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## SMA Megacities: Deep Dive

*Application of two socio-cultural frameworks to a flood event in Dhaka, Bangladesh*



Understanding the  
Human Side of the  
Environment

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## Chapter One: Introduction and Project Background

The Strategic-Multilayer Assessment (SMA) Megacity Reconnaissance, Surveillance, and Intelligence (M-RSI) project seeks to aid United States Pacific Command (USPACOM) in understanding socio-cultural dynamics within megacities. For this portion of the project, USPACOM socio-cultural analysis (SCA) planning frameworks (“the SCA approach”) were used to guide remote data collection for a proto-type assessment of the risk of humanitarian crisis in Dhaka, Bangladesh. The SCA approach consists of five distinct, yet related frameworks<sup>1</sup> that are designed to provide planners with a quick triage tool to assess risk, as well as provide a guide for analysts conducting longer-term assessments. The five frameworks are structured to reflect USPACOM’s mission objectives and planning process. Given this was a proof of concept effort, analysts were asked to apply two of the five SCA frameworks—the SCA Humanitarian Crisis (HC) Framework and the Intra-state Violence (IV) Framework—to Dhaka, Bangladesh.

In addition to identifying the key risk factors for humanitarian crisis in Dhaka, this study considered the following question regarding the connection between a humanitarian crisis and the risk of intrastate violence/VEO activity in Dhaka:

1. Could government/NGO failures to provide immediate relief and rescue in the event of a humanitarian crisis in Dhaka enhance support for VEO-affiliated groups in the city?

The effort represents an initial attempt to expand the use of the SCA frameworks by linking risks in one framework to risks in another as well as determining relationships between, and joint impacts of, framework elements.

### Approach

During non-crisis (Phase 0) periods, the SCA Humanitarian Crisis framework described below can be used to help analysts and planners track the general nature of the risk of humanitarian crisis. As shown in Figure 1, humanitarian crises can be triggered by one of a number of factors—some environmental (floods) and some socio-political (conflict). All create a unique set of risks for those affected and those seeking to respond. The level and type of risk of humanitarian crisis is determined by the level of services (law enforcement, health and medical, and utilities) the government provides, the readiness and response capabilities, and the recovery capacity of the affected area.

Utilizing data and information remotely collected—to include quantitative and qualitative data, academic research, news reports, and international and NGO policy documents and reports—analysts were able to conduct a quick triage risk assessment of the area of interest, in this case of Dhaka, Bangladesh. For example, they were able to determine how the quality of roads in Dhaka (route trafficability) affected the risk of humanitarian crisis in the event of a natural hazard such as a flood. Analysts employed a simple five-point qualitative coding scheme ranging from no appreciable risk to severe risk to quickly measure risk factors. Roll-up to higher levels was accomplished by applying a

<sup>1</sup> The five frameworks are: Humanitarian Crisis (HC), Intrastate Violence (IV), Recalcitrant States (RS), Power Rebalancing (PR), and Economic Instability (EI). For more information on the SCA frameworks contact Joseph Lee (GRS) [jtleee@grsco.com](mailto:jtleee@grsco.com).

simple ordinal measure to these assessments. The “no appreciable risk” elements were scored as 1 (color coded green); low risk of failure as 2 (color coded yellow); moderate risk as 3 (color coded orange); severe risk as 4 (color coded red); and elements that had insufficient information to evaluate were scored as 0 (color coded grey).

Analysts began with a triage assessment of the overall humanitarian crisis factors before delving into analysis of risk in the context of severe flooding. The HC Framework contains factors relating to three stages of disaster relief: immediate impact, disaster response and responsibilities, and recovery and reconstruction. It was important to separate these phases/functions as the information on even the same elements (e.g., actors, procedures, and risk conditions) differs for each. Conducting a deep dive on a single factor allowed analysts to tailor the information related to each element in the risk framework to a specific condition and thus produce more tactical and operational analyses. For example, how flooding may impact the risk of humanitarian crisis due to the flood effects on potable water or delivery of medical supplies to areas in need. Upon completing analysis of the risk of flood-driven humanitarian crisis in Dhaka, analysts conducted a preliminary assessment of how such conditions may increase the risk of intrastate violence emerging as the result of such a flood.

| Natural Hazards                |                        |                                   |                                                 |                           | Sources of Human-Behavioral Hazard |                                 |                                       | Services Failures                |                                |                          | Readiness and Response                    |                                      |                                                  | Recovery Services                 |                                                  |                            |                                   |                                               |
|--------------------------------|------------------------|-----------------------------------|-------------------------------------------------|---------------------------|------------------------------------|---------------------------------|---------------------------------------|----------------------------------|--------------------------------|--------------------------|-------------------------------------------|--------------------------------------|--------------------------------------------------|-----------------------------------|--------------------------------------------------|----------------------------|-----------------------------------|-----------------------------------------------|
| Geophysical Events (and Space) | Climatological Hazards | Ecosystem Disruptions             | Contamination and Degradation                   | Human Caused Events       | Standard Conditions                | Law Enforcement/Policing        | Health & Medical Service              | Utilities                        | Preparation and Warning        | Emergency & Response     | Civil/Military Authority                  | Vulnerable Commerce                  | Outside Aid                                      | Financial Assistance              | Insurance/ Re-Insurance                          | Loans/ Micro-Financing     | Debt Forbearance and Cancellation | Relief/Grants/ Social Funds                   |
| Earthquake                     | Flood                  | Epidemics/ Pandemic               | Failures in Environmental & Ecological Security | Industrial Fire Explosion | Infrastructure Failure             | Policing                        | Hospitals and Emergency Rooms         | Shelter Destruction/ Degradation | Planning and Preparedness      | Fire and EMS Services    | Executive Order/ Emergency Administration | Farming, Fishing and Food Production | Health, Nutrition, Water and Sanitation          | Insurance                         | Emergency Shelter, Camp Coordination/ Management | Emergency/ Micro-Financing | Protection                        | Early Recovery, Logistics, Emergency Telecoms |
| Landslide                      | Severe Storm           | Severe Insect Infestation         | Chemical Spill                                  | Conflict                  | Hazardous Working Conditions       | Criminal Justice System         | Availability of Health Care Personnel | Water and Sanitation             | Monitoring and Forecasting     | Civilian Volunteer Corps | Command and Control Infrastructure        | Housing Construction and Maintenance | Emergency Shelter, Camp Coordination/ Management | Loans/ Micro-Financing            | Emergency Shelter, Camp Coordination/ Management | Emergency/ Micro-Financing | Protection                        | Early Recovery, Logistics, Emergency Telecoms |
| Volcanic Activity              | Tsunami/Tidal Surge    | Commodity Destruction / Infection | Nuclear/ Radiological                           | Influx of IDP's/ Refugees | Housing/Density Issues             | Prisons and Jails               | Mortuary Affairs                      | Communications                   | Multi-Hazard Warning Service   | Route Trafficability     | Military Readiness                        | Industry and Commerce                | Protection                                       | Debt Forbearance and Cancellation | Emergency Shelter, Camp Coordination/ Management | Emergency/ Micro-Financing | Protection                        | Early Recovery, Logistics, Emergency Telecoms |
|                                | Drought                | Wildfire                          | Gas Leak                                        |                           |                                    | Facilities/ Property Protection | Medical Supplies                      | Energy and Fuel                  | Dissemination/ Alert Broadcast | Search and Rescue        | Defense Support of Civil Authority        |                                      | Early Recovery, Logistics, Emergency Telecoms    |                                   |                                                  |                            |                                   |                                               |

Figure 1. SCA Framework: Humanitarian Crisis and Disaster Response (see appendix A for a larger version)

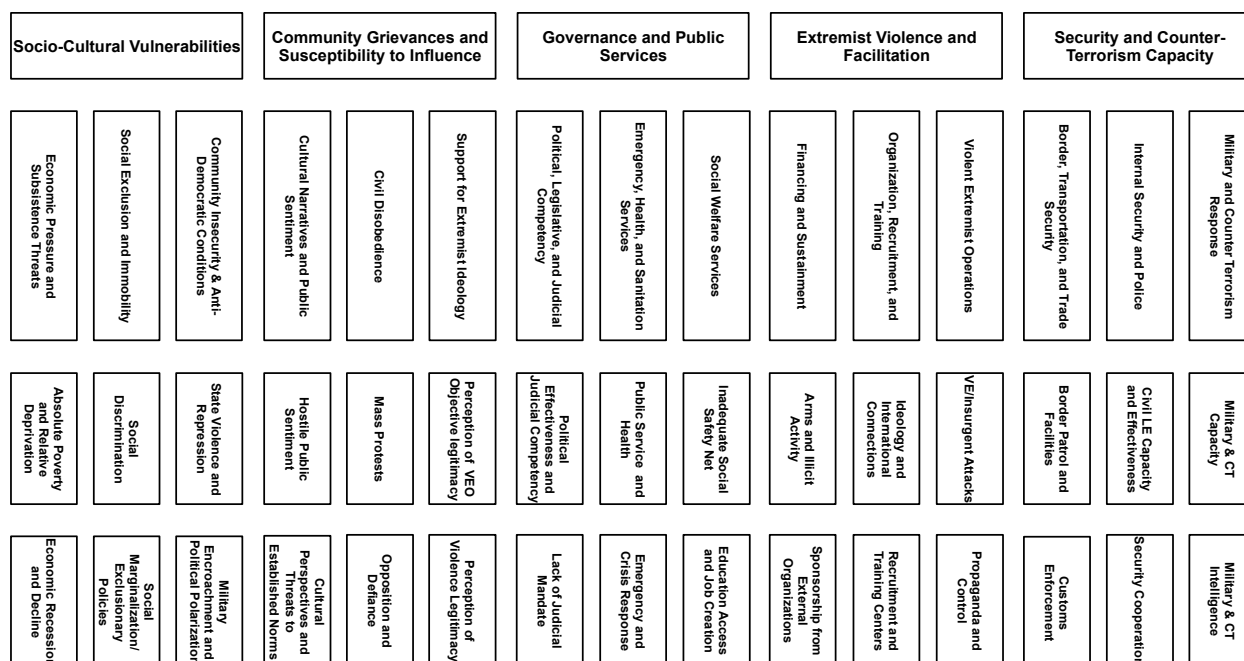


Figure 2. SCA Framework: Intrastate Violence (see appendix B for a larger version)

## Organization of the Report

Chapter Two provides an overview of Dhaka as well as a quick holistic assessment guided by the SCA HC Framework of individual factors relevant to assessing the risks of humanitarian crisis. Chapters Three through Five contain detailed assessment of a subset of framework risk factors of importance in the context of a flood in terms of immediate impact, institutional plans and responsibilities, and recovery. Chapter Six discusses how these risk factors relate to, and impact, the IV Framework as applied to Dhaka. Chapter Seven discusses implications for USPACOM and Chapter Eight provides a short discussion on the importance and unique challenges associated with megacities.<sup>2</sup>

<sup>2</sup> For a more detailed discussion of megacities see: Ehlschlaeger, C. (2014). *Understanding Megacities with the Reconnaissance, Surveillance, and Intelligence Paradigm*. Strategic Multilayer Assessment Program, Office of the Secretary of Defense.

## Chapter Two: Applying the Framework to Dhaka, Bangladesh

A general understanding of the political and physical (both geographic and built) environment in Dhaka is necessary in order to conduct a tailored assessment of the risk of humanitarian crisis, as well as the possible links between a humanitarian crisis and increased violence in the city. In Dhaka, as in any megacity, there are specific conditions that affect the risk level of the factors contained within the Humanitarian Crisis and Intrastate Violence Frameworks. This chapter provides the context necessary to understand the initial risk of a humanitarian crisis and identifies the most vulnerable factors once a crisis occurs.

### Dhaka

Dhaka, the capital of Bangladesh, is one of the fastest growing megacities in the world with a population estimated to exceed 20 million by 2025 (S. Hossain, 2005, 2006, 2008; Kotkin & Cox, 2013). The city's unparalleled rapid growth is primarily due to in-migration<sup>3</sup> (Baker, 2007; S. Hossain, 2006, 2008; Ishtiaque & Ullah, 2013; Siddiqui et al., 2010; Talukder, 2006) with individuals moving into the city from the rural environs. This migration is confounded by repeated political redefinition of urban boundaries,<sup>4</sup> resulting in a lack of clarity in terms of provision of services, which may hinder response during a humanitarian crisis and delay recovery after.

While Bangladesh is a religiously and ethnically homogenous society, social divisions do exist along socio-economic and political party affiliation lines (Sajjad, 2014). A large percentage of residents<sup>5</sup> within Dhaka live in slums surrounding the city proper. These residents operate outside the formal economy (Amin, 1987; Baker, 2007; Cameron, 2010; M. N. Alam, 2012; Biswas, Alam, & Faruqui, 2013), live in temporary housing in floodplains (Aßheuer, Thiele-Eich, & Braun, 2013; Baker, 2007; Begum, 2007), are the victims of wide-spread corruption and inadequate urban planning and development (Ahmmed, 2013; Chowdhury, 2005), and are, for the lack of a better term, under the control of musclemen (*mastaans*). Mastaans control access to social services (e.g., water, latrines, and electricity), including availability and price, as well as other activities including political party membership, when to engage in political protest, and how and when to vote (Baker, 2007; BRAC University, 2012; Cameron, 2010; Datta, 2005; Rashiduzzaman, 1997). This population is most vulnerable to the effects of a natural disaster given its physical location in floodplains, their low socio-economic status, and their already reduced access to goods and services.

<sup>3</sup> According to experts, the in-migration, purported to be roughly 26,000 Bangladeshis per month (Islam, 2007), is primarily driven by a desire for economic improvement (M. Z. Hossain, 2001; S. Hossain, 2008; Ishtiaque & Ullah, 2013) and a need to secure shelter (Herrmann & Svarin, 2009; Ishtiaque & Ullah, 2013).

<sup>4</sup> For this effort, we use the following political boundary for understanding the geographic components of Megacity Dhaka: "Dhaka Statistical Metropolitan Area (DSMA)...comprises Dhaka City Corporation (DCC) and the entire Narayanganj Sadar, Bandar, Keraniganj, Savar, Tongi and Gazipur Sadar Thanas" (Talukder, 2006, p. 161).

<sup>5</sup> There are reports that place this population anywhere between 30% (Uddin & Baten, 2011) to 40% (Kelly, 2012) of the population of Dhaka. However, given the extreme poverty and the rapid in-migration that is occurring, it is likely that these unofficial estimates are inaccurate and that the numbers are most likely higher.

Dhaka city governance underwent a political division in 2011 in which the city was split into parallel administrative entities—Dhaka South City Corporation and Dhaka North City Corporation. The majority political party, the Awami League, who initiated the division, contended that the rapid growth of the city made adequate service provision through one administration impossible. The political division has created widespread confusion with regard to the provision of services and the division of roles and responsibilities between political actors (T. Ahmed & Akhter, 2014; Barta & Al-Mahmood, 2013; Mahmud, 2013a). The significant overlap of functions and responsibilities between the two city corporations is compounded by the presence of national organizations with jurisdiction within the city boundaries (Baker, 2007; BRAC, 2012; Chowdhury, 2005; Siddiqui et al., 2010; Talukder, 2006). Some suggest that the bifurcation of the city has actually degraded what were already inadequate services and exacerbated the chaotic nature of the city’s governance (T. Ahmed & Akhter, 2014; Barta & Al-Mahmood, 2013; Mahmud, 2013a). Despite the effort to improve governance, Dhaka’s rapid growth on a relatively small geographic footprint continues to increase pressure on the city’s already weak political, physical, and economic infrastructure.

### Overall Humanitarian Crisis Risk Assessment for Dhaka

A quick (triage) Humanitarian Crisis risk assessment<sup>6</sup> for Dhaka (see Figure 3) uncovered four hazards at high-risk for generating humanitarian crisis in Dhaka. These are earthquake, flooding, violent political or social conflict, and the weakness of policing (denoted in red in Figure 3). Given the prevalence of flooding events and the potential for increased incidence as the result of climate change, our effort focused on the risks of humanitarian crisis stemming from a flood. Our approach identified specific risk factors to focus on in the event of a flood in Dhaka in order to optimize preparedness and responsiveness.

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<sup>6</sup> A detailed risk assessment of the full framework was beyond the scope of the effort.

Red = severe risk  
Orange = significant  
Yellow = moderate  
Green = sufficient/low  
White = not considered  
Grey = no information

## Dhaka Hazard: Flooding

sedimentation in Bangladesh; 4) population growth coupled with unregulated construction has destroyed natural flood drainage areas in the southwest and east of the city and replaced them with real estate development on landfill; and 5) questionable construction and maintenance of flood embankments, canals, and drainage pipes, which is a critical shortfall in Dhaka (Brouwer, Akter, Brander, & Haque, 2007; A. N. Haque, Grafakos, & Huijsman, 2010; K. N. H. Haque, 2012; Khan et al., 2012). At one time, Dhaka had a system of 54 intersecting canals (*khans*) that served as drainage channels from the city into the rivers (see Figures 4 and 5). A 2011 report found that unregulated or corrupt urban

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planning allowed for 43 of these canals to be filled and built upon and considered “beyond reclamation.” The remaining 13 were filled with refuse and sediment but might be reclaimed (Ahsan 2011). Although the map of Dhaka’s drainage and flood protection infrastructure (Figure 5) may look sufficient at first glance, there are significant deficiencies in the system. First, only a portion of the city is protected from riverine flooding by anything other than crude sandbag embankments. Ironically, in many of those areas protected by the embankment (shown in red), flood water drainage (e.g., from rainfall) can be impeded by that very embankment and lead to water-logging, which then increases the likelihood of further flooding.

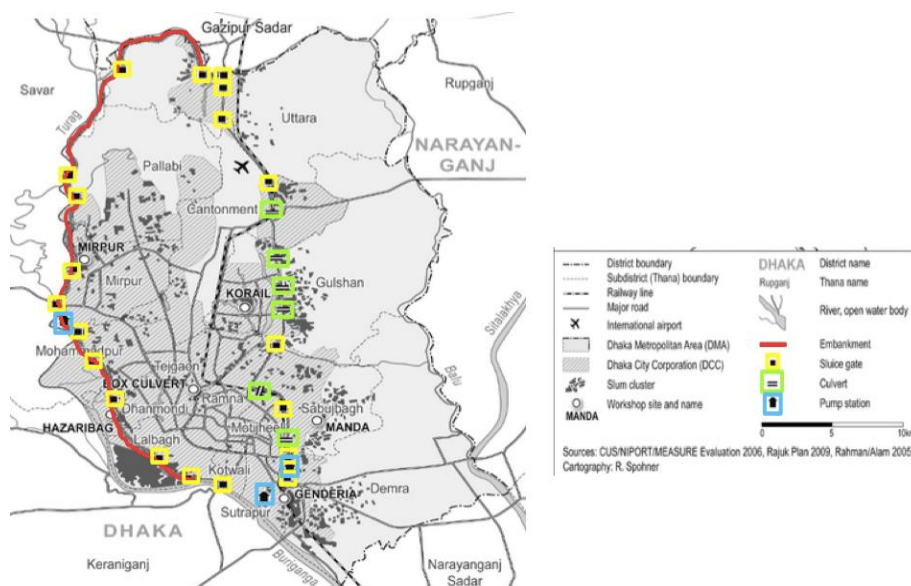


Figure 5. Dhaka Drainage and Embankment Infrastructure

### Vulnerable Populations

Residents of Dhaka most directly affected by floods are the lower income and slum dwellers. Historically, government flood relief efforts have been inadequate to meet the basic needs of Dhaka’s flood victims (S. M. Ahmed & Ahmed, 1999). However, the norm of mutual assistance and community self-reliance has proved to be a strong source of resilience among those impacted by Dhaka’s annual floods (Aßheuer et al., 2013). While community self-reliance can improve a family’s ability to survive a flood in the short-term, it can also compromise their own and their community’s longer-term ability to rise out of poverty. Recovering from a flood depletes a family’s financial assets, which can prevent them from saving for and investing in businesses and education for their children and family (Aßheuer et al., 2013; Bangladesh Disaster & Emergency Response, 2004). While there is evidence that the government has improved its disaster planning, response, and coordination capabilities significantly in the last 20 years, its efforts do not penetrate deeply into the flooded slum areas of Dhaka (S. M. Ahmed & Ahmed, 1999; Bangladesh Disaster & Emergency Response, 2004; Kanti Paul, 2002). Floods continue to cause severe damage to health, safety, security, shelter, income, food security, sanitation, and the general well-being of Dhaka’s residents.

In addition to loss of resources and basic necessities, Dhaka’s flood victims face a variety of threats to their personal security, ranging from theft to sexual harassment (Faiz Rashid, 2000). It has been reported that many flood victims resist going to flood shelters for as long as possible due to fear of leaving their homes unprotected and becoming easy targets for theft (Aßheuer et al., 2013). It may be telling that

very few reports describing disaster relief mention civilian law enforcement. Instead, and especially in slum areas, flood victims appear to rely on one another for security and support (Faiz Rashid, 2000). Families and neighbors move to shelters together to bolster their own personal security.

### Dhaka Hazard: Conflict

Bangladesh, formerly East Pakistan, was born out of conflict with the western part of Pakistan. Although 55% of Pakistan's population lived in East Pakistan, it received a much smaller share of government revenue than the West. The perception in East Pakistan that the central government was intentionally discriminating against it drove a wedge between the two sides of the country (Akam, 2002). Animosity toward the central government came to a head following its inadequate response to the November 1970 Bhola cyclone that devastated major portions of East Pakistan and killed nearly a half a million people. Under the leadership of the Awami League, East Pakistan began to push for greater autonomy and eventually separation from the West. On 25 March 1971, the Pakistani government responded with "Operation Searchlight"—a large-scale military attack at the University of Dhaka that killed 172 East Pakistani intellectuals (The Secretariat of the International Commission of Jurists Geneva, 1972).<sup>7</sup> This attack signaled the start of a full-scale civil war between East and West Pakistan. Once India entered the war in December 1971 on the side of East Pakistan, Pakistani forces surrendered (Ali, 2010; Husain, 2010).

After achieving Bangladeshi independence, competition for political power remained a key source of violent conflict in Dhaka (Datta, 2005). Since 1991, the country's two main political parties, the Awami League (AL) and the Bangladesh Nationalist Party (BNP), have alternated leadership of the country. Both parties are "personality-dominated, family-oriented and feud-ridden" (Datta, 2005) and share a history of extreme animosity. While in power, both parties have used violence and extralegal measures to intimidate and silence the opposition (Datta, 2005). When in opposition, both have organized violent strikes (*hartals*) as means of achieving their own political goals or stymying those of the other side (Datta, 2005; Harrison, 2013; Rashiduzzaman, 1997).

University campuses have become important organizational centers for political parties, and violent clashes between their student groups have driven a number of universities to ban student politics (Datta, 2005; Rashiduzzaman, 1997). In particular, the Jamaat-e-Islami (JI) student wing, Bangladesh Islami Chhatra Shibir, is "notorious" for the use of violence, torture, and killing (Sajjad, 2014). Both the Awami League and the BNP also routinely recruit and pay "mercenary" demonstrators and armed activists to conduct "processions, rallies, roadblocks, blockades, arson, violence and other forms of civil disobedience" and enforce compliance with hartals (Baker, 2007; BRAC University, 2012; Rashiduzzaman, 1997). The political parties use the influence and enforcement power of local mastaans to mobilize residents for political rallies and protests, particularly during election campaigns. Mastaans typically are not politically motivated but lend support to the highest bidder; they commonly switch sides to remain in the favor of whichever major party is in power (Rashiduzzaman, 1997).

<sup>7</sup> Commander of the Operation Pakistan Major General Rao Forman Ali explained the attack on the university: "if we have to leave the country, let's make it as difficult as possible for the Bengalis" to rebuild without the intellectual guidance necessary for nation building (Choudhury, 1972, pp. 193–194).

In addition to politically motivated violence, crime in Dhaka is a growing concern for residents. While less than 10% of the country's population resides in Dhaka, 61% of the country's crime occurs there. Inadequate and corrupt law enforcement agencies have been unable or unwilling to curb the increase in crime, which runs the gamut from minor theft to robbery, intimidation and extortion, smuggling, human trafficking, violence against women and children, and murder (Baker, 2007; S. Hossain, 2006; Siddiqui et al., 2010; Talukder, 2006; United States Department of State, 2012; Wickberg, 2013). Research has also posited that a lack of law enforcement resources, staff, training, and authorities explains the government's inability to curtail criminal activities and maintain civil order (Baker, 2007; S. Hossain, 2006; Talukder, 2006; United States Department of State, 2012; Wickberg, 2013). Given the alleged government corruption, together with deep popular distrust of civil institutions, it is not uncommon for residents to bypass the established (albeit ineffective) legal system and seek justice outside of the legal system, primarily through informal settlements by local leaders or a community court (Baker, 2007).

## Limitations

The remainder of this report provides a detailed assessment of the risk factors for humanitarian crisis and intrastate violence emerging from a Dhaka flood. There are however a few caveats that should be considered by readers. First, while there are some advantages, including cost and time savings, associated with conducting remote assessment of risk in a region, state, or city, there are also some limitations that must be recognized. Using only remotely sensed and remotely collected data largely limits researchers to information that has been previously published or broadcast, and to interactions with subject-matter experts available to U.S. audiences. This can create content validity questions and concerns—in other words, are analysts able to obtain adequate information to reach a valid conclusion that aligns with “ground-truth.” For example, with Dhaka the majority of research available on living conditions and quality of life was focused on the slum dwellers; information on the middle class in particular was sparse.

Second, the two SCA frameworks used for this project (i.e., HC and IV) are still in development and were used in draft form to test the approach. Readers should be cautioned that the frameworks described in this report might not ultimately align well with the final USPACOM SCA frameworks. The method of applying the frameworks, however, should remain consistent: beginning with an overall assessment of risk factors considered independent of operational context, followed by a tailored drill-down depending upon the risk context of interest.

Third, finding scholarship and data sources that separated city from national-level data and information was quite difficult in some areas; an issue we suspect may be the same for cities or regions in other developing areas as well. Finally, conditions in Dhaka, as in other megacities in the developing world, are changing rapidly. One of the prime sources of information related to flood impact and response is historical record. However, it is difficult to assess how important conditions like population, water management improvements or further degradation, and political rivalries might impact the humanitarian consequences of future flood events.

## Chapter Three: Immediate Flood Impact & Risk

The following three chapters contain detailed assessments of the subset of HC Framework risk factors identified as relevant in the context of a flood event. Assessment is divided into three sections: immediate impact (Chapter 3), institutional plans (Chapter 4), and responsibilities and recovery (Chapter 5). This chapter analyzes information related to the impact of previous flood events, together with current conditions in the city to identify the factors within the larger HC Risk Framework that are most likely to be immediately and adversely affected by a flood in Dhaka.

Figure 6 takes the factors from the HC Framework identified as risk prone in the event of a flood in Dhaka and maps the relationships between each factor. Analysts employed a simple five-point qualitative coding scheme to quickly measure the level of risk (from non-appreciable risk to severe risk) associated with each factor. The “no appreciable risk” elements were scored as 1 (color coded green); low risk of failure as 2 (color coded yellow); moderate risk as 3 (color coded orange); high-risk elements were given a score of 4 (color coded red); and elements that had insufficient information to evaluate were scored as 0 (color coded grey).

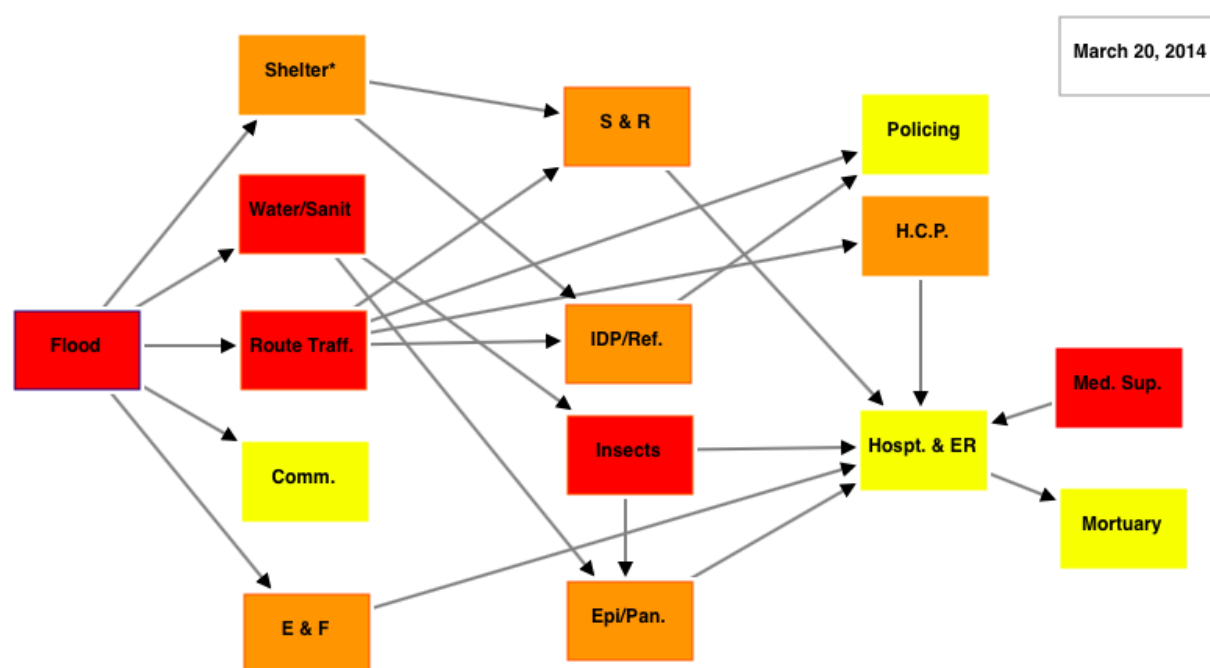


Figure 4. Flood Risk Assessment - Immediate Impact

## Overall Assessment of Immediate Impact and Risk

Everyday problems in Dhaka become high-risk issues in the event of a flood. The majority of Dhaka residents suffer from safe water scarcity on a daily basis, and flooding worsens this situation. The lack of potable water, combined with physical immersion in contaminated water, exposure to stagnant water, and the inability to effectively heat and sanitize water for cooking purposes significantly increases health risk. Route trafficability, severe insect infestation, and a lack of medical supplies are also aggravated by increased water levels. Traffic is a consistent problem in Dhaka, and is made worse in the event of high

floodwaters, leaving many unable to traverse roadways to obtain food, medical supplies, or reach employment. Standing water during floods also increases the insect infestation Dhaka residents face on a daily basis, resulting in increased public health problems (e.g., dengue fever). Finally, the historical challenges associated with provision of medical supplies in Dhaka City also become a high-risk concern as medications to treat water-borne illnesses and dengue fever (caused by the increase in mosquito infestation) become unavailable due to lack of supplies, transportation problems, and increased need.

The risk to shelter is also significant in the event of a flood, but the relative ease of repair to housing structures as well as the small percentage of the population affected by routine flooding places shelter destruction in the moderate risk category. Also in the moderate risk category is the provision of energy and fuel. Even under normal circumstances energy and fuel are not plentiful commodities in Dhaka. During a flood, these services “essentially grind to a halt” (M. Alam & Rabbani, 2007) until the water recedes; however, the impact on the population is moderate due to coping mechanisms and reduced expectations. Search and rescue is also ranked as a moderate risk as impassable roads and a lack of communication infrastructure affect the ability to conduct search and rescue operations. Route trafficability also results in the availability of health care personnel being rated as a moderate risk as personnel have difficulty reaching hospitals and emergency care centers. Epidemics/pandemics are also rated a moderate risk. Standing and/or contaminated water increases the risk of epidemics/pandemics. The longer the water stands, the greater the risk of epidemics/pandemics in the form of water-borne illnesses or diseases carried by insects. Finally, the almost guaranteed displacement of a certain percentage of people living within the city, as well as individuals converging on the city due to flooding in outlying areas, results in internally displaced persons (IDPs)/Refugees ranked as a moderate risk.

Factors assessed as low risk of spurring a humanitarian crisis in the event of a Dhaka flood include communications, policing, hospitals and emergency rooms, and mortuary services. Due to Bangladesh’s implementation of flood warning systems (see Figure 7) and the relative ease of passing information via both high and low-tech methods, communications has been determined to be of low risk in the event of a flood in Dhaka. While insufficient information was found on policing in the event of a

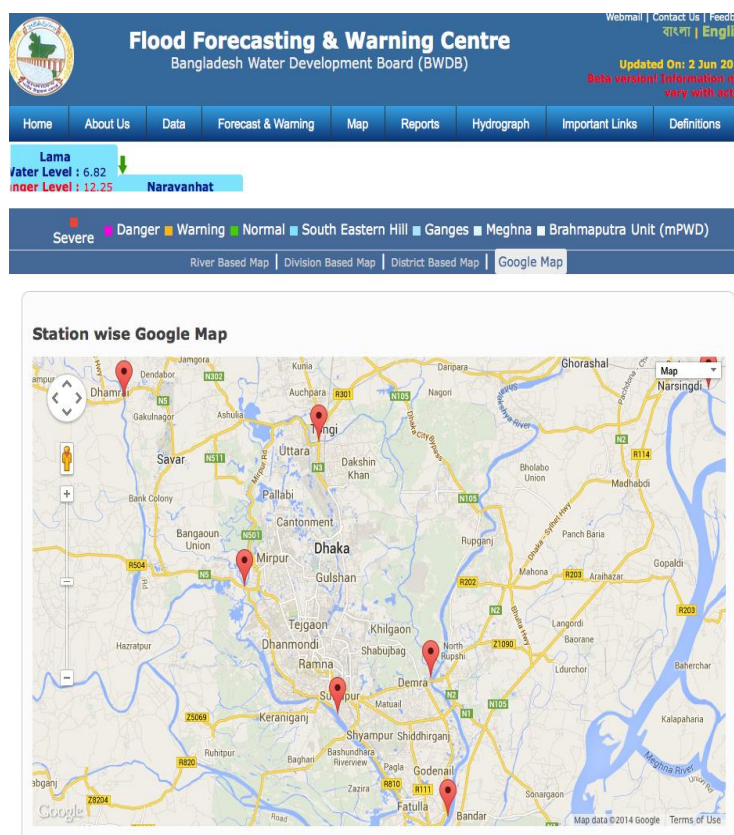


Figure 5. Bangladesh Flood Forecasting and Warning Center  
<http://www.ffwc.gov.bd>

flood in Dhaka, drawing from research on policing capabilities within Dhaka, it is likely that a flood would merely magnify the insufficiency of the law enforcement agencies within Dhaka, rather than decrease policing capabilities. Thus, the ability of law enforcement agencies to maintain civil order within the city boundaries is determined to be of low risk. Hospitals and emergency rooms as well as mortuary affairs are also rated as low risk. In the immediate aftermath of a flood it is likely that the need for hospitals and emergency rooms as well as mortuary services will be low. However, as time elapses the need will increase.

## Detailed Assessment of Risk Factors

The following section provides the detailed assessment of the individual factors associated with the immediate risk of humanitarian crisis in the event of the flood in Dhaka, Bangladesh (see Figure 6). The factors are grouped according to risk: high, moderate, low, no appreciable risk, or insufficient information to evaluate.

### Key Risk Factors (Red)

#### Water and Sanitation (Water/Sanit)

According to reports, the current provision of water and sanitation is unable to meet the needs of Dhaka's growing population (Cameron, 2010; Kelly, 2012; Talukder, 2006; The World Bank, 2007). Over half of the population suffers from safe water scarcity issues (Uddin & Baten, 2011). Additional reports highlight the large discrepancy between provision of water and sanitation among various socio-economic sectors of society with only 9% of lower socio-economic households, those typically impacted most during a flood, having access to a sewage line and only 27% having access to a piped water supply.

Historically, there is a high risk associated with the provision of water and sanitation in the event of a flood. One of the most devastating floods in Dhaka's history resulted in an estimated 127 million Taka (approximately \$1.6 million USD) to repair damage to the water supply system (Huq & Alam, 2003). Additionally, in 2004 it was found that the water supplied by the central water system had been contaminated by sewage, resulting in high levels of coliform bacteria, which resulted in water borne diseases (Haque, Grafakos, & Huijsman, 2010, p. 7). Water and sanitation are essential for maintaining and sustaining health and flooding contaminates an already insufficient system creating additional problems for the already vulnerable population.

#### Route Trafficability (Route Traff)

Even without water hindering movement along the roads, traffic congestion is highlighted as one of the most significant problems facing Dhaka today (Baker, 2007; Rahman, M. Shafiq-Ur & Nahrin, Kasphia, 2012; Siddiqui et al., 2010). Residents typically complain of inadequate public transportation, poor traffic patterns, and the high number of vehicles on the roads. Thus, given the inadequate infrastructure and low-lying topography, Dhaka has historically experienced disruption in traffic and transportation during periods of rainfall and water logging (L. C. S. A. Ahmed & Ahmed, 2010; M. Alam & Rabbani, 2007; Huq & Alam, 2003; Tawhid, 2004). There are reports that rainfall as little as 25mm (less than 1 inch) can impede normal traffic movement within the city (Tawhid, 2004). Plans are in place by the government to address route trafficability in the event of water events (elevating major roads), but

efforts have been slow and will not address all major, much less minor, routes within the city. While residents have historically developed coping mechanisms (mental acceptance, boats, or wading through) in the short-term, for extended cases of flooding, route trafficability will likely increase the risk of humanitarian crisis as people are unable to move around the city, go to work, and obtain food and medical services.

### Severe Insect Infestation (Insects)

Mosquitoes of the culicidae family are common parasitic vectors of diseases such as malaria, filariasis, dengue fever, yellow fever and most of the arthropod borne viral types of encephalitis. Mosquitos are a very large problem in Dhaka due to a lack of natural or man-made drainage capabilities, poor sanitation, lack of government capacity, and natural presence of stagnant bodies of water. Karim, Md. Rezaul, Md. Muzahidul Islam, Md. Sheik Farid, Karim et al (2012) find a significant relationship between dengue fever outbreak in Dhaka and the monsoon season with 2-8 times the number of dengue cases than in the post-monsoon period. Thus, this factor is rated to be of high-risk due to the increase in medical issues associated with an increase in insect infestation and the population's frustration with the rampant mosquito problem (Ameen, Hossain, & Chowdhury, 1999; Lawson, 2003; Mahmud, 2013b).

### Medical Supplies (Med. Sup.)

Access to medical supplies for Dhaka's poorest is challenging even during the best of times, but during a flood, access to essential medical supplies is highly irregular or nonexistent for many Dhaka residents (S. M. Ahmed & Ahmed, 1999; Faiz Rashid, 2000). Information about how the residents of Dhaka access needed medical supplies in the aftermath of a flood is largely anecdotal with few comprehensive studies of the problem. Challenges to those most in need of medical supplies include: a lack of money to spend on treatments; not knowing where to go or not being able to travel due to flooding; health care providers unable or unwilling to bring services to those most affected due to flooding; medical supplies being either the wrong kind, wrong dose or a poor quality, in short supply, or in the wrong form (tablets given to children too young to take them or to people too sick to chew or swallow them); and flood shelters typically not stocking any, or insufficient, medical supplies (S. M. Ahmed & Ahmed, 1999; Faiz Rashid, 2000).

### Moderate Risk Factors (Orange)

#### Shelter Destruction/Degradation (Shelter)

In the event of substantial water accumulation, the substructure of the *pucca* (brick) houses in higher socio-economic sections of the city and the *katcha* (unprocessed raw materials, such as mud) and *jupri* (thatched) houses in the lower socio-economic areas, primarily in the low-lying areas of Dhaka and East Dhaka, are the most prone to suffering significant damage within the city limits (M. Alam & Rabbani, 2007; Tawhid, 2004). Historically, these areas have suffered significant damages ranging from roughly Tk 4.4billion in the 1988 flood to Tk 2.3billion<sup>8</sup> in the 1998 flood, impacting over 400,000 and 200,000 structures respectfully (M. Alam & Rabbani, 2007). While there is risk to shelter for millions of residents within Dhaka, this factor has been coded as moderate risk due to the remarkable resilience

<sup>8</sup>\$90.4million USD in 1988 dollars and \$47.3million USD in 1998 dollars.

demonstrated by those historically impacted (Aßheuer et al., 2013) and the relative ease of repairing flood damage to the simple housing structures. According to remotely collected research, “Single events like a disastrous flood can be handled because slum dwellers have redundant and flexible access to various other people as well as to the provision of loans and material and non-material support” (Aßheuer et al., 2013, p. 33).

It should be noted that assessing risk to shelter in the event of a flood is an inexact science based upon incomplete information and data. While remotely sensed imagery can provide an overview of housing structures, the extent of waterlogging damage to substructures and the number of individuals residing within a structure is difficult to ascertain. Additionally, historical accounts of damage to housing are highly dependent upon the methodology used to assess damage (e.g., visual inspection, satellite observation, or word of mouth) and the availability and accuracy of reports available remotely.

### Energy and Fuel (E&F)

In general, provision of energy and fuel to the citizens of Dhaka is inadequate and is generally perceived by the citizens to be of low quality (World Bank, 2007). It is reported that “overall power demand is now about 7,500 mw while its supply is around 6,300 mw, leaving a shortage of 1,200 mw per day” (Metropolitan Chamber of Commerce and Industry, Dhaka, 2013, p. 2). Additionally, there is an ongoing gas crisis with supply often too low to facilitate even the most basic of tasks such as cooking (Energy Bangla, 2013). It is difficult to ascertain the impact of a flood on the provision of energy and fuel to the major industry (garment) in Dhaka, although one can surmise that the impact would be significant, particularly with regard to access for the workers and the ability to provide energy to the factories.

### Search and Rescue (S&R)

Historically, search and rescue operations have been severely hindered by access and communications issues (Bangladesh Disaster & Emergency Response, 2004). Detailed information on the number of residents who required search and rescue capabilities in previous floods was difficult to obtain remotely. However, given current and anticipated communication and route trafficability issues search and rescue has been evaluated at being a moderate risk for Dhaka.

### Influx of IDPs/Refugees (IDP/Ref.)

Individuals residing in temporary or semi-temporary housing structures within Dhaka are most likely to be impacted by a flood, as these structures are primarily located in low-lying areas and constructed of highly permeable products (e.g., mud or straw). However, due to severe water logging issues, more permanent structures (made with brick) are likely to experience a greater long-term impact, as brick and mortar erode with prolonged water exposure. Historically, floods have forced millions of Dhaka residents to seek out higher ground until the flood waters recede, which in some instances, has taken upwards of two months (Pacione, 2009). While a flood within the city limits would temporarily, or in some cases permanently displace city residents, Dhaka also serves as a destination for individuals seeking refuge from the flooded hinterlands. Thus, it is important to not only look at internal displacement, but to also assess whether or not flooding is ongoing in the rural areas, forcing individuals to flee into the city. Given the expected displacement of individuals in the event of a flood, there is a moderate risk of humanitarian crisis associated with this factor.

### Epidemics/Pandemics (Epi/Pan)

Dhaka residents are at increased risk of disease due to exposure to contaminated water in the event of a flood,. Exposure will occur primarily from physical immersion in the contaminated water, exposure to stagnant water, or from a lack of potable water. While citizens residing in the flood-prone areas are most likely to be negatively affected by problems associated with lack of potable water, such as gastrointestinal disease, the entire city is likely to be impacted by the rise of disease-carrying mosquitoes. With regard to immediate impact following a flood disaster the risk associated with epidemic/pandemic is moderate. However, as the length of time the water remains in the city increases so does the risk associated with this factor.

### Availability of Health Care Personnel (H.C.P.)

In general, Dhaka lacks adequate health care professionals to treat the millions of residents on a day-to-day basis (Kelly, 2012); flooding will only exacerbate this situation. However, the availability of healthcare workers during a flood may not be an overwhelming problem due to several reasons. First, although it is difficult to determine their total staff sizes, the health system in Dhaka is supplemented by private and NGO-run hospitals and clinics that account for a significant portion of healthcare provided in the city. Second, there appears to be a significant network and supporting social norm of volunteerism in the city. In the past, Dhaka's hospitals have been relatively adept at using volunteer workers, firefighters, national health officials, and other assistance when capacity surges were necessary. Nevertheless, it should be considered that the size of the population suggests that in a severe and longer duration event even surges of volunteer workers may be insufficient. Thus, this factor is determined to be of moderate risk.

### Low Risk Factors (Yellow)

#### Communications (Comm.)

Historically during a flood, communication networks (such as radio, Internet, TV) are poor and inadequate in Dhaka, with some residents remaining cut off from communications for up to 2 weeks (Huq & Alam, 2003). However, over the past few years, the government of Bangladesh has made considerable strides in improving access to information, including the creation of a dedicated Flood Forecasting and Warning Centre (3CD, 2006) and associated website. Additionally, the government is exploring mass-communication technology, including an established information hotline and text-push technology (Annual Report FFWC, BWDB, 2013). In regards to low-tech communication, it appears that social networks within the affected areas are also a functional means of disseminating information and therefore mitigating this issue(Faiz Rashid, 2000; S. Hossain, 2008).

#### Policing (Policing)

Crime syndicates and gangs have infiltrated the city and areas once considered safe are no longer so (M Rahman, 2010). While crime and violence are higher in low-income residential areas and congested commercial areas, there are no areas safe from criminal elements. There are reports that individuals in the flood prone areas are unwilling to leave their homes and seek out shelter due to fear of theft and loss of their valuables because of a lack of a police presence (Aßheuer et al., 2013). However, this does not raise the risk of humanitarian crisis, as police do not routinely patrol the slum settlements (Baker,

2007). Additionally, in the immediate aftermath of a flood, the role of the police is limited due to access and the nature of the event. It is important to note that this factor may not remain a low risk but instead increase to moderate if floodwaters persist for extended periods of time and the situation deteriorates.

#### Hospitals and Emergency Rooms (Hospt. & ER)

While the lack of potable water, exposure to bacteria-rich water, and high numbers of mosquitos suggest that residents of Dhaka will likely need medical care in the days and weeks following a flood, this factor is determined to be of low risk immediately following a flood. This is primarily due to hospitals unlikely being directly impacted by floodwaters, and given disease requires time to manifest, they are able to maintain routine provision of service in the immediate aftermath of a flood. This risk assessment could change if reduced trafficability hampers access to medical clinics and hospitals. Even if medical facilities are accessible, power outages due to infrastructure damage may limit the services personnel are able to provide and the amount of medical supplies available (e.g., some medical supplies require refrigeration). Analysts were unable to fully ascertain the specific impact of a flood on the ability of residents to seek out medical treatment or the ability of the hospitals and medical providers to dispense medical treatment.

#### Mortuary Affairs (Mortuary)

Information about how bodies are recovered and interred in Bangladesh is sparse. However, mortuary services do exist in Dhaka (Gupta, 2009). It is unclear whether these services are public or private or whether Dhaka's poorest citizens (who are most affected by floods) can access these services. While this factor is coded as low risk in the immediate aftermath of a flood, the risk coding is likely to change and increase over time or based on secondary effects associated with a flood (such as disease).

## Chapter Four: Disaster Response and Responsibilities

### Overall Assessment

In order to fully understand and assess risk of a humanitarian crisis in the event of a flood, analysts needed to understand not only the immediate factors associated with risk, but also understand which government, quasi-government or other entity is responsible for implementing or overseeing response activities. In Dhaka, remotely collected information uncovers what appears to be a highly complex and overlapping network of immediate disaster response responsibilities, actors, and infrastructure. An argument can be made that Dhaka's greatest risk for humanitarian crisis actually lies in its weak and convoluted institutional and governing capacities. Not only has insufficient institutional capacity prohibited Dhaka from benefiting from international aid intended to reduce its vulnerability to flooding effects, but institutional weakness and ambiguity, low capacity, and corruption appear to combine to make the situation worse as Dhaka continues to grow. Figure 8 categorizes the type of information available on flood response associated with each factor in the Immediate Impact and Response model. Factors where lines of responsibility and authority are clear are denoted with a green border.

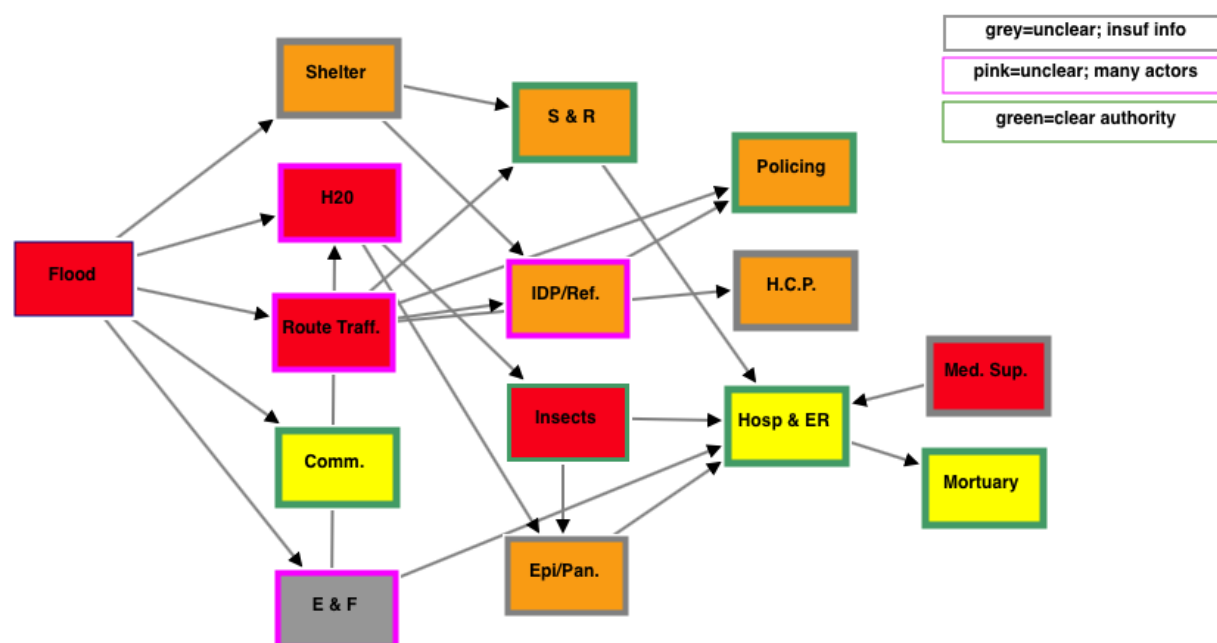


Figure 6. Disaster Response Responsibilities

The Bangladesh National Disaster Management Plan and the Standing Orders on Disaster (SOD) lay out government-wide responsibilities at the national level down to the *pourashava*, or city levels, during four periods from pre-disaster to early recovery.<sup>9</sup> However, a close examination of the SOD

<sup>9</sup> These are "normal times" pre-disaster, alert and warning stage, disaster stage and post-disaster "early recovery and rehabilitation" (Ministry of Food and Disaster Management, 2010).

demonstrates that a lack of clarity remains concerning responsibilities for three of the four most critical elements of immediate flood response: water, route trafficability, and energy & fuel. This is either due to insufficient information (grey borders) or the many agencies and levels of government given responsibility that make it impossible to tell which one would in fact act and in what capacity (pink and grey borders). For example, the SOD assigns responsibility for providing safe water to the local and national offices of the Health Ministry, the national Bangladesh Water Development Board, the local Dhaka Water Supply and Sewage Authority (DWASA), NGOs and the NGO Coordination Ministry, and the Dhaka City Corporation Disaster Management Committee. Based upon information gathered on provision of social services during non-crisis times, and during previous flooding, coordination of efforts including the numerous volunteer and NGO actors in the city is a serious concern (Yahya, Shams, Islam, & Mahmud, 2010) and one without a ready or simple solution. Furthermore, the SOD was drafted



Figure 7. Division of Dhaka into Two Administrative Entities

before the separation of the Dhaka government into North (DNCC) and South City (DSCC) Corporations (see Figure 9).<sup>10</sup> In addition, since the drafting of the SOD, Dhaka has not experienced a significant flood. Thus, it is difficult to judge what we could expect to occur in practice in the event of a natural disaster. So while there is a seemingly detailed plan, questions remain as to the degree to which the SOD and National Disaster Plans are simply “paper plans” and how, or even whether, they would work as intended.

### Institutional Setting and Key Areas of Risk

The period after the 1988 and 1998 floods in Bangladesh saw a shift in policy thinking about floods, moving from primarily flood relief to flood management, which included relief as well as preparedness and impact mitigation programs in pre-disaster periods (Beck, 2005). This change is evident in both the existence and substance of the National Disaster Management Plan and SOD. The Ministry of Food and Disaster Management (MoFDM) is the national center point of disaster response in Bangladesh and is responsible for reviewing and refining the National Disaster Plan and the SOD. It appears that the Minister, together with other national authorities, is responsible for declaring that an event constitutes a “disaster”—the key to triggering the release of supplies, funds, and other SOD response responsibilities.

While there is evidence that disaster planning, response, and coordination capabilities have improved significantly in the last 20 years, the lines of responsibility and authority within Dhaka continue to be

<sup>10</sup> Image from: <http://pakistanpolicygroup.com/wp-content/uploads/2012/03/Dhaka-Divided.jpg>

considered as chaotic and murky at best (Baker, 2007; S. Hossain, 2006; Talukder, 2006). According to experts, there are over 50 national, city, and non-governmental institutions involved in the management of Dhaka, resulting in significant overlapping of functions, and poor coordination (Baker, 2007; BRAC University, 2012; Talukder, 2006). Furthermore, the city government lacks the budgetary resources necessary to ensure adequate, proficient, and corruption-free delivery of essential services (Chowdhury, 2005; S. Hossain, 2006; Wickberg, 2013). There is also a basic governance issue in areas hardest hit by flooding. Slum areas are not always “claimed” by the city, and efforts to provide routine basic services, and flood-assistance, do not appear to penetrate those flood-prone areas (S. M. Ahmed & Ahmed, 1999; Bangladesh Disaster & Emergency Response, 2004; Kanti Paul, 2002).

The 2010-15 National Disaster Plan calls for pre-disaster formation and meeting of Management Committees at the district, *upazila*, union, city corporation, and *pourashava* levels. These are to work in concert with national- and district-level disaster management committees on disaster risk reduction and, once a disaster has been declared, for emergency response management. The *Pourashava* Chairman, or in a city, the mayor, is the head of the City Management Committee that consists of all city commissioners, representatives from all the government departments in the city, NGOs, and community-based organizations (CBOs). During the 2007 floods, the Dhaka City Corporation (DCC) took on the central coordinating role, establishing a flood control room, and forming various relief management teams (L. C. S. A. Ahmed & Ahmed, 2010)<sup>11</sup>. Although the City Management Committee is intended to meet monthly during non-disaster periods, it is unclear how often the Dhaka Committee actually meets.<sup>12</sup> Unfortunately, since the updated disaster plan and SOD were released, the DCC has been split into two entities, so while there are indications that a single Dhaka City Disaster Management Committee exists rather than separate North and South Disaster Committees the lines of disaster response authority may be blurred during the next disaster as existing response plans have yet to be amended or tested under the new institutional arrangement.

## Detailed Assessment of Risk Factors

### Unclear Responsibility (Pink)

The factors in Figure 8 outlined in pink are those in which responsibilities or intent to respond in the event of a severe flood are unclear because there are too many actors with partial responsibility in this area without sufficient indication of a coordinating mechanism.

### Water and Sanitation (Water/Sanit)

There is a lack of clarity regarding primary responsibility for flood water drainage, provision of potable water or water decontamination as well as which group would conduct and pay for any water infrastructure repairs required as a result of a flood. Outside observers and the public in Dhaka have long criticized city authorities for the lack of coordination among the various entities (e.g., the National

<sup>11</sup> Pursuant to the National Disaster Management Plan, funding for the City Disaster Committee is to consist of (unspecified) contributions from the national and local governments as well as “local donation”. No further information on the amounts or sources of funding could be discovered.

<sup>12</sup> Nevertheless, it does seem to have been established and somewhat active: December 2013 news reports indicate the Chair had met with NGO representatives.

Bangladesh Water Development Board (BWDB); the local Dhaka Water Supply and Sewage Authority (DWASA) Dhaka City Corporations; and the Capital Development Authority (RAJUK) that control elements of flood water drainage in Dhaka (Apirumanekul & Mark, 2001). In addition, contamination of Dhaka's already inadequate water supply by polluted floodwaters can pose a major problem during and after a severe flood event (M. Alam & Rabbani, 2007; Baker, 2007; Uddin & Baten, 2011). According to the 2010 SOD, both the Health Ministry and the Dhaka City Corporation Disaster Management Committee are charged with providing water and sanitation services in the event of a natural disaster including testing drinking water, providing safe drinking water, dispensing purification tablets and protecting water sources from contamination. The NGO Affairs Bureau and City Disaster Management Committee would be involved in organizing water-related relief efforts among the five UN agencies in Bangladesh involved in humanitarian assistance, the 30 international NGOs with disaster response capabilities, and the hundreds of NGOs and community-based organizations (CBOs) ("BANGLADESH," 2012).

#### Route Trafficability (Route Traff)

A branch of the national police force, the Dhaka Metropolitan Police (DMP), is responsible for the maintenance of law and order within the greater part of the metropolitan area, including traffic (Talukder, 2006). The police are also charged with acquisition of vehicles for debris disposal immediately after a disaster and ensuring traffic control external to the disaster area (Ministry of Food and Disaster Management, 2010). The Dhaka Transport Coordination Board (DTCB) is charged with coordinating among various agencies the implementation of transport-related projects in Dhaka City; however, there is evidence that the DTCB lacks the power to implement any project (Talukder, 2006). Furthermore, with the division of the city into two entities (DNCC & DSCC), it is now unclear which mayor would serve as Chairman of the DTCB. In the aftermath of a natural disaster, specifically a flood, analysts were unable to identify which organization would be responsible for ensuring safe passage along major roads. However, in the case of severe floods, the Bangladesh Air Force is responsible for providing alternative methods for access (Center for Excellence, 2012, p. 88), and, in the case of large movements of relief supplies, the SOD calls on the Bangladesh Air Force and Navy to assure the operability respectively of airfields and ports.

#### Influx of IDPs/Refugees (IDP/Ref.)

In the past, citizens of Dhaka have been displaced by floods, not necessarily as a result of rising water (for which work-arounds such as building elevated living platforms have emerged) but because of health concerns, namely the "stench of stagnating dirty water and the nuisance of mosquitoes" (Faiz Rashid, 2000, p. 243). In an effort to improve the situation as part of its 2013-15 Plan, the Bangladesh Red Crescent Society reported that it has established "slum preparedness disaster committees (SPDC) for 60 of the reportedly 5000 slums in Dhaka" (International Federation of Red Cross and Red Crescent Societies, 2014). However, it is difficult to determine where relief centers have been, or would be, established for Dhaka flood victims, although anecdotal information indicates that schools have served as flood shelters (S. M. Ahmed & Ahmed, 1999; M. Alam & Rabbani, 2007; Cameron, 2010).

### Energy and Fuel (E&F)

It is likely that repair of damaged infrastructure would be conducted by either the Dhaka Power Distribution Company Limited (DPDC) or Dhaka Electric Supply Company (DESCO)—the two companies that provide electricity in Dhaka (National Web Portal of Bangladesh). Titas Gas Company, part of the Bangladesh Oil, Gas, and Mineral Corporation, maintains the natural gas lines in Dhaka and repairs would fall under their jurisdiction. While there are several actors at play with regard to provision of services, analysts were unable to identify which entities would be responsible for providing emergency supplies of energy and fuel in the immediate aftermath of a flood.

### Clear Responsibility (Green)

Responsibilities for the remainder of the risk factors in the flood model are assessed to be both relatively clear and relatively well known. There are two caveats however. First, in all cases, the relationship and jurisdictions of national versus city authorities remains unclear. Second, the green border around these factors should not be taken to suggest adequate quality, scope, and/or service is provided. Rather, the border indicates only that main points of responsibility appear to be relatively clear.

### Communications (Comm.)

A good amount of the improvements in Dhaka's and Bangladesh's Disaster Management has involved pre-disaster warning systems and communications during disasters. While the SOD does identify a variety of communication responsibilities, unlike other factors where multiple actors and redundant efforts can hamper relief efforts, overlapping communication responsibilities do not appear to pose added risk because the overlap is in the area of dissemination not in the production of warnings. Specifically, beginning in April through the end of the monsoon season each November, primary responsibility for production of flood forecasting and warning information is clearly assigned to the Ministry of Water Resources' Flood Forecast and Warning Center (FFWC) (part of the Water Development Board). The FFWC monitors 86 representative water level stations and 56 rainfall stations throughout the country and within Dhaka, sends warning information to the City Disaster Management Committee for further dissemination to utilities and services via Bangladesh Betar (Radio Bangladesh), and NGO early warning programs (such as on the ground neighborhood committees).<sup>13</sup> The Bangladesh Police are responsible for coordinating its wireless frequency with the wireless network of Bangladesh Rifles, Bangladesh Water Development Board, MOFDM, Bangladesh Red Crescent Society, Disaster Management Bureau (DMB), Bangladesh Railways, Cyclone Preparedness Program (CPP), Bangladesh Inland Water Transport Authority (BIWTA) and Bangladesh Inland Water Transport Corporation (BIWTC), etc.

<sup>13</sup> The FFWC serves in a supporting role to the provide support services to Bangladesh Meteorological Department (BMD) and the Space Research and Remote Sensing Organization (SPARRSO) during cyclonic disasters. However, the potential for conflict between the FFWC and The Space Research & Remote Sensing Organization (SPARRSO), which is owned by the Ministry of Defence may increase as SPARRSO continues its current effort to develop a National Flood Monitoring System (NFMSRG) for monitoring flood operationally in Bangladesh based on remote sensing and GIS in four thematic areas: flood area, population affected, flood damage, and flood early warning.

### Search and Rescue (S&R)

The Ministry of Home Affairs controls the Fire Service and Civil Defense, Bangladesh Police, Ansar, Village Defense Party<sup>14</sup>, Bangladesh Rifles, and Bangladesh Coast Guards, each of which might be called by the Disaster Management Committee to assist in search and rescue.

The military is charged by the 2010 SOD with assuring that it is trained, prepared, and equipped to respond to requests by civil authorities for search, evacuation, and rescue in disaster prone areas before the monsoon season starts. The Bangladesh Air Force is called on to assist with airlifts of people and supplies "according to the necessity of relief preparations by civil authority" including making sure military air fields are available for emergency response and temporary storage of relief supplies (Center for Excellence, 2012, p. 88). While the line of responsibility appears to be fairly direct, what is less clear is the degree to which the military and others are able to procure and maintain the supplies that would be needed to conduct effective search and rescue in the case of severe rainfall and riverine flooding.

### Hospitals and Emergency Rooms (Hospt. & ER)

While each hospital has an administrator and medical director, the general and impartial oversight of hospitals and physicians in Bangladesh—and Dhaka—is an issue of growing debate. Critics of the healthcare system report that there is at present no oversight of hospitals and physicians and that rectifying this will require that Parliament enact new laws to establish independent oversight (A. Ahmed, 2014). In the event of a flood, it is anticipated that these issues would continue, thus making access to hospitals and emergency rooms a moderate risk.

### Mortuary Affairs (Mortuary)

The Army is charged by the SOD with removal of dead bodies and debris in the case of a disaster. However, in the case of flood, the SOD also instructs the Ansar (police) and Village Disaster Party platoons "under the command of officer/platoon commander" to bury the "dead bodies and carcasses as well as undertake rescue operations" (Ministry of Food and Disaster Management, 2010, p. 77).

### Unclear Responsibility and Insufficient Information (Grey)

The three factors outlined in grey in Figure 8 are those which remotely collectable information was insufficient to determine responsibilities or intent to respond in the event of a severe flood.

### Shelter Destruction/Degradation (Shelter)

During the 2004 flood, the "army and the district administration" reportedly took responsibility for establishment and management of shelters (Bangladesh Disaster & Emergency Response, 2004) as well as the provision of mobile medical teams. A decade later, following SOD revision and bifurcation of the city, it is difficult to identify specifically which entity or entities have primary responsibility for establishing and supplying shelters during a flood event. According to the 2010 Bangladesh National Standing Orders on Disaster (SOD), the military is charged with assisting in setting up temporary shelters while the NGO Affairs Bureau instructs "NGOs to assist local administration" (2010, p. 56) in evacuating

<sup>14</sup> The Bangladesh Ansar is force of the Bangladesh National Government charged with the maintaining internal security and enforcement of law in the country. The Village Defence Party is responsible for the enforcement of law within Bangladesh villages and towns.

people to safer areas as well as conducting damage and needs assessments. Despite the SOD mention of the military as having the capacity to set up emergency shelter, it is difficult to identify more specifically than the Dhaka City Corporations who is responsible for providing emergency shelter, although the Red Crescent Society and other NGOs certainly are involved. The SOD does mention that the City Corporation Disaster Management Committee is responsible for visiting pre-selected emergency safe centers and shelters. In an undated presentation by S.A.T.M., Aminul Hoque (Superintending Engineer & Team Leader, Disaster Management Committee, Dhaka City Corporation) mentions that the Store and Purchase Department of the DCC stocks bamboo, tents, candles, dry foods like biscuits etc. as part of their flood preparedness. Given the lack of clarity and unverifiable actualization of the plans this is a factor where additional, local on-the-ground information appears to be necessary in order to better understand how relief would be implemented and thus the likely risk of associated humanitarian crisis.

### Epidemics/Pandemics (Epi/Pan)

From information remotely collected, it is possible to ascertain that representatives from the Health Ministry as well as local officers are to be included in the Disaster Management Committee (DMC) and are tasked with tracking health needs in the event of a disaster. Although the question of the adequacy of services remains, the Dhaka North City Corporation Health Department reports that it conducts routine immunizations, mosquito control, disinfects during diarrhea outbreaks, has a public health lab for testing food, and controls stray animals. Although it likely does the same, no evidence could be found that the Health Department of the South City Corporation engages in comparable activities.

### Availability of Health Care Personnel (H.C.P.)

The availability of healthcare personnel in the event of a flood in Dhaka is unclear, although analysis suggest that the availability of personnel required to tend to people with flood-related illnesses (the treatment of which is relatively simple) may be less problematic than garnering the supplies needed to provide that care (see section on Medical Supplies below).

According to the SOD, the Ministry of Health and Family Welfare, Directorate General of Health Services and attached agencies are responsible for providing curative and preventive health service during and after a disaster by deploying emergency medical teams. In particular, the Ministry of Health must also ensure availability of ambulances, medicine, vaccines, and surgical equipment at *upazila* health centers. The Dhaka Civil Surgeon's Office (Metropolitan Area) lists 270 physicians serving government hospitals and clinics in Dhaka, a city of over 14 million people. Approximately 95 nurses, 74 medical assistants, 40 medical technologists, 170 community health care professionals, and about 200 health assistants assist these physicians. This equates to roughly one healthcare professional for every 16,500 people within Dhaka.

### Medical Supplies (Med. Sup.)

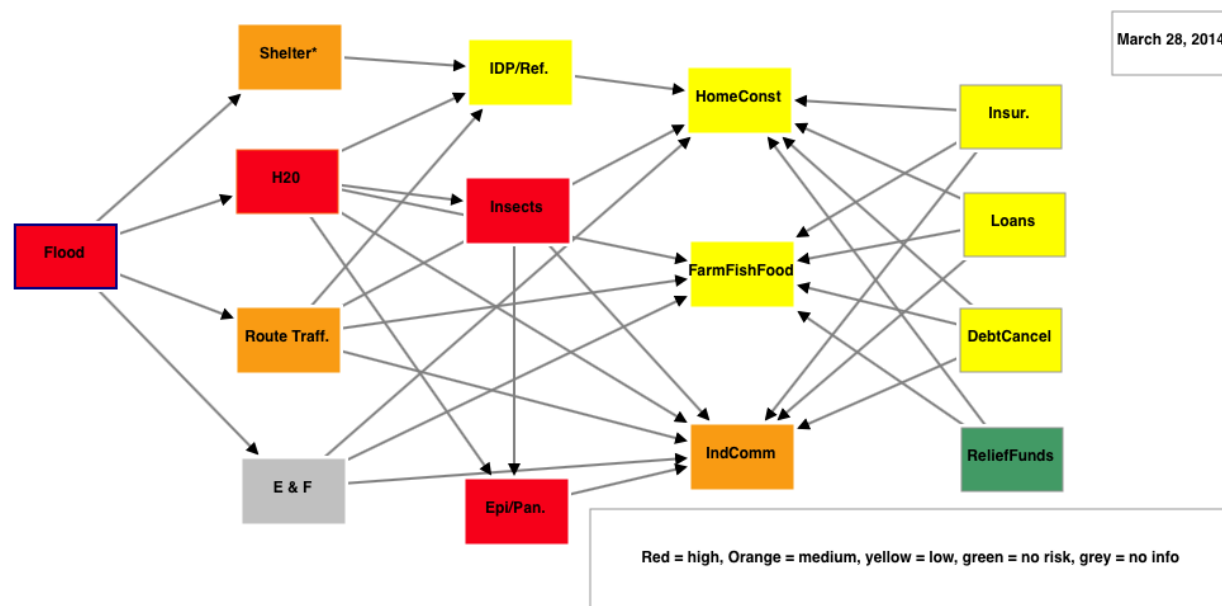
In non-crisis times, reports indicate residents are dissatisfied with the “availability of prescribed drugs and medical supplies at the health centers” (Sohail, 2005, p. 63). The national Ministry of Health is responsible for ensuring “adequate availability” of ambulances, medicine, vaccines, and surgical equipment at *Upazila* Health Centers in disaster prone areas (Ministry of Food and Disaster Management, 2010). In Dhaka, emergency medical needs are established jointly by hospitals and the

Health Ministry, although it is unclear how or where this happens or how much of the main medication for dengue fever and diarrheal diseases—the most likely to emerge during flooding—are stored in Dhaka, how these are controlled, and how they are distributed.

In flow of emergency medical supplies from NGOs and foreign governments would be coordinated by the City Disaster Management Committee, which includes members from the NGO Affairs Bureau. It is unclear, however, how coordination of receipt and delivery of emergency medical supplies between the national-level disaster and health committees and those operating at the city level would occur. It is also not clear which agency has responsibility for determining who reviews the quantities of emergency medications (e.g., for dengue fever and diarrheal diseases) that are stored in Dhaka, how current they are, and how they would be controlled and distributed. In non-crisis periods, Dhaka residents commonly express dissatisfaction with the availability of prescription drugs and medical supplies as well as the overall quality of care at public health care institutions (Sohail, 2005, p. 63). It is, therefore, not unreasonable to presume that these issues would be exacerbated in the event of a flood. Moreover, the people most likely to be affected by flooding (e.g., individuals and families living in slums and shelters) are the same population historically unable to access adequate medical care and medicine routinely and during times of high water (Faiz Rashid, 2000).

## Chapter Five: Recovery and Reconstruction

In determining risk, it is necessary to understand not only what is likely to be affected by a natural disaster and who or what is responsible, but also what recovery and reconstruction looks like within the area of interest. With that in mind, analysts explored those factors within the USPACOM SCA Humanitarian Crisis Framework that are relevant to recovery and reconstruction efforts (see Figure 10).



### Figure 8. Recovery and Reconstruction in Dhaka in the aftermath of a Flood

## Overall Assessment

The lack of clarity as to who is responsible for conducting and paying for the water and sanitation repairs, the significant impact that a lack of potable water has on vulnerable populations, and the historical issues of water supply in Dhaka makes potable water one of the highest risk factors during the recovery and reconstruction phase. Despite the approximate equivalent of one million U.S. dollars spent annually in Dhaka on combating insect infestation, this also continues to be a major problem. As pointed out earlier, prolonged water accumulation exacerbates the insect infestation problem, making this a high risk factor during recovery and reconstruction. The prolonged water accumulation and resulting disease caused by insects, as well as the increase in water-borne diseases, also contributes to epidemics/pandemics being rated as a high risk factor, particularly when coupled with a lack of medical supplies necessary to treat these diseases.

In the recovery and reconstruction phase, shelter destruction/degradation, route trafficability, and industry and commerce factors are rated as moderate risks. Lack of funding (formal or informal) may prevent reconstruction of shelter, particularly for those individuals who are not landowners (slum dwellers) or for individuals whose shelter is extensively damaged or damaged beyond repair. In addition, long-term water exposure (long periods of standing water or frequent flooding) has detrimental effects to more substantive housing (e.g., brick), resulting in an increase in the percentage of population whose

housing is compromised. Route trafficability also continues to remain a moderate risk, primarily due to the cost of repairing the infrastructure, as well as Dhaka City Corporation's failure to complete the plan devised in the early 2000s to raise road heights. The lack of traversable roads, combined with illness and power outages, also places industry and commerce in the moderate risk category.

At low risk during the recovery and reconstruction phase are the influx of IDPs/refugees; housing construction and maintenance; and farming, fishing, and food production. While displaced persons from the rural environs may descend on Dhaka in the event of a flood, the city reports very little internal displacement and has policies in place for the establishment of emergency shelters. In addition, informal networks also assist those displaced by the flood and continue assisting with housing construction and maintenance during the recovery and reconstruction phase. Together with coping mechanisms employed by those living within the hardest hit areas, housing construction and maintenance becomes a low risk category. Diverse, informal networks also maintain a flow of food into the city, providing customers for the food industry, resulting in food product being ranked as a low risk during this phase.

Economic factors such as insurance, loans, aid, and debt cancellation are not at risk during the recovery and reconstruction phase. Few, if any, slum dwellers have property insurance, but this does not appear to prevent recovery and reconstruction after previous flooding (Nagarajan & Brown, 2000). Loans from friends within social networks as well as micro-loans are used to take care of immediate needs such as food. While debt cancellation does not appear to be an option offered by formal banking institutions, many microfinance institutions (MFIs) are willing to reschedule loan payments to accommodate those affected by a flood. The provision of aid from NGOs, charities, and foreign governments also poses no risk to recovery and reconstruction; rather, aid is extremely welcomed by both the government and the people. While aid alone is not sufficient to effect reconstruction and recovery, it is an essential element. Poor government coordination does undermine the effectiveness of aid and the ability of NGOs to help Dhaka's most vulnerable; however, despite these limitations, it has a net positive effect.

## Detailed Assessment of Risk Factors

The following section provides the detailed assessment of the individual risk factors associated with the risk of humanitarian crisis during the recovery and reconstruction phase following a flood in Dhaka, Bangladesh. The factors are grouped according to risk: high, moderate, low, no appreciable risk, or insufficient information to evaluate.

### High Risk Factors (Red)

#### Water and Sanitation (Water/Sanit)

A major issue in the aftermath of a flood is the contamination of the already inadequate and subpar water supply within the city (M. Alam & Rabbani, 2007; Baker, 2007; Bangladesh Disaster & Emergency Response, 2004; Faiz Rashid, 2000; Huq & Alam, 2003; Uddin & Baten, 2011). For example, an assessment in the aftermath of the 2004 flood found:

44 deep tube wells were affected by flood- water; production of 13 of these was suspended. The estimated loss in water production due to suspension was 45 million liters per day. The remaining tube wells were kept operational by adopting protection

measures including the erection of a protection wall around the pump house and raising housing pipes and electrical appliances above flood- water. It was also found that 5 of the 13 suspended tube wells were badly damaged and required replacement. The estimated cost to rehabilitate the water supply system is about 127 million<sup>15</sup> taka..." (Huq & Alam, 2003, p. 129)

Lack of clarity regarding responsibility for conducting and paying for infrastructure repairs, combined with the significant impact that a lack of potable water has on the vulnerable population, makes this a high risk factor for Dhaka, Bangladesh.

### Severe Insect Infestation (Insects)

According to reports, Dhaka spends roughly the equivalent of one million U.S. dollars annually to battle the city's rampant mosquito problem (Ameen, Hossain, & Chowdhury, 1999; Lawson, 2003; Mahmud, 2013b). However, according to numerous surveys and reports, the efforts have been futile and mosquitos continue to be a major issue for all residents within the city. Mosquito infestation is made worse during periods of prolonged water accumulation, resulting in this factor being evaluated as high risk (T. U. Ahmed et al., 2007; Karim et al., 2013; Lawson, 2003; Tawhid, 2004).

### Epidemics/Pandemics (Epi/Pan)

In the aftermath of previous floods in Dhaka there has been an associated increase in incidences of acute respiratory infection, diarrhea, watery dysentery, jaundice, typhoid, and scabies (Uddin & Baten, 2011). The most prevalent ailment in the aftermath of a flood is diarrhea and associated dehydration (ICDDR, 2011). Following the 2004 flood, the number of cases of "diarrhoea passed all the last records" (Haque et al., 2010, p. 8). While this is a known issue, Bangladesh lacks the required infrastructure and resources to ensure adequate provision of potable water to the vulnerable populations. Additionally, Bangladesh fails to provide access to necessary medical solutions to counter the effects associated with severe diarrhea, leaving millions vulnerable. Epidemics/pandemics are consequently evaluated as a high risk factor.

### Moderate Risk Factors (Orange)

#### Shelter Destruction/Degradation (Shelter)

In the case of a flood in Dhaka, the homes most likely to be affected are permeable structures owned by individuals with little to no savings to address the damages without seeking external economic assistance, either through informal or formal means. Additionally, given high population density, limited economic resources, and the scarcity of high ground within city limits, individuals are forced to either stay put and implement physical coping mechanisms (e.g., lifting their beds up on bricks, building bridges, moving to the roof), adopt psychological coping mechanisms (e.g., a mentality of "it could be worse"), or incur greater costs by attempting to re-locate. As noted in the immediate impact and recovery section, prolonged exposure to water will eventually erode and damage housing structures composed of brick and concrete, thus affecting an even larger percentage of individuals in the city over

<sup>15</sup> \$1,635,963 USD in 2004 dollars

time. This factor is determined to be of moderate risk due to the historic level of damage caused by previous floods, as well as the level of vulnerability associated with the type of housing materials typically used in the construction of shelter in the city.

#### Route Trafficability (Route Traff)

Previous floods have caused significant damage to the roads and associated transportation infrastructure, with damage estimates ranging from 12.8 billion Taka to 160 billion Taka depending on the reporting organization (Tawhid, 2004). In an effort to help reduce damage and ensure adequate access during floods, the Dhaka City Corporation embarked upon an effort in the early 2000s to raise the height of the road above the normal flood water level in the low-lying areas, with a goal of completing the project by 2007 (Hoque, n.d.). However, geospatial analysis (ERDC, 2014) and anecdotal reporting indicate that as of March 2014, this project is incomplete and in disrepair in certain areas (Ashraf, 2010). Given the historic impact of flooding on the transportation network around and within Dhaka and the steps the city has taken to address the problem, this factor is of moderate risk.

#### Industry & Commerce (IndComm)

A flood in Dhaka negatively impacts industry and commerce (both formal and informal) due to a lack of route trafficability, illness, power outages, and business and banking closures, among other issues (IRIN & UN-HABITAT, 2007; Tawhid, 2004). According to reports, the 1998 flood resulted in a total loss to large-scale industry of around \$30 million USD and roughly \$36 million USD to the small and medium sized industry (IRIN & UN-HABITAT, 2007). The 2004 flood essentially brought much of Dhaka's business centers to a standstill, with the garment industry suffering an estimated loss of roughly \$81 billion USD (Tawhid, 2004). While the informal economy also takes a big hit due to loss of mobility, customers, and resources, the informal economy is quicker to recover due to low start-up costs and strong motivation and need to generate income. This factor is determined to be of moderate risk for humanitarian crisis due to the majority of the population within Dhaka operates within the informal economy, allowing greater flexibility and speed to return to normal operations. However, if Dhaka were to experience another significant, long-lasting flood, the associated risk could increase.

#### Low Risk Factors (Yellow)

##### Influx of IDPs/Refugees (IDP/Ref.)

This factor has been evaluated as being of low risk for Dhaka in the event of flood due to the relatively low reporting of internal displacement of the urban population and the response of the government and external community in establishing shelters for the residents (S. M. Ahmed & Ahmed, 1999; Aßheuer et al., 2013; Pacione, 2009). However, it is important to note that in the event of a flood in the rural environs, the number of displaced persons and refugees seeking shelter in and supplies from the city is likely to rise and place pressure on the already stressed system.

##### Housing Construction and Maintenance (HomeConst)

In the aftermath of a flood, individuals will typically take out loans to help rebuild and repair damage to their homes (see section on loans and microfinance). There are also reports that some individuals will make modifications and adjustments to their homes to live with the “the inconvenience of flooding” by

erecting “temporary bamboo bridges attached to them for providing access to adjacent grounds during the flood season” (Rashid, Hunt, & Haider, 2007, p. 100). While there are some efforts to develop homes that are able to withstand floodwaters, it has been difficult for developers and entrepreneurs to find investors for more than a pilot effort that was completed in 2010. The lack of investment and development may be due to the fact that those most likely to benefit from this technology do not in fact own the land that they inhabit—because they are either squatting on public land or paying rent on privately owned property (Baker, 2007; Hanchett, Akhter, & Khan, 2003)—and are thus at the mercy of the government or private owners. Given the coping mechanisms employed within the hardest hit areas and the existing technology, this factor is rated as low risk.

### Farming, Fishing & Food Production (FarmFishFood)

According to a recent study (Keck & Etzold, 2013), Dhaka’s food supplies have historically been “repeatedly disconnected due to floods and cyclones, yet there was always enough food in the megacity thanks to wholesale traders’ diverse and flexible supply networks (p.1).” It is through strong social networks that Dhaka’s food providers are able to ensure food availability. This is true even in the event of a natural disaster, such as a flood. For example, in 2007 “when severe floods and a tropical storm destroyed much of the country’s paddy production, diverse supply networks, mutual support and trust-based relations enabled Dhaka’s food traders to make sure that harvest losses and blocked access roads would not cause severe supply shortfalls in the city” (Keck & Etzold, 2013, p. 88). However, it is critical to note that availability does not always mean access, as affordability is often an issue for low-income individuals, a fact that is made even more evident during a flood.

### No Appreciable Risk Factors (Green)

#### Insurance, Reinsurance (Insur.)

Those most affected by floods in Dhaka—slum dwellers—almost universally lack property insurance. In the aftermath of a flood, some of the slum dwellers are forced to borrow money from friends, neighbors, money lenders, or NGOs to repair or replace their homes (Nagarajan & Brown, 2000). Recognizing the devastation flood poses to shelters, livelihoods, and wellbeing of its people, the Government of Bangladesh’s Ministry of Disaster Management and Relief announced a pilot flood insurance plan in August 2013 for poor and vulnerable people in the river basin of the Sirajganj district (Dhaka Tribune, 2013). The program is funded and organized by Oxfam Bangladesh. It is not yet clear whether the program will be successful or if it will be available to the residents within Dhaka. A 2013 Government of Bangladesh funded study (Medimorec, 2013) found that a micro-insurance program for the poorest segment of society would likely not succeed for three reasons: participants 1) could not afford the insurance, 2) did not understand how the insurance worked, and 3) the payout was generally lower than the cost of repairs. Given that the lack of property insurance does not appear to be a significant issue for victims of flooding it has been coded as a low risk (yellow) to reconstruction.

#### Loans Microfinancing (Loans)

Loans from MFIs are one of the primary coping mechanisms households use to provide shelter, food, and health care in the wake of a flood (Del Ninno, 2001). The vast numbers of slum dwellers, those most likely to be affected by the flood, do not have access to flood or property insurance to offset their losses.

According to one study (Del Ninno, 2001), the number of people seeking loans for food during a flood doubled to 15.9% compared to 7% in the month preceding the flood. The average loan amount was Tk 6,000, which was largely spent to pay for food (families in the slums pay an average of Tk 3,000 a month for food (Del Ninno, 2001)). Interestingly, the main providers of loans were friends and family (23 and 31 percent respectively). Other sources included MFIs, banks, and local moneylenders (*mahajans*) (Del Ninno, 2001). However, during the 1998 floods, some MFIs did not have the ready assets to accommodate the sudden surge in lending; demand for loans outpaced supply. In response, some MFIs have developed disaster funds, which are available in the event of a major disaster (Nagarajan & Brown, 2000). Therefore, loans microfinancing was assessed as posing low risk (yellow) for reconstruction.

#### Debt Forbearance & Cancellation (DebtCancel)

In Bangladesh, many MFIs recognize the need to reschedule (but not cancel) loan payments in the wake of flooding in an effort to reduce defaults and losses (Nagarajan & Brown, 2000). This is generally done on a case-by-case basis, with debt forbearance determined by need and generally resulting in forbearance of 3-10 weeks. There was no evidence that MFIs canceled loans as a general practice however. Despite loan rescheduling, the 1998 flood was so devastating that some borrowers, fearing for their ability to repay their loans, turned to local money lenders or relatives to repay their loans, sinking them further into debt (Faiz Rashid, 2000). Keeping in mind that loans from family and friends do not directly apply to this factor, debt forbearance was coded as low-risk (yellow) to reconstruction and development.

#### Relief, Grants, Social Funds (ReliefFunds)

Private donations and international aid are dispersed both through the Bangladeshi government as well as through local NGOs such as the BRAC (Akter, 2004). This makes distinguishing the source of aid—GoB or external—difficult to determine. What does appear clear is that the total aid received is not sufficient to meet the demand or to have a major positive impact on long-term recovery, although the efforts of food aid do supplement short-term per capita calorie consumption amongst the most vulnerable flood victims (Del Ninno, 2001).

#### Insufficient Information (Grey)

##### Energy and Fuel (E&F)

In the event of a flood, damage to energy supply infrastructure is guaranteed. Previous reports of damage to the existing energy and fuel lines following a flood within the city found "leaks... at more than 300 places in the cooking-gas supply line, affecting over 100,000 households" (Pacione, 2009, p. 556). Given there have been historical problems with the infrastructure following a flood, coupled with the current insufficient supply of energy and fuel to the residents (Energy Bangla, 2013), it is likely that this is an area of risk for Dhaka. However, this factor was unable to be fully assessed due to a lack of sufficient information.

## Chapter Six: Flood Impact on Intrastate Violence

The SCA Humanitarian Crisis Framework risk analysis provides the information required to understand the potential scope and nature of the risks resulting from flooding on the infrastructure, services, and population of Dhaka. However, assessing the resulting potential of increased risk of intrastate violence—either by violent extremist organizations (VEOs) or the population as a whole—requires linking the analysis of the HC Framework to the Intrastate Violence (IV) Framework. Thus, once the risk assessment of the HC framework for a flood event was completed, an exploration of the VEO activity, political violence, and crime information for Dhaka followed. This information was analyzed to determine its potential interaction with the risk factors identified in the HC framework, specifically, in the case of a flood event. As shown in Figure 11 below, a major flood in Dhaka is unlikely to result in a significant increase in intrastate violence.

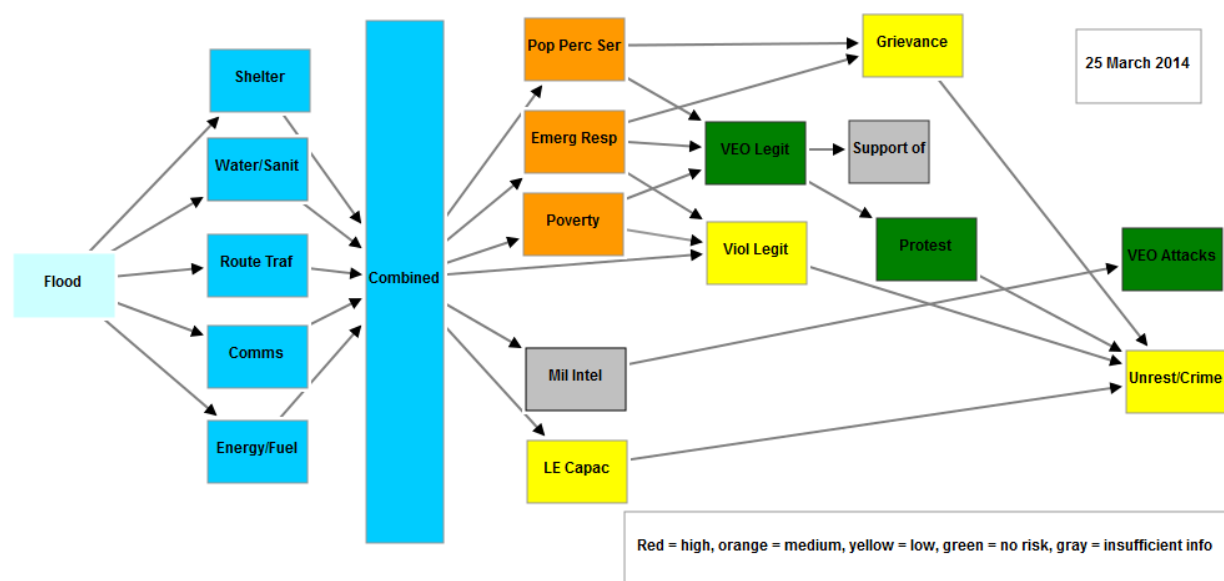


Figure 9. HC & IV Framework Risk Assessment

Figure 11 combines the Humanitarian Crisis (HC) and Intrastate Violence (IV) Frameworks to assess whether or not a flood or flooding (information derived from the HC Framework) increases the risk of intrastate violence (information derived from the IV Framework) in Dhaka. The analysis emerges from the synthesis of the two frameworks to provide insights neither framework can offer on its own. Moving from left to right—and drawing on information on the effects of the flood on shelter, water & sanitation, route trafficability, communications, and energy & fuel (Chapters 3, 4, and 5)—we know that extreme flood events disrupt the daily life of Dhaka's citizens, especially its poorest citizens. We also know that Dhaka has a high level of political violence and previously experienced extremist violence, peaking in August 2005 when Jama'at ul Mujahideen (JMB) simultaneously exploded 500 bombs across the country.

Dhaka suffers from regular flooding and violence, but are they related? This framework allows us to arrive at the conclusion that extreme flood events historically do not result in a greater risk of intrastate violence in Dhaka. This chapter will explore the rationale for that conclusion using the HC & IV Frameworks.

## Overall Assessment

The research indicates that previous floods in Dhaka did not lead to an increase in intrastate violence. Unless new stressors emerge, such as 1) increase in frequency and intensity of floods, 2) mobilization of those affected against the government, 3) extremist groups providing essential services to flood victims, or 4) growing anti-government sentiment, in general, among the population, there is no reason to expect that flooding will significantly increase the risk of intrastate violence in Dhaka in the future. Therefore, despite the literature (Berrebi & Ostwald, 2011) suggesting a frequent link between natural disasters and extremist violence, the analysis suggests that this relationship is not presently evident in Dhaka. Several factors support this conclusion:

1. Floods (and meteorological events in general) may have less of a long-term impact on a population compared to other kinds of natural disasters such as earthquakes or volcanic eruptions.
2. Those most affected by floods in Dhaka are also the poorest segment of society; those who generally lack political voice, legal rights to the land they live on, and who may not have a strong understanding of the state's role in providing essential services.
3. Slum dwellers are quite resilient; they do not wait for government handouts to meet their needs (although they do expect the government and NGOs to provide some level of relief) and rely on their community and social ties to survive the floods and recover after the waters recede.
4. In general, citizens of Bangladesh believe that the government (in coordination with strong international and NGO assistance) provides adequate disaster relief.
5. Political violence in Bangladesh appears to be generated from the top down, not from the bottom up. The most common form of organized violence in Dhaka revolves around political protests orchestrated and led by the opposition political party and their student wing. Groups mobilize their supporters against the ruling party and protests are generally not spontaneous events.

## What is likely to increase risk of violence?

Climate change is, and will increasingly become, a source of instability in Bangladesh. Bangladeshi scientists estimate that by 2030, 20% of the country's territory will be permanently inundated with water, generating up to 20 million "climate refugees" (Hagerty, 2008). Climate change will likely exacerbate tensions already generated by unemployment, poverty, social conflict, and government corruption. The additive effects of water scarcity, disease, food insecurity, and population migrations elevate concerns about rising extremism (Hagerty, 2008; Smith, 2007). Given Dhaka's location along the Buriganga River in the Bengal Delta and the associated rapid population growth, primarily due to immigration, the city is likely to experience the impact of climate change across multiple factors. Future weather events and rising ocean water will challenge the capacity of the Dhaka government and stress

the resilience of society in significant ways, which VEOs might exploit (Berrebi & Ostwald, 2011; Smith, 2007).

A 2011 study (Berrebi & Ostwald) of 167 countries found an empirical link between natural disasters and subsequent increases in violence. The results indicate that violence is higher in lower GDP per capita countries following a disaster. Furthermore, the researchers found that geophysical and hydrological disasters prompt a more sustained and escalating effect on terrorism than climatologic or meteorological disasters. Based on event data from University of Maryland's Global Terrorism Database, there was a rise in violence following three major natural disasters in Dhaka: 1991 (cyclone), 1998 (flood), and 2004 (tsunami) (Figure 12). However, it took a year or more for the violence to peak after a crisis, raising the question of whether other factors accounted for or contributed to the rise in violence.

Additionally, the study (Berrebi & Ostwald, 2011) also implies that greater warning times, better disaster preparedness and more effective response planning by the government are associated with lower incidence of subsequent violence. These buffers are highly relevant in Dhaka because the government and the NGOs operating in the area are prepared for natural disaster response. For example, while overall government capacity in Bangladesh is poor, the government has a track record of responding to natural disasters (Sajjad, 2014). The nature of most natural disasters (monsoons, cyclones, etc.) also gives the government time to warn and protect its citizens. Finally, the government is aware that Pakistan's poor response to the devastating Cyclone Bhola in 1970 was a major trigger of the Bangladesh Liberation war (Husain, 2010), suggesting that, at least with the current generation, there is a collective awareness that failure to respond to a natural disaster can result in a transformative situation, something that the government is keen to avoid.

So while natural disasters may contribute in a rise in violence in Bangladesh, albeit mitigated by the buffers described above, they are not a primary driver of violence. Political action is just as if not more likely to cause violence. Figure 12 shows the incidence of elections (which are a major driver of political violence) and major natural disasters in Bangladesh. The greatest spike in violence correlates to political tension in 1995 surrounding a reportedly rigged election and heightening tensions between the AL and BNP (Government of Canada, 1996; Reuters, 1995). A casual analysis of Figure 12 shows that the peaks in violence are more closely aligned with political violence than natural disasters (even accounting for a two year lag).

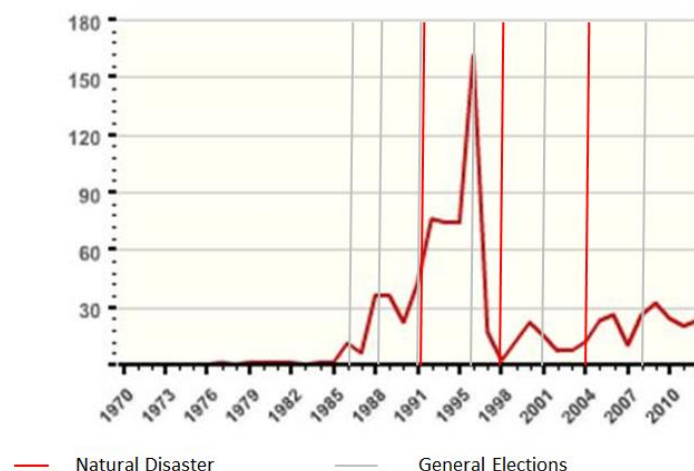


Figure 10. Relation of natural disasters and elections to violence

## Detailed Assessment of Risk Factors

The following section provides the detailed assessment of the individual risk factors associated with the immediate risk of intrastate violence in the event of a flood in Dhaka, Bangladesh. The factors are grouped according to risk: high, moderate, low, no appreciable risk, or insufficient information to evaluate.

### High Risk

There were no factors determined to be of high risk in this framework.

### Moderate Risk

The following factors were determined to be of moderate risk for increasing intrastate violence.

#### Popular Perception of Public Service & Health (Pop Perc Ser)

While government provision of essential and health care services following a flood is inadequate to meet the needs of the population, its weaknesses are offset by two factors: 1) significant domestic and international NGO support and 2) the resilience of Dhaka's poorest population. The Government of Bangladesh (GOB) and Dhaka regularly respond to floods, but their limited resources, as well as struggles to coordinate and distribute relief equitably, is challenged by the magnitude of flooding experienced by Dhaka residents. Domestic and international NGOs contribute significantly to the provision of public services and health in the aftermath of the flood, bolstering the perception of the government's capacity to provide services after a flood (Mamunur Rahman, n.d.). Finally, while the people most affected by the flood hope for and expect support from the government, they do not wait for handouts to meet their needs. They use their social networks and sheer perseverance to meet their basic needs, often at great cost (Aßheuer et al., 2013). The GOB and City of Dhaka, due in part to international assistance, have historically been perceived as providing adequate, but not good, provision of public services and health after a flood; however, there is room for significant improvement (Sajjad, 2014).

#### Emergency & Crisis Response (Emerg Resp)

Flooding disasters in Dhaka primarily affect those living in slum settlements, positioned mainly along rivers and on top of natural flood plains. Therefore, the foci of emergency response efforts in Dhaka are the slums and slum dwellers. There are three primary providers of emergency relief to those most affected by the floods: the government, NGOs, and the social network of slum dwellers. However, it is often unclear to slum dwellers where flood assistance comes from. During non-crisis times, the government plays a limited role in providing essential services to slum dwellers because they do not have a legal right to the land they live on and, as such, do not receive government support (World Bank 2007, xvi; Hossain, 2008). In the aftermath of a humanitarian crisis, foreign governments and NGOs are the leading providers of disaster aid in Bangladesh, contributing as much as 80% of all disaster aid to the country, potentially alleviating the vulnerable populations access to government services. However, the Bangladeshi government is the prime distributor of financial aid for the entire nation (Kanti Paul, 2002) and more often than not if Dhaka is experiencing flooding, other parts of the country are also in crisis and requiring disaster aid, resulting in diminished aid to Dhaka. Furthermore, one study suggested that

conditions are routinely so bad in the slums that “it is hard to distinguish acute flood-related needs from chronic ‘normal’ situation” (Bangladesh Disaster & Emergency Response, 2004).

### Absolute Poverty & Relative Deprivation (Poverty)

A significant portion of Dhaka’s poorest residents live in slums and experience very low quality of life in terms of income, food security, access to safe water, sanitation, health, education, and access to essential services (S. Hossain, 2008). Poverty continues to increase in Dhaka as migrants flood into the city from rural areas and few people work their way out (S. Hossain, 2008). Not only do the slum dwellers experience poverty, they also suffer from extreme inequality relative to official residents. They face economic insecurity, resulting from informal economy employment, higher rates for essential services (like water) compared to the rest of the population, as well as social and political disadvantages resulting from poor access to health services, lack of political voice and representation, and lack of educational opportunities (Uddin & Baten, 2011).

Floods in Dhaka exacerbate the problems associated with poverty (Aßheuer et al., 2013). First, shelters for displaced persons are often overcrowded for long periods or destroyed. Second, people are unable to work because their workplaces are flooded, they are sick, or they have sick children or spouses at home that must be cared for. Third, victims must pay exorbitant rates for food, clean water, and medicine. Fourth, an empirical study of mental health in Dhaka’s slums showed that floods, along with poor housing quality, poor sanitation, and poor employment prospects (all which occur during a flood event) negatively affect the mental wellbeing of slum residents (Gruebner et al., 2012).

Government and NGO aid is inconsistent and insufficient to meet the needs of the affected population during floods; therefore, people must rely on their social network, neighbors, and community for support. Nearly two-thirds of slum households take out loans from family, friends, landlords, or neighbors within their social network during floods (Aßheuer et al., 2013). The loans are repaid “relatively quickly” because work is easy to come by once the flood waters recede (Aßheuer et al., 2013). However, the long-term effect of the flood on a family’s finances makes it even more difficult for families to save enough money to climb out of poverty and may increase their vulnerability in the event of future floods.

Despite these conditions and challenges, for many of Dhaka’s rural migrants, life in Dhaka’s slums provides greater economic security and opportunity than what is typically experienced in rural homes. Although flooding can cause economic hardship, in many cases it is easier and quicker to recover from the economic effects of floods in urban areas than in rural areas. Flooding in rural areas leads to the destruction of crops, livestock, dwellings and equipment, and in extreme cases (riverine erosion) the land itself. Even without the loss of land or livestock, many do not have the resources to carry them over until new crops can be planted and harvested. Economic recovery for those in urban slums can begin as soon as water levels begin to recede and common occupations, such as small businesses (shops, rickshaws, small-scale manufacturing) or work in the garment industry can resume. As long as possessions can be protected from theft during the worst of the flooding, the potential loss of their means of livelihood is much lower.

## Low Risk

The following factors were determined to be of low risk of a rise in intrastate violence due to a flood in Dhaka.

### Civil Law Enforcement Capacity & Effectiveness (LE Capac)

The Rapid Action Battalion (RAB) is the elite anti-terror and anti-crime unit of the Bangladesh Police. Like the Army, the RAB is not free from political influence. Gang and VEO leaders evade arrest and continue operations as corrupt politicians and law enforcement look the other way (Hossain, 2012). Furthermore, the criminal justice system, especially the judiciary at the local level, is highly politicized and used for partisan “witchhunting” (Datta, 2005). Reportedly, police will not take action on a reported crime unless a bribe is paid (Rahman 23 August 2005). Especially in the slums, law enforcement does not exist unless it is to carry out a political agenda. Given that this is the situation at the best of times, it is hard to see how flooding could negatively affect the level of law enforcement capacity for the areas of Dhaka most likely to be effected. However, crime statistics are largely unavailable or unreliable. Some crime statistics do exist, but vary so little month-to-month, that the reporting is highly suspect. Furthermore, there is little evidence to suggest that law enforcement has a major presence inside slum areas. Therefore, there is weak information available to help us understand the role that law enforcement plays in preventing unrest or violence after a flood.

### Perception of Violence Legitimacy (Viol Legit)

Bangladesh was born out of political violence, and violence is ingrained in Bangladesh’s culture and politics (Datta, 2005). Furthermore, one of the triggering events that led to the fragmentation of Bangladesh from West Pakistan was West Pakistan’s poor disaster response after the 1970 cyclone, which killed 300,000-500,000 people (Smith, 2007). Several decades later, in 1991, street protests were the primary impetus for the return to democracy. Since then, protests (known as *hartals*) have been used as extra-legal events to compel the government to change unfavorable legislation or action (Riaz, 2005). Unlike other South Asian nations, political violence in Bangladesh does not have an ethnic or sectarian basis; rather, it stems from a chasm between the two main political parties—the BNP and the Awami League. Political violence in Bangladesh appears to be primarily a top-down, not bottom-up phenomenon, driven more by mainstream politics than radical political parties or VEO groups. In fact, much of the political violence is carried out by the student wings of the major political parties (Datta, 2005). *Hartals* are not generally an organic, spontaneous popular uprising; rather, the leaders of the Awami League and BNP political parties orchestrate protests as an extra-institutional means of achieving their goals.

While the population may be accustomed to, and participates in, violent political activity, those most affected by flooding (and poverty, inequality, etc.) are not necessarily more prone to organizing violence in response to their own political interests. Multi-country studies (Bandy & Smith, 2005; Berrebi & Ostwald, 2011; Hagerty, 2008) do suggest a link between natural disasters and terrorism, arguing that the damage done by natural disasters, combined with a government’s inadequate response, compels individuals to join violent extremist organizations. However, in looking at Bangladesh’s history of violence (University of Maryland’s START Global Terrorism Database), it seems to be primarily driven by

political elites and activists, and more closely correlated with political events (such as elections) than with natural disasters. Furthermore, as discussed above, Bangladeshi perceptions of government response to flooding are fairly favorable, making it unlikely that VEOs or militant groups would be able to capitalize on dissatisfaction with the government or international community's disaster response to mobilize or build support.

Although there is currently no indication that violence and flooding are linked in Bangladesh, Bangladeshi scientists estimate that by 2030, 20% of Bangladesh will be permanently inundated with water, generating up to 20 million “climate refugees” (Hagerty, 2008). Coupled with political tensions, weak governance, and extreme economic uncertainty, it is possible that people may be driven to organize, support and participate in grass-roots violence (whether political or religious) in the future (Smith, 2007).

### Hostile Public Sentiment (Grievance)

In the aftermath of previous flooding, despite the resilience of flood victims, many believe the government and NGO response was inadequate (Faiz Rashid, 2000). One study found that 67% of flood victims were “disappointed” by the government and NGO relief effort (Aßheuer et al., 2013). While some expressed anger, many more felt they lacked the political voice to effect change. It should be noted that public sentiment is very difficult to measure and obtain, especially in places like Dhaka. The best sources of sentiment derive from focused surveys and interviews; however, this information can also be gleaned second-hand in academic studies, newspaper articles, and NGO reports. Hostile public sentiment could also be measured via social media, although in the case of Dhaka, only a segment of society has access to Internet and mobiles phones, making this remote sensing method less reliable.

### Civil Unrest & Crime (Unrest/Crime)

There is no evidence that floods or other natural disasters generate civil unrest or spur large amounts of crime or looting in Dhaka. Often, those most affected by floods are the slum dwellers. Because the poor lack political voice and are focused on survival, there is less risk of unrest originating from this discontented population. However, several authors suggest population could demand change as climate change continues to increase the frequency and destruction of floods in Bangladesh, if the government fails to meet the population's basic needs. (Hagerty, 2008; Riaz, 2005). “The volatile interaction between Bangladesh's chronically poor governance and looming environmental threats could well create a ‘perfect storm’ of human tragedy, lawlessness, armed conflict, and perhaps even state collapse” (Hagerty, 2008, p. 183).

### No Appreciable Risk

The following factors were determined to be of no risk of a rise in intrastate violence.

### Perception of VEO Objective Legitimacy (VEO Legit)

There is little evidence that flooding has historically increased the perception of VEO legitimacy among those most affected by flood events. The information available for the purposes of this effort shows no discernable risk of VEO groups gaining legitimacy through provision of essential services nor is there risk of increased approval for VEOs in the aftermath of flooding. There is little or no evidence of VEOs

undertaking social service activities in Bangladesh in order to gain legitimacy or the sympathy and support of the population. There are occasional mentions of such groups providing services (Ahamed & Nazneen, 1990; Brown, n.d.; Ganguly, 2006), but no details about which specific groups are involved or the type, scope, and location of such activities. Research suggests that while VEOs are currently active in Bangladesh, they do not have well-established social service networks or community outreach programs of their own in Dhaka.

### Mass Protest (Protest)

There is no conclusive evidence that floods generate mass protest in support of a VEO agenda. Historically, no protests have been held following a flood to support a VEO or VEO agenda, or organized by a VEO.

### Violent Extremist/Insurgent Attacks (VEO Attacks)

Mainstream politics—not extremism—is the main driver of violence in Dhaka (Sajjad, 2014). After the orchestrated attacks on 17 August 2005, political parties cracked down on VEOs, eliminating their leadership (Datta, 2005; Ganguly, 2006; Harrison, 2013). Since 2005, there have been no reported, or claimed, terrorist attacks in Dhaka. However, events like the *Hifazat* march to Dhaka (from Chittagong) in April 2013 to promote their political agenda, resulted in several injuries and deaths as protestors clashed with Awami League supporters (New Age, 2013). On 5 May 2013, Hifazat supporters violently protested against the ruling Awami League in Dhaka (Gowen, 2014). Outside of Dhaka, students from Hifazat’s madrassa in Chittagong were implicated in making the bombs that were used in the 7 October 2013 bombing at the Lal Khan Bazar in Chittagong. Furthermore, in Dhaka’s universities, student groups, such as *Islami Chhatra Shibir* (the student wing of the Jamaat-e-Islami party), are a well-known source of recruitment for extremist groups. These student groups are essentially quasi-militant organizations (Sajjad, 2014). However, the line between terrorism and political violence is often blurred in the case of Bangladesh. Additional research is required to further clarify this relationship.

While this element is coded green—to indicate no risk—due to the fact that there is no current or historical evidence that floods generate VEO attacks in Dhaka, availability of information may have limited the analysis. Understanding day-to-day activities of VEOs in absence of terrorist attacks is extremely difficult to ascertain from open source material. Some VEOs have websites, but they are mostly propaganda tools. Furthermore, tracking the activities of student groups associated with VEOs or Islamic political parties may also provide some evidence of rising or decreasing threat.

### Unable to Evaluate

#### Military Intelligence & Counterterrorism Capability (Mil Intel)

The military only becomes involved with issues dealing with violent extremism upon request of the civil administration (Datta, 2005). In October 2004, Prime Minister Khaleda asked the military to intervene in the growing violent extremist problem, called Operation Clean Heart. While the military initially had widespread support, it “soon came to be perceived as another mechanism for political witch-hunting” (Datta, 2005). While weapons and criminals/extremists were seized during the operation, the legislature later passed a law granting the Army immunity for its civil and human rights violations, which further reduced the public’s trust in the military. On a day-to-day basis, it is not clear what role the military

plays in combatting terrorism. It is also unclear from the available sources how military and counterterrorism capabilities may be compromised by a flood event in Dhaka. Furthermore, there is no evidence to suggest that there is a risk associated with a flood and the ability of the military to collect intelligence or engage in counterterrorism activities. In addition, there is very little open source information about the quality of Dhaka's (and Bangladesh's) military intelligence and counterterrorism capability. Military operations, such as Operation Clean Heart, are announced and covered in journal articles and the media, but the capacity of the military to interdict intelligence about potential unrest in the aftermath of the flood is largely unknown from open source material.

#### Support of Violent Extremism Organizations (Support of)

While some multi-country studies (Bandy & Smith, 2005; Berrebi & Ostwald, 2011; Hagerty, 2008) suggest a link between natural disasters and terrorism, sometimes through the provision of social services to gain support, there was no evidence of this kind of relationship in the case of Dhaka. However, it is important to note that evidence of passive support is always challenging to gather. Surveys and newspaper reports are likely the best source for indicating a change in the level of support for violence legitimacy. In addition, geospatial imagery might show an increase in the number of madrassas or mosques built within the slums as one indicator of rising passive support for VEO legitimacy.

## Chapter Seven: Implications for USPACOM

The USPACOM area of responsibility is vast, covering thirty-six countries, twenty territories, and other assorted parcels of land amounting to just over half of the world's land mass. With a stated mission of ensuring peace, deterring aggression, responding to crises and, when necessary, advancing security and stability through traditional means, USPACOM planners and analysts are faced with an abundance of information and very little time to sort through the “noise” to identify high-risk areas. Additionally, traditional means of collecting information is usually associated with high financial costs. With fewer resources, both financial and personnel, non-traditional methods of collecting, assessing, and analyzing information during the various phases is paramount for USPACOM to be able to execute its mission.

Through utilizing an approach such as the USPACOM SCA Framework, USPACOM planners and analysts are able to apply their understanding of the region/country/city of interest to conduct quick risk assessments of high-level factors pertinent to operational objectives. If the assessment identifies factors of high risk, a drilled-down focused assessment can then be conducted on specific factors that are relevant. For example, in the case of understanding humanitarian crisis in Dhaka analysts selected the high-level risk of flood and then conducted a drilled-down focused assessment of factors pertinent to understanding the risks associated with humanitarian crisis in the event of a flood in the city.

The quick assessment is based upon a broad understanding of the region/country/city context and does not require a great amount of information or data. However, the focused, drilled-down, assessment requires tailored information that is collected against a particular risk area. For example, in the case study of Dhaka, Bangladesh, the focused risk assessment pertaining to the risk of humanitarian crisis associated with a flooding event required analysts to collect information specific to those risks associated with flooding events. For example, in the detailed flood risk assessment, information on the impact of floodwaters on the provision of medicine, rather than general information on the status of medical supplies at large in the city, was required. This approach not only streamlines the data collection process, but also allows analysts and planners to identify areas of risk and strength prior to an event, potentially aiding in risk mitigation and planning. Additionally, conducting a Phase 0 risk assessment, in theory, provides an opportunity for the Combatant Command (COCOM) to engage with other USG entities to identify and construct a coordinated whole-of-government targeted approach and response. A recent World Bank report estimated that for every \$1 (US) spent on risk reduction, it saves \$7 (US) in relief and repairs in the aftermath of a humanitarian crisis (Raju, 2014). Thus, phase 0 risk-mitigation efforts can not only improve the humanitarian situation in Dhaka during a non-crisis, they also have the potential to save money during the aftermath.

## Remote Sensing and Remote Collected Data as a Means to Understanding Megacities

Remotely sensed data traditionally refers to a very specific field of study about “objects or areas from a distance, typically from aircraft or satellites” (US Department of Commerce, n.d.). There are many advantages of this approach: data is relatively easily collected, can be updated quickly, does not require

personnel on the ground, and can, in many instances, be gleaned from existing sources. For example, collecting data on the socio-economic status (SES) of populations across a country (or megacity) is often hard to do using traditional methods such as census data. In LDCs, this particular type of data is often hard to find and can be years out of date, as populations change rapidly. Remote sensing can offer an alternative data source. For example, through the analysis of specific imagery of housing types in a city or region, an analyst can use detected building materials as proxy indicator of SES (e.g., brick buildings indicating a higher SES vs. straw indicating a lower SES).

However, no matter how apparently objective and evidenced based, analysis of data requires an understanding of the context in which it exists. While there can be no doubt that this type of analysis has the benefit of providing more timely and comprehensive data, interpretations based on such data alone run the risk of missing important contextual factors specific to the environment in question. Lack of context can lead to significantly misleading results. For example, while concrete is commonly coded as a building material that indicates higher SES, many slum dwellings in Dhaka are constructed at least partially from concrete. The housing type maps are not capable of telling us is how many people are living in the houses shown, or what the interior facilities and conditions are like. Similarly, maps showing the location of water wells around Dhaka can, when considered in isolation, lead to the misleading conclusion that access to water is not a significant problem. However, what these maps cannot tell us is how non-physical factors such as the cost of access (in bribes or taxes) serve to limit the actual access for individuals and communities. Without the contextual understanding of the overall situation, conclusions drawn from the imagery would be misleading.

Remotely-collected data—information gleaned from imagery in conjunction with data and information obtained or accessed outside of the country (such as scholarly articles, survey data, and subject-matter elicitation)—can provide analysts with a more robust and contextualized understanding of remote sensed data. Remotely collected data is not perfect and comes with issues of its own, such as limitations in availability and reliability. Data may be unavailable because they are not routinely collected, or because they are not published widely, either online or in traditional formats. Data that are available may be unreliable for several reasons. The data may be out of date—a particular problem with large-scale data collection efforts<sup>16</sup> such as census takings—or incomplete, making inferences drawn from them prone to error, particularly for rapidly changing megacities. Errors can also be a function of the manner in which the data are collected. This limitation is a common problem with government statistics, which can be incomplete, badly compiled, or in some cases inflated or underestimated for political reasons (unemployment and crime statistics often suffer these problems). Without knowing details of the data collection process and how systematic errors are likely to affect such data, drawing strong conclusions these data can be misleading. Even when the data and information available are accurate, they can still only tell us how things are supposed to work, not how they actually work. This deviation can vary in importance by either the magnitude of the difference, or the importance of the issue.

<sup>16</sup> This can be highly problematic in countries where there are pocket areas of high conflict, with some polling companies unable to access the population due to concerns for their own safety.

Even when data are available and reliable, they may not be able to answer specific questions of importance to the analyst. For example, the majority of data available on the population of Dhaka focuses on those living in the slums, as this has been the primary area of concern for the organizations collecting the data. Forming a complete picture of the social, political, and economic functioning of a megacity requires information on all major sections of the population. Sole dependence on remotely collected data leaves the analyst dependent on the efforts of other researchers, who may not be interested (and therefore not have spent time collecting data) in the same questions or topics closely related enough to require similar data and information.

Faced with limited time and resources, researchers and planners are increasingly looking to remotely collected and sensed data to provide the information they need to understand specific regions, countries, and megacities. With improvements in technology and the wealth of information now available online, research of this type is becoming both more feasible and more common. However, it does bring with it limitations and potential pitfalls. Some of these caveats have to do with the potential for significant disparity between what is information and what is the reality, and some are a function of how we interpret and extrapolate from the data we have. In both cases it can be argued that the cause stems from the same basic limitation of remote analysis, the tendency to miss the “feel” for the environment that is gained by in person, on the ground research and experience. This limitation can be somewhat mitigated by taking advantage of subject matter expertise (SME) knowledge and in-country media reports, but needs to be kept in mind at all times.

### **Considerations for Risk of Humanitarian Crisis in the Event of Flooding in Dhaka, Bangladesh**

The analysis suggests that Dhaka’s greatest risk for humanitarian crisis actually lies in its weak and convoluted institutional and governing capacities. Not only has insufficient institutional capacity prohibited Dhaka from benefiting from international aid intended to reduce its vulnerability to flooding effects, but institutional weakness and endemic corruption will likely make the situation worse as Dhaka continues to grow. While Bangladesh has a National Disaster Management Plan and associated Standing Orders on Disaster (SOD), questions have been raised as to the degree to which they are simply “paper plans” or whether they would work as intended in the event of an actual large-scale disaster. Furthermore, because the SOD was drafted before the separation of the Dhaka government into North and South City Corporations, and after the most recent disastrous floods, it is very difficult with remotely collected information to judge what is likely to occur during future disasters. The analysis indicates that in the event of a major flood, the engagement process would begin with a declaration of “disaster” by the government of Bangladesh. A request for U.S. assistance would be made to the Ambassador in Dhaka who would then reach out to USPACOM and other appropriate agencies. Until the official request is made, the international community is likely to be limited to remote observation and risk assessment. The USPACOM SCA framework enables analysts to relatively quickly identify where to focus humanitarian crisis response shortly after receiving an official request for assistance, thus reducing the delay in starting operations. The analysis suggests that life-saving and relief items likely to be in greatest need for risk-mitigation include: emergency mobile medical support able to reach into slum areas (including dehydration and diarrheal medication particularly for children), potable water or

decontamination equipment, and insect relief including mosquito netting. All items are relatively easy to obtain and dispense quickly providing much needed risk-mitigation in the first few phases of a flood.

### Concluding Remarks

The risk of humanitarian crisis due to a flooding event in Dhaka is primarily associated with a lack of potable water, epidemic/pandemics due to physical immersion in contaminated water, exposure to stagnant water, the inability to effectively heat and sanitize water for cooking, insect bites, diarrhea and associated dehydration. While these issues are commonplace in Dhaka, a flood will exacerbate the already poor infrastructure and inadequate resources potentially triggering a humanitarian crisis among vulnerable populations. However, while citizens residing in the flood-prone areas are most likely to be impacted, the entire city would be affected by increased numbers of disease carrying insects. Additionally, analysis of the linkage between the Humanitarian Crisis Framework and the Intrastate Violence Framework suggests that unless new stressors emerge such as 1) an increase in the frequency and intensity of floods, 2) mobilization of those affected against the government, 3) extremist groups providing essential services to flood victims, or 4) growing anti-government sentiment, in general, there is no reason to expect that flooding will significantly increase the risk of intrastate violence among the population in Dhaka in the future.

The analysis of flood-related risks of humanitarian crisis in Dhaka also included an exploration of the feasibility of conducting remotely-sensed assessments of various types of risks in megacities. The conclusion of this additional analysis suggests that a risk assessment using M-RSI is feasible, with caveats and limitations and a broadening of the notion of “remotely-sensed” to “remotely collected.” The main limitation to conducting a M-RSI risk assessment is in the difficulty associated with obtaining unbiased, high-confidence information at the city-level, which for some factors was difficult if not impossible to obtain. The difficulty increases with the extent to which the area under study is underdeveloped, understudied, and most critically, undergoing rapidly change—unfortunately, characteristics that define many of the world’s megacities.

## Chapter Eight: Implications and Lessons Learned for Megacities

Although the focus of this analysis was a single megacity, this examination of Dhaka raises some issues and questions that have implications for understanding all megacities. Cities have been part of human society for thousands of years. While population demands continue to drive their growth, technology and innovation have helped overcome the logistical problems associated with concentrating so many people in such small areas. But is there a functional limit to the size of a city? The situation in Dhaka shows how common problems of governance (lack of capacity, unclear lines of authority) and provision of services are magnified in both scale and impact in the context of megacities. Environmental pressures present another incremental challenge to the effective functioning of a megacity like Dhaka. Are these problems unique to Dhaka, or megacities in the developing world, or do they also have the potential to affect all megacities?

### Governing Megacities

As a town or city grows, there is a concurrent need to develop and manage infrastructure and provision of basic services for the population (including provision of water, justice, rule of law, education, etc...). As such systems grow in scale, they tend to also grow in complexity, requiring greater expertise, technical knowledge, and resources to manage effectively. As bureaucracies become larger, they become more complex and cumbersome, potentially compromising efficiency and accountability. Governance, then, faces a dual problem: scale of task and organizational complexity. In less developed countries (LDCs), these problems have been exacerbated by the speed of growth of megacities. In many such megacities, such as Dhaka, Cairo, and Santiago, the speed of growth has far outpaced urban planning capacity and infrastructure development. This has contributed to the scale of slum developments, which become effectively ungoverned sections of the city, with limited access to many basic services. In contrast, New York, Tokyo, and many of the “established” megacities in more developed countries (MDCs) did not experience the same overwhelming speed of population growth that those in the LDCs have faced. Rather, they have taken their present form and scale after their national and regional governments have consolidated and developed the institutional capacity to effectively govern large urban populations.

One possible solution to the problems created by the scale of megacities is to divide governance of the city into smaller organizational units, or to reduce lines of authority to the sub-city level. This could potentially increase the efficiency of service provision and general governance, both by reducing the scale of these tasks, and enabling public officials to focus more specifically on the needs of various groups or geographic areas of the city. This was the approach taken in Dhaka, with the division of the city into parallel administrative entities – Dhaka South City Corporation and Dhaka North City Corporation in 2011. It appears, however, that this approach brings a new set of problems. Specifically, overlapping areas of responsibility are created that increase, rather than decrease bureaucratic inefficiency, while reducing transparency and accountability. As previously noted, recent reporting suggests that the division of the city may have actually further compromised services provision and heightened the chaotic governance.

When considering the governance and administrative needs of megacities, several critical factors emerge. First, governing capacity and technical expertise is essential to the creation of a functioning megacity capable of meeting the needs of all of its residents. Second, the speed with which a city grows to become a megacity places increasing pressures on governance and planning; the faster a city grows, the more likely it is to outstrip the ability of any governing authority to keep up. This finding suggests that identifying cities that are growing at a rapid rate and intervening early to increase governing capacity and plan for future growth could relieve some of the negative aspects of megacities (crime, environmental quality, insufficient basic services). Better understanding of the causes of rural-urban migration may also offer the potential to slow the speed of growth of some of the most vulnerable megacities, such as Dhaka. It is possible, for example, that greater investment in rural development may help stem the tide of migration to major urban centers, providing more time for planning, development, and strengthening of governing capacity as cities grow.

### Quality of Life and Provision of Services

As megacities grow, the demand for space increases, often pushing up the cost of land and housing to the point where it is impossible for lower earning workers to legally and safely live in the city. This issue affects megacities in both LDCs and MDCs; however, the solutions available to individuals differ. As recent protests by fast foods workers in New York highlighted, for those in minimum wage jobs, the higher cost of living in a megacity is often not compensated for by higher wages. In MDCs, many individuals solve this problem by moving out of the city and commuting long hours to work. In LDCs, the solution for many is to move to or remain in the slums that surround most megacities, commuting into the city-proper to work, or engaging in informal economic activities within these communities.

Both responses create costs for communities and individuals. As lower earning residents are pushed out of megacities in MDCs, the cultural and social make-up of the city can change, leading to potential changes in diversity. The value of property in older, working class neighborhoods can increase, forcing out longtime residents while breaking social networks and community identities as more affluent groups move in. As the cost of commercial land and rent increases, smaller independent businesses can be forced out as well, reducing the economic diversity of the city. The increase of traffic into and out of the city as more workers commute also places greater demands on the transportation infrastructure and leads to congestion. Long commutes cost individuals time and money and reduce the time available for community and family engagement. Increased stress on aging infrastructure places greater financial and planning demands on city authorities. If not addressed, infrastructure deficiencies can affect economic activity within and between a city and the surrounding regions.

In the megacities of LDCs, high demand for affordable housing and business property pushes many residents and small businesses into unplanned and unofficial developments—slums—surrounding the city proper. While in the short term these developments alleviate the chronic shortage of space, in the longer term they place additional burdens on the city. Illegal tapping of water, electricity, and other services strain already overextended infrastructure. Lack of adequate sanitation increases the risk of disease, and unplanned buildings are often highly vulnerable to natural disasters, such as floods and earthquakes, or manmade threats such as fires.

Slums are not just residential areas. They are better thought of as parallel cities, with their own economic, social, and political life. The economic activity in these areas falls within the grey economy... not illegal in itself, but unregulated and untaxed. In the short term, grey economies provide a buffer to social and political stability in megacities by providing a livelihood for rural migrants with few skills and little education. However, in the longer term, they compete with economic activity within the formal sector and may fail to contribute to the cost of running the city and providing public services, while still relying, albeit marginally, on those services.

The effect of growth on quality of life for residents in LDC megacities may be more dramatic than for residents in MDCs, but several consistencies emerge. Growth increases the cost of land, and the resulting rise in residential and business costs force out the poorer residents and smaller businesses. In both cases growth, whether regulated and planned (as in MDCs) or unregulated and outstripping planning capacity (as in most LDCs), places increasing pressures on infrastructure and public services. The quality of life for some or all residents in the megacity is negatively affected as services become less reliable and more inefficient.

## Environmental Pressures

Any discussion of megacities at some point comes to the issue of environmental constraints on the growth and safety of the city. In both MDCs and LDCs, megacities test the capacity of the physical environment to support continued growth. Demand for land has seen development expand through reclamation of land (New York and Tokyo, for example) or onto flood plains and drainage areas (as is the case in Dhaka). Not only is such land more vulnerable to extreme weather events, in its natural state it also serves as a safety valve for the city, allowing strong tides and flood waters to dissipate before reaching the city. Development is not only hazardous to those occupying those areas. It also increases risk to the city as a whole. While careful and well researched planning and engineering can mitigate some of the potential dangers of this type of modification of the environment (as was the case for Tokyo's newest airport), it remains risky nonetheless. When development is largely unplanned or poorly understood (as seen in Dhaka), poor urban development can compound existing environmental pressures faced by megacities and place physical and human elements at much greater risk.

Additionally, populations of megacities require vast quantities of water to function and remain safe. Without adequate clean water, sanitation becomes much harder and the risk of disease increases as a result. For poorer residents in the slums of LDC megacities, lack of access to affordable clean water can significantly compromise health and quality of life. The follow-on effects of poor sanitation and unregulated dumping of waste into rivers and the water supply can also compromise the livelihood and health of downstream rural populations.

## Political Power of a Megacity

The emergence of megacities can also have political ramifications at both the national and regional level, particularly if they are not balanced by other large urban centers. The influence of a megacity can result simply from its population density, or from the nature of the political process within the country as a whole. Whatever the cause, the actual or perceived dominance of a megacity for regional and/or

national politics has the potential to affect not only political and social outcomes for the city itself, but also national and regional politics more broadly.

The political power of megacities in democratic MDCs derives from their populations. The sheer weight of voters in a megacity can drive electoral outcomes at both the regional and national level. This trend is seen clearly in the case of New York City, which is predominantly Democratic, versus western New York State, which is predominantly Republican. At the state level, since the majority of New York's population live in the area from New York City north to Albany, Democrats dominate the state assembly and the governor is similarly most likely to be a Democrat. At the national level, western New Yorkers can gain representation in the House, while New York's senators (due to the state-wide election process) are nearly always Democrats, representing both the choice and interests of New York City and northern New York voters. While it could be argued that this political imbalance is simply a reflection of the democratic process, it does have implications for the way in which political incentives drive policies in the state. Senators, Governors, and Presidential candidates know that to be elected they have to appeal to urban, Democratic voters, and Democrats dominate the State Assembly.

This political divide reflects a more fundamental divide between the interests, values, and concerns of largely rural western New York, and the urban center. There is little incentive for senators, or the state assembly, to focus on the needs and interests of this smaller segment of the their constituent population, marginalizing them and undermining their effective representation.

As with New York, concerns over the disproportional influence of Dhaka on national politics in Bangladesh are also rooted in the urban-rural divide. In Bangladesh, the sentiment "as goes Dhaka, so goes Bangladesh" is frequently heard (BRAC University, 2012), and there is a concern that whichever party manages to control Dhaka could control the country as a whole. However, there is a significant difference between the two cases, for Dhaka does not comprise the majority of the population of Bangladesh. So from where, in a democratic country, does this concern arise? It appears that concerns over the political power of the city are less to do with voting patterns and more to do with the exercise of political influence. Politics in Bangladesh is dominated by the rivalry between the Awami League and the BNP. Both parties commonly use extra-institutional means, such as strikes and protests, