strengthen the knots by which the roof structure is tied to the frame/partitions • Move into the fish trading house that is most elevated • Move to relatives living elsewhere in Khulna • Contract current ward councillor • Contact the Baptist church priest • Contact Mr. Khaleq Mollah 	<ul style="list-style-type: none"> • Neighbours and relatives (6) • Madrasa (4) • Former ward councillor (4) • Govt. schools (2) • Fish Traders Association (2) • Relatives in Khulna (2) • Current ward councillor (2) • Baptist church priest (2) • Mr. Khaleq Mollah (1)
Job/business is affected by bad weather (e.g. heavy rainfall, cyclones, etc.)	<ul style="list-style-type: none"> • Accept what Allah brings for us • Contract Mr. Manu (former ward councillor) • Consult the Baptist church priest • Consult the Fish Traders Association • Safeguard business premises, material and equipment • Keep customers informed 	<ul style="list-style-type: none"> • Former ward councillor (4) • Rely on Allah (3) • Baptist church priest (2) • Fish Traders' Association (2) • Customers (1)
Family members start to become sick, due to heat stress	<ul style="list-style-type: none"> • Keep the room open and use hand fan • Consult the doctor, first the quack and then if needed the general hospital • Keep oral saline at home • Wipe body with wet cloths • Contact relatives living in Supraghat • Walk outside near the pond 	<ul style="list-style-type: none"> • Neighbours and relatives in Supraghat (3) • Quack on the embankment (2)
People find it difficult to live in the settlement, due high population density, too much shouting and quarrelling	<ul style="list-style-type: none"> • Calmly advise people not to shout/quarrel • Do nothing, as doing anything will make matters worse. One respondent said 'people do not even listen to the KCC mayor, why would they listen to us?' • Walk away from the gathering for a while • Complain to household heads/landlords • Confront troublemakers 	<ul style="list-style-type: none"> • Neighbours and relatives in Supraghat (3) • Landlords (2)
A fall in the quality of living conditions, e.g. shortage or poor quality water; waterlogging, blocked drains and bad sanitation	<ul style="list-style-type: none"> • Consult with other affectees and try to solve the problems on their own • Collect water from deep tube well that does not have salinity problem • Accept the fate of everyone • Contract the current ward councillor • Adapt to new situation • Harvest rainwater more 	<ul style="list-style-type: none"> • Neighbours and other affectees (8) • Deep tube well owners around Supraghat (5) • Current ward councillor (2)
People no longer get support from their network, maybe due to natural disasters such as Sidr/Aila	<ul style="list-style-type: none"> • Rely on Allah • Look for alternative job/income source • Restore network with good behaviour • Consult Mr. Khaleq Mollah • Contact the Baptist church priest 	<ul style="list-style-type: none"> • Rely on Allah (2) • Christian Mission priest (1)

Note: * The table refers to what households would do (second column) and who they would contact first (third column) during potential future shocks/stresses (first column), not what they have done in the past. It refers to Supraghat only.
** The importance of a contact has been measured by the number of times (presented in parenthesis) the contact has been mentioned during our interactions with all households.

5.3.2 Lack of a socio-political platform

Here we reflect on the level of poor people's access to the political process urban governance structures in Khulna. There are at least two perspectives through which we observe that dwellers in both settlements suffer from a lack of socio-political platform. First, dwellers are denied an appropriate right to shelter and basic services. This manifests differently in the two communities. In Magbara, it has been partly market-driven and partly determined by 'how the elite society (e.g. landowners) treats poor urban people' – by offering poorly constructed dwellings, inadequate water and sanitation provisions, and no health and education facilities. The absence of a minimum legal standard for rented settlements has led to landowners being ad-hoc in their provision of facilities and remaining unaccountable.

The situation in Supraghat is more complex. The auto-establishment of this low-income settlement can be seen conceptually as an act of poor people exercising their rights to shelter (Plyushteva, 2009). However, in Bangladesh's titling-based land market, such practice is considered illegal and invariably leads to potential confrontation with the title holders. In an ideal world, a compromise is feasible if the settlers and the title holders have the same level of socio-political platform. Instead, we observe that land changes hands without the knowledge of the dwellers, resulting in powerful people gaining capital and trying to evict the dwellers. But it is the dwellers, with some NGO and municipality support, who have made improvements and added value to the land over time (e.g. by elevating the land, constructing roads, etc.).

