



Urban Risk: *Hazards and Vulnerability in Khulna and Bagerhat cities, Bangladesh*

This short summary highlights the methods and main findings of research examining risk in urban areas of Bangladesh. The full report is available upon request from rsloman@cafod.org.uk

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URBAN DISASTERS

More than half of the world's population now live in urban areas. Cities are lifelines of society and engines for economic growth. However, rapid urban growth poses many challenges to city authorities and if not well managed, cities can become generators of new vulnerabilities and hazards. In Bangladesh, southern coastal urban centres are frequently exposed to heavy monsoon rains and cyclones. In 2007 Cyclone Sidr (Cat 4 storm) tore through south west Bangladesh killing over 4000 people and leaving 2 million without a source of income. Khulna and Bagerhat districts were severely affected experiencing 240 km/hr winds that caused storm surges of up to 6 meters². To reduce the risk faced by these coastal cities there is a need for context-specific approaches for the assessment of vulnerability and adaptive capacity that bring positive change to diversified groups living in cities. One such approach uses knowledge as a way for organized urban poor to consolidate their capacities and negotiate successfully with the authorities. Knowledge can be a significant human capital that informs decision making, transfers value, promotes learning and improves actions. It is recognised that a 'co-production of knowledge' facilitated through a participatory process, together with communities, local government and other stakeholders is fundamental for community based Disaster Risk Reduction. Here this concept is tested for urban risk reduction.



The low elevation of Khulna city makes it vulnerable to tidal flooding, storm surges and drainage congestion (Photo: MSA Khan).

RESEARCH SUMMARY

CAFOD has worked alongside partners in Bangladesh since 1986 and recognise that rural and urban areas are at risk in differing ways. Therefore CAFOD asked researchers from IWFM-BUET to review urban risk, drawing on community knowledge, in two coastal cities in Bangladesh; Khulna (pop.1.4m) and Bagerhat (pop.51 000). The researchers found that Khulna and Bagerhat cities face similar water and climate related hazards that give rise to or aggravate secondary issues such as disease or saline drinking water and soils. Out of multiple hazards, communities living in these cities noted that water logging (flooding) due to drainage congestion were the most severe hazard in both cities. However the vulnerability to these hazards varied across different groups, hotspots and cities. To examine this variation the researchers developed a method of measuring vulnerability referred to as a vulnerability index. This index was created from a measure of hazard exposure, sensitivity and the capacity to adapt. Using this index along with participatory rapid appraisal the researchers were able to highlight key 'hotspots' of risk within the two cities in addition to identifying good practice for participatory risk assessment for urban communities.

²http://www.gfdr.org/docs/AssessmentReport_Cyclone%20Sidr_Bangladesh_2008.pdf

RESEARCH QUESTIONS

Bangladesh is one of the most hazard prone countries in the world; it is also a country with a rapidly growing urban population. Therefore there is a large urban population exposed to hazards such as earthquakes, cyclones and floods. This research addressed the following questions:

- What is the nature and dynamics of urban vulnerability in the southwestern coastal region of Bangladesh in a multi-hazard setting?
- What are the limitations in the current approaches for assessing vulnerabilities of urban communities in a multi-hazard coastal setting?
- What methods and tools are appropriate for assessing community vulnerabilities in a multi-hazard coastal urban setting?
- What are the current adaptive practices of the urban communities to reduce the effects of the natural hazards in the region?

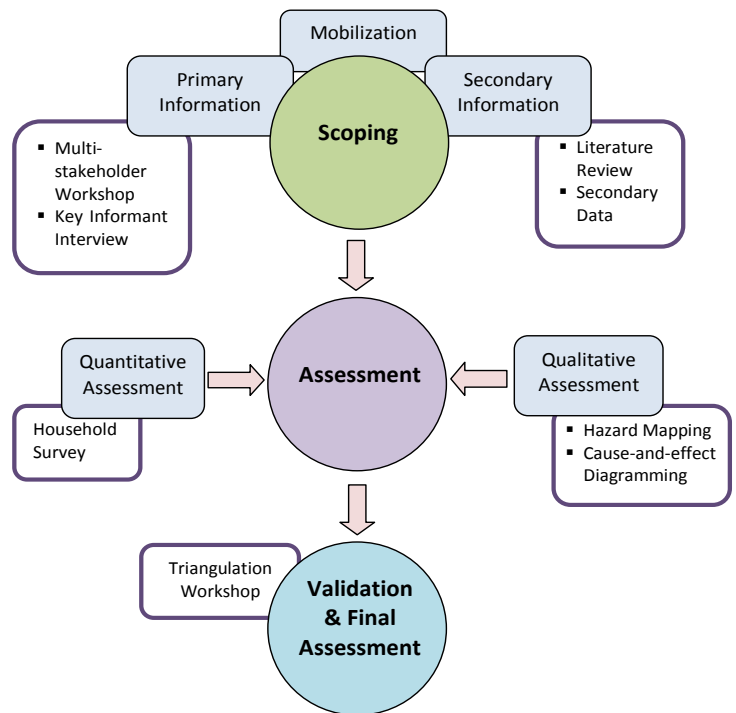
Therefore a team of researchers at the Institute of Water and Flood Management – Bangladesh University of Engineering and Technology (IWFM–BUET) undertook in-depth participatory research focussed on two of the most vulnerable cities in Bangladesh; Khulna and Bagerhat. The objectives were to:

- Identify and assess potential hazards in two coastal cities in southwestern Bangladesh;
- Assess vulnerability and adaptive capacity of urban residents to climatic hazards; and
- Identify the level of preparedness of the urban residents to disaster risks and adaptive practices in response to such risks.

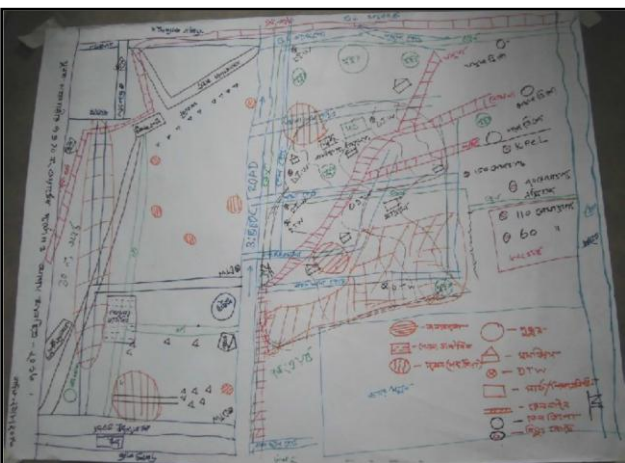
ASSESSMENT METHODS

The researchers used more than one social science research method to tackle the questions outlined above; both key informant interviews and also participatory workshops with relevant stakeholders including community groups.

The diagram opposite provides a summary of the research methods used. It is an approach that can be replicated for future urban risk assessments. The diagram shows that a scoping stage is required to identify target areas, hypothesis and contextual information.



Methods framework for urban risk assessments



Participatory hazard map of Ward 7 and Ward 10 of Khulna City, 2013 (Photo: Rashed Jalal).

This phase included reviewing existing literature and trialling a selection of participatory workshops and interviews, while identifying the most important vulnerability issues and hotspots. It highlighted the importance of key informant interviews and enabled the researchers to refine participatory activities for the workshops. Finally the researchers presented their findings to key stakeholders for their validation.

HAZARDS IN KHULNA AND BAGERHAT CITIES

Flooding/Water logging: Communities in both cities identified urban flooding and water logging, caused by heavy rainfall, as a primary hazard. This is similar to rural areas but suggests that both environments suffer from a lack of drainage that leads to water logging during heavy or prolonged rains. Communities in the cities reported that it can take several days for the water to drain and during this time those who rely on 'occasional' work such as street vendors, rickshaw drivers, and day labourers lose their income. This stagnant water causes severe problems including restricted movement for the collection of clean drinking water, contamination of water leading to water borne diseases and problems sending children to school through the flood waters. Additionally there is no facility for solid waste management in slum areas of Khulna and therefore flood waters are contaminated and in turn lead to a further pollution of drinking water. In addition both cities suffer from tidal flooding; communities noted that in recent years this hazard has increased in size.

Cyclones and storm surges: Despite rating these hazards as a lower threat, communities in both cities noted how these events put increased pressure on resources due to an influx of internally displaced people from the rural areas. It is interesting to consider therefore that although the cyclone itself may not have a high impact it was a driving force in rural migration to cities.



The urban poor live in slum dwelling in high risk areas such as canals or 'Khals' (Photo: Uthpal Kumar).

Potable water: Shallow tube wells provide most drinking water in Khulna. Those interviewed noted that this was sufficient 10-15 years ago but now the water is saline and is no longer potable. In addition the water table has dropped by approximately 100-300 feet during the last 10 years and therefore in the dry season the wells are dry. Communities reported that in these months the poorest people have no choice but to drink unsafe saline water. This leads to diarrhoea and dysentery. In some areas more than 200 people rely on one tube well, and this can lead to stress and disputes between households and within the wider community. Whilst those who are powerful and wealthy have wells installed on their land and restrict access.

City	Hazards (primary and secondary)	Vulnerable people
Khulna	<ul style="list-style-type: none"> heavy rainfall water logging salinity scarcity of potable water siltation of river bed 	<ul style="list-style-type: none"> individuals with disability peri-urban residents and slum dwellers migrants from rural areas peri-urban farmers and fishermen homeless and landless people
Bagerhat	<ul style="list-style-type: none"> scarcity of potable water drainage congestion inappropriate operation of the sluice gates poor sanitation deteriorating river navigability 	<ul style="list-style-type: none"> individuals with disability homeless and landless people slum dwellers day laborers rickshaw pullers hawkers

A summary of the main hazards and vulnerable people identified by communities living in Khulna and Bagerhat cities, Bangladesh.

CREATING A VULNERABILITY INDEX: Examining exposure, sensitivity and adaptive response

Although it is vital to identify which hazards impact urban communities and individuals it is also important to examine their vulnerability. Combining these two elements you can identify areas at high risk and should be prioritised for risk reduction measures.



Rickshaws are popular mode of transport and a core source of income for the urban poor. They are particularly vulnerable during flood events (Photo: Uthpal Kumar).

The ability to measure levels of vulnerability is therefore important but often difficult and context specific. The difficulty lies in how you take something that can only be described and turn it into something that can be measured and compared? Developing a quantitative vulnerability index using proxy indicators is one solution. For this research proxy indicators related to three constructs of vulnerability: hazard exposure, sensitivity and adaptive capacity. Subsequently a ranking or scoring system for each indicator is then selected. This was created by capturing the communities and 'experts' perception of how important each indicator was to raising or lowering vulnerability. A total of 13 indicators were selected. Using these indicators and using them

within household surveys the researchers were able to assess vulnerability in 11 hotspots of risk in the cities, containing over 110 households with a high level of vulnerability.

Vulnerability component	Indicator
Exposure	Frequency of Hazard
	Duration of Hazard
Sensitivity	Ratio of non-earning to earning members in a family
	Ratio of female to male members in a family
	Ratio of disabled to able members of the family
	Dependency on local income of a family
	Ratio of loan to income of a family
	Ratio of savings to income of a family
	Housing type
	Location of house
Adaptive capacity	Income level of a family
	Education level
	Duration of living in the city area of the family

This research has highlighted the potential of participatory knowledge co-production for urban risk reduction in southern Bangladesh. It demonstrates the importance of a participatory methodology for understanding urban risk and creating a reliable vulnerability index for urban environments. It has also highlighted the importance of examining vulnerability in context with communities at risk.

This briefing paper is one of three short reports from this collaborative research; the two further papers discuss Adaptive Capacity for Urban DRR and Participatory Tools for Urban DRR.