Without a formal socio-political platform, people do not enjoy the opportunities normal citizens would have for formal dialogues with political leaders or elected officials. Instead, they are forced to stage demonstrations in symbolic places, such as in front of press clubs, and outside the residences and offices of politicians and elected officials. This usually helps them to enforce a temporary non-action and establish a partial equilibrium of rights at best. The futility of this equilibrium is tested every time that political power changes hands, both locally and nationally. During this process, dwellers who can raise their economic base sufficiently high move out of the settlement, to purchase elite/middle income status. They exercise their power and continue to claim economic benefits from the settlement through holding possession of, and renting out, their dwellings. In return, they act in favour of the dwellers, thus indirectly helping the temporary non-action to prevail.

Second, unlike Bangladesh's formal employment sectors, such as the readymade garments industry, the job markets in which the majority of poor people in Khulna are employed, such as rickshaw pulling, labouring in construction, furniture making and shrimp processing, are not formally regulated (Maligalig et al., 2009). These informal markets are controlled by elite groups, who may be helping the poor with employment, but who usually deny the workers a proper working environment, appropriate rates of pay, and adequate compensation.²¹ In response, we notice the formation of claims groups (Thorp et al., 2005) such as a construction labour association (Magbara), and a handling labour association and disability welfare organisation (Supraghat). In the absence of a formal trade union culture, these groups operate informally, often allowing street-level political leaders and sometimes elite employers to represent the groups. Consequently, the groups do not usually attempt to bring serious socio-political changes for the benefit of the poor urban workers. Instead they are more focused on dispute resolution and other non-structural matters.

5.3.3. Ineffective support from public institutions

In Section 5, we acknowledged support from both national- and city-level public institutions. We now reflect on how effective and pro-poor these supports are in Khulna. The city protection embankment, a nationally significant project, is losing its capacity to keep the city protected from flooding and storm surge. The riverbed is filling up and its water holding capacity is decreasing. During Aila, the storm surge toppled the embankment in a few places, but luckily it held out, as many people, including poor people, rushed to put sand bags on it. The BWDB comes under pressure every time there is news of embankment failure elsewhere, but with the exception of an investigation into the embankment's structural aspects, no efforts have been made to increase the river's navigability, through dredging, for example.

Apart from embankment failure, which is a common fear for the entire city population, poor settlements such as Supraghat, which is located close to the river Rupsha and served by a sluice gate, are also suffering from sedimentation in the channel connecting the sluice gate. This causes slow draining of water logged inside the settlement. It is not clear who will manage these gates in future, as the BWDB is transferring the responsibility to KCC. We noticed that the gate is currently operated by a shrimp trading house adjacent to the gate.

The Department of Forests is the other institution that has impacted on poor urban people via how it manages forest resources in the southwest of Bangladesh. Its decision

²¹ Improper working environment is reported by respondents working as shrimp cutters/cleaners at night (bad lighting and wet environment), inadequate rate is reported by male respondents working as carpenters (lower rate when working as casual daily labour), and inadequate compensation is reported by respondents who have worked/are working as construction helpers (non-payment of life insurance).

to ban *golpata* harvesting following cyclone Sidr had a knock-on effect on poor people's livelihoods. While the policy was implemented in order to give the ecosystem services to revive, there was no consideration of how people who depend on *golpata* would survive. The policy has had a permanent and lasting impact on the traditional dwellings constructed using materials such as *golpata* and bamboo, forcing a shift of livelihoods for many poor urban dwellers.

At the city level, we saw at least four types of public institution offering direct services to the poor urban settlements: KCC; KDA; hospitals; and educational institutions. We highlighted KDA's ignorance of poor urban people in Section 6.2.3. In its development plan, there seems to be no reference to poor urban settlements, whereas the 2005 census and mapping of slums in Bangladesh identified over 500 low-income settlements in Khulna, accommodating about 0.2 million people on an area of about 142 hectare (Angeles et al., 2009).²² By comparison, KCC's presence is quite noticeable in public settlements, through its participation in the UPPR project. But, as we argue below, this participation does not include budgetary responsibility on the part of the municipality. This has given the elected representatives scope to exercise political opt-outs. Finally, people expressed dissatisfaction with the support received from hospitals, but they appear to be happy with the educational institutions.

5.3.4 Aid and NGO dependency

As noted in Section 5, Khulna's poor people are dependent on basic services provided by a range of institutions, most notably NGOs and municipality-donor partnerships. While the level of services in these settlements is far from adequate, these institutions are beginning to make visible improvements, mostly in public settlements, but sometimes in private settlements too. However, the way in which they are doing this, we argue, is developing a culture of NGO and aid dependency. We make three supporting observations.

First, we observe that communities are being organised to function as a delivery chain of donor-funded projects, rather than as a socio-democratic unit. Through our examination of the three most active NGOs and donor-funded initiatives – Nabolok,²³ UPPR and World Vision – we see a strong emphasis on securing community involvement. This is done through the formation of primary groups at the neighbourhood level (e.g. 15-20 adjacent households forming a primary group in UPPR) and two to three upper-level units to sequentially represent a settlement, a ward, and sometimes the city (when created). However, it is the settlement-level units (such as CDC and CDC clusters in UPPR) that make the claim and are supported. The money and technical assistance

²² Source: Carolina Population Centre, The University of North Carolina at Chapel Hill: <http://www.cpc.unc.edu/measure/our-work/gis/bangladesh-slum-maps/Khulna>. Accessed 17 June 2011.

²³ See: <http://nabolokbd.org/>

always come from the top (nationally or internationally) and are allocated using a top-down method. There is no control or participation by the community representatives in deciding how the money is allocated or indeed where the money comes from. The participating households maintain a savings account by putting in a minimum amount of regular savings, but the service is usually paid for, sometimes involving additional contributions from the participating households. There is a complex arrangement concerning how the savings can be accessed and used, but people feel that as long as they maintain the savings account, the service will continue. This indicates an expectation of a continuous flow of aid money or NGO support, which is unlikely. The UPPR may expect that when they withdraw their partnership with the communities, they will be replaced by the communities-municipal government partnership. But the municipal government's participation in the process is limited to authentication and approval giving; it does not make any financial contribution, apart from offering rent-free office space for the UPPR project office. Thus, once the aid money is gone or the NGO projects are completed, the whole organisational structure is likely to become dysfunctional.

Second, we see opportunities being created for higher-level elected representatives to exercise political opt-outs. The concept of donor-municipal government partnership (as in UPPR) is theoretically very good. But currently no municipal budget is allocated to support these activities. Instead, the municipal government sometimes acts as a regulatory body (by approving/preventing NGO activities), and sometimes as a facilitator (by participating in project implementation, such as by authenticating the selection of beneficiaries and validating their claims in UPPR). To an extent, such non-financial engagement may be good, as it enhances the accountability of the service providers. But this has also given the elected representatives an opportunity to opt-out of their commitment to poor urban people via their representation in NGO- and donor-funded projects. For example, the ward councillors face the day-to-day challenge of addressing people's needs (including those of the poor), but enjoy very limited budgetary allocation. To them, NGOs and donor-funded projects bring facilities that they cannot provide to the poor. So, the culture of NGO and aid dependency is taking root in the formal institutional structure too, largely as a result of its ineffective partnership with third party service providers.

Thirdly, we note that people are becoming increasingly reluctant/unable to do what they should do independently as citizens. For example, people are blocking drains by dumping waste into them, both in private and public settlements. Pond water in both settlements has also become filthy and highly polluted, partly due to waste thrown mostly by the dwellers. Several attempts at NGO-led garbage collection in Supraghat were unsuccessful. One reason for this was that dwellers had to pay a minimum amount to the garbage collectors. Perhaps, a free-of-cost garbage collection project could improve the

situation. This again points to an emerging culture of dependency – be it on state, NGOs, development aid or an adaptation fund.

5.3.5 Limits to people's agency and structures

The drawbacks in the physical settings, socio-political contexts and external institutional support undoubtedly affect the conditions in which poor urban people in Khulna live and maintain their livelihoods. But, as discussed in Section 5.2, the effects are not uniform across households and between communities. Some households have been able to develop more effective adaptation practices than others. This implies that there are other factors which limit household agency and structures. We identify the following limiting factors:

- *Limited options for labour mobilisation.* Having additional working members in the family makes a big difference to household income, especially for very poor and poor households. However, there is limited employment opportunity for poor women, especially recent migrants, as observed in Magbara. Women in Supraghat are better placed to find a job in shrimp cutting/cleaning. But the job is likely to be temporary, seasonal and involve working at night.
- *Shocks and critical incidents.* We have observed impacts of three forms of shock and critical incident: (i) idiosyncratic shocks (illness); (ii) covariant shocks (e.g. fire incidents; oversupply of unskilled labourers); and (iii) other household-specific events (e.g. dowry).
- *Changing social structure.* Family break-ups in villages often result in the creation of female-headed households moving to urban areas. These households remain particularly vulnerable socially throughout their lives. They expect their children to look after them when they grow up, but this rarely happens.
- *Poor attitude to risk.* We observed at least two cases where poor attitude to risk-taking prevented the development of more effective practices: (i) loyalty to the family profession (e.g. carpentry); and (ii) accepting destiny and doing nothing risky.
- *Limited use of productive assets.* Ownership of productive assets matters a lot to people. However, we find only limited numbers of cases where dwelling ownership has been turned into income generation, such as by renting rooms. In most cases, dwellings are too small to accommodate a tenant.
- *Fractious community organisations.* We find evidence to suggest that there are social divisions and conflicting interests in both settlements – between men and women, between young and old, between leaders/owners and inhabitants. Consequently, the views of socially less powerful groups may be ignored when collective action is undertaken, and the benefits of collective action may thus be unevenly distributed.

6. Implications of findings for policy and institutions

What does our understanding of how Khulna's poor people are tackling their existing shocks and stresses in the wake of climate change tell us about policies? We structure our discussion on implications at three levels – local, national and international.

6.1 Implications for Khulna-based institutions

One important local (city) level policy outcome is the need to observe closely how informal land markets operate for the poor, both as a potential vehicle to address the shelter needs of future (environmental) migrants (in private settlements) and as an option for existing citizens to claim their ownership of dwellings, if not land (in public settlements). There are a range of innovative practices to consider in terms of their specific operational and design features. For example, the landowner-tenant cooperation to access micro-credit in Magbara emerged out of a creative partnership between the supply (landowner) and demand (tenant) operators of private land markets, without the knowledge of the lender. While in Supraghat, there are examples of informal mortgages provided by NGOs without any formal ownership of the land for dwelling owners. It is worth examining whether micro-finance institutions can formally recognise such practices which could ease the financial constraints of private suppliers/owners of low-income dwellings.

Another policy outcome is the need to recognise the potential danger of political opt-out and exclusion practices in public and private settlements, respectively. The political opt-out practice in public settlements such as Supraghat seems to work as a 'win-win' situation for the donors and elected representatives. Politicians enjoy image creation without having to make a financial contribution, while donors acquire political support for their project. But it is unclear whether the politicians will be able to replace their opt-out by real engagement when the aid money disappears. It seems necessary to address the culture of aid and NGO dependency that underlies the opt-out practice. Political exclusion, on the other hand, is shaped by the informality of private rental markets, whereby tenants are often excluded from the voter list as a consequence of their short-term tenancy. There should be a mechanism to encourage tenants to be included in the voter list for the municipal constituency in which they live, which will in turn make politicians sympathetic to them. Our data have clearly shown that even just the physical presence of elected representatives can act as a catalyst for positive changes in poor urban settlements.

The other important policy outcome is that access to adequate and appropriate forms of basic services matters greatly to people. Inadequate facilities (e.g. limited number of community latrines) often force people to continue unhealthy and illegal practices (e.g. use of hanging latrines). Similarly, lack of or limited access to appropriate types of facilities (e.g. deep tube well) make people use inferior alternatives (e.g. shallow tube well). Two issues deserve further mention in this regard. First, the recent establishment

of KWSA has been followed by a ban on deep tube well installation, further exposing poor urban people to scarcity of safe drinking water. Careful planning is required for KWSA to avoid being seen as a 'bad institution' due to a failure to connect the poor urban settlements on a priority basis. Second, the difficulty of obtaining NGO/donor-led service provisions in private settlements remains.

6.2 Implications for national-level institutions

There are three important national-level policy outcomes. First is the need to closely evaluate how the issue of insecure tenure can be systematically included in official policies and plans. Like other metropolitan development plans, the KDA does not classify 'low-income settlement' as a land use type, despite the fact that 20 percent of the city's population live in these settlements. The national government acknowledges that six to eight million people could be displaced and in need of resettlement by 2050 – many of whom will be poor people migrating from rural to urban areas (GoB, 2009). Progress towards the future resettlement of poor people in urban areas should start by acknowledging existing poor urban settlements. A good deal of background work has already been done in the form of mapping and census of slums in urban Bangladesh in 2005 (CUS, 2006). Can this inform a much-needed low-income settlement policy in the country, either made afresh or by amending and finalising the 2004 draft National Housing Policy?

Second, it is important to acknowledge that the livelihoods of poor urban people are intricately linked to ecosystems services located both within and beyond the geographical extent of the urban area in question. Our findings have shown how the impacts of cyclone Aila in the Sundarbans, followed by a temporary ban on *golpata* harvesting, led to a collapse of demand for traditional building materials in Khulna city and ultimately a change of livelihoods for *ghorami* (poor people engaged in traditional dwelling construction). The damage caused to coastal embankments by cyclone Sydr (partly because of the bad management of embankments, which significantly weakened them) was also far reaching. The knock-on effect was felt by the poor women shrimp cutter/cleaners in Supraghat.

The final policy outcome relates to the important consequences of bad working conditions in activities in which most of the poor urban people in Khulna are employed, such as labouring in construction, furniture making and shrimp processing. Devising a local- to national-level socio-political platform would help poor workers to bargain for a proper working environment, appropriate rates, and adequate compensation. This may also incentivise episodic community groups to become established and pursue structural changes for their members.

6.3 Implications for international organisations

The most obvious policy outcome of international significance is how not to think in terms purely of 'carbon-emission' when it comes to understanding the impacts of climate change in poor urban settlements of developing countries such as Bangladesh. International climate policies are dominated by actions to reduce greenhouse gas emissions, although poverty and human development are increasingly considered to be part of the policy remit (Tanner and Allouche, 2011). Cities are often blamed for being the highest emitters (Dodman, 2009), and seen as central to reducing emissions (Satterthwaite, 2010). However, blaming city dwellers in general means unjustly blaming poor urban people. Poor people's consumption of domestic energy in Khulna is very low and perhaps negligible. The prospect of energy-efficient technologies taking hold in Khulna's low-income settlements is also very slim. Perhaps the only example of a low-carbon initiative touching on people's lives here is the creation of jobs in battery-driven auto-rickshaws, assuming that the battery energy source releases less carbon than fuel. However, these auto-rickshaws are not creating new jobs; rather, they are taking demand away from rickshaw pulling, thus affecting the livelihoods of poor people. Also, our findings clearly show that impacts of climate change are neither the primary nor the only challenges facing poor urban people. Climate change impacts mostly compound their challenges indirectly.

A related policy concern is the lack of mechanisms through which the growing sums of international money to support adaptation measures could reach poor urban people. We have spotted at least two examples in our study where international money could have directly benefited Khulna's poor. The first example is IWM's (2010) study on 'Bangladesh: strengthening the resilience of the water sector in Khulna to climate change', funded by the Climate Change Fund. It remains to be seen whether the study leads to any change in institutional attitudes towards Khulna's poor. Second, in principle poor urban people can benefit from current global funds through the CDMP, as Bangladesh is currently implementing CDMP Phase II (GoB-UNDP, 2008). While one of its four outcomes refers to poor urban settlements, the focus is limited to 45 pilot settlements in Dhaka, Chittagong and Sylhet, and on issues concerning earthquake and other (unspecified) urban hazards. The scope of CDMP is thus limited to (non-climatic) rapid-onset events, and does not include slow-onset processes or cascade effects. In contrast, many problems facing poor urban people are and will be stresses, not shocks. In addition, the coverage of post-disaster recovery activities in CDMP is usually defined by the geographic extent of the affected area, so the displaced population, such as environmental migrants to urban areas, goes unsupported. Indeed, our respondents who migrated to Khulna due to destruction caused by Aila and Sydr reported that they did not receive any government or NGO support because they left their villages.

A potential policy option to channel international money to poor urban people may be to look at existing long-term pro-poor donor-funded projects such as the Local Partnerships for Urban Poverty Alleviation Project (LPUPAP, 2001-2007) which was succeeded by the UPPR project (2008-2015). Our analysis has revealed that the UPPR project has major limitations in terms of effective institutional designs. Before the UPPR model can be considered for this role, it is important to examine whether such projects can actually build community organisations.

The final policy concern refers to an absolute lack of connection of Khulna's poor with established international groups and federations such as Shack/Slum Dwellers International or Homeless People's Federation. Satterthwaite (2009a) reported many success stories of these international organisations of urban poor groups (through federated savings groups). While the practice of group savings exists in Khulna's poor urban settlements, this has not yet resulted in larger federations and collective actions.

7. Conclusion

The Khulna case studies have enabled us to understand the problems facing poor urban people in Bangladesh and to reflect on people's agency and structures and the potential role of institutions in adaptation. These general lessons can be used to understand poor urban people's adaptation to climate change, not just in Khulna but in Bangladesh generally and perhaps beyond. Low-income people show a similar level of concern about the security of their tenure and about safeguarding their livelihood in an increasingly urbanised and changing society (Chatterjee, 2010; McKean, 2009). Indeed, as we observed in Khulna, issues concerning insecurity of tenure, inadequacy of basic services and difficulties in maintaining livelihoods are predominant in poor people's perceptions of their priority problems (Table 1). The impacts of climate change mostly compound these challenges indirectly, via rapid-onset events (e.g. waterlogging; flash flooding), gradual-onset events (e.g. increased salinity, resulting in deteriorating water quality), and cascade effects (e.g. over-stressed basic services and oversupply of casual labourers, due to increased levels of environmental migrants in low-income settlements).

Despite facing many challenges in the city, Khulna's poor are unable to return to their ancestral land. This is partly due to the destruction of rural livelihoods, probably caused in part by climate variability and change, e.g. frequent and intense cyclones and storm surges and growing levels of saline intrusion. With the scope to acquire urban land being slim, they rent private dwellings and/or squat on public land. They develop their resilience by adapting to the risks in cities via practices across various domains: (i) livelihoods; (ii) tenure, shelter and built environment; (iii) health and wellbeing; and (iv) inclusion in social and political networks.

Opportunities to develop these practices are more limited in private than in public settlements. A key issue here is that people need to be sure that their living space – their

tenure – is secured, before they are willing to invest in shelter, basic services and neighbourhood development. The virtuous circle of people's investments in better housing and basic services over time improving their health and quality of life, making more time and energy available for productive activities by household members (Baud, 2000; Rakodi, 1999; Satterthwaite, 1997) is thus not available to those living in private settlements.

Institutions – public, NGOs, community-based and private – have an important role to play here. While in general the levels of institutional support in Khulna are increasing, serious improvements to policies are needed to effectively address the central concern of poor urban people's rights to shelter and development. In particular, there is an urgent need in Bangladesh to acknowledge climate change as a significant urban problem in national-level policies. Not least, the National Housing Policy should be amended, with an emphasis on implementing a low-income settlement policy and addressing issues concerning both private and public settlements. The critical issues surrounding political opt-outs and exclusion should be addressed. In addition, city-specific mechanisms need to be devised for an effective coalition within the municipal governance structure to channel institutional support to satisfy people's claims in a way that facilitates, but does not displace, their agency and structures.

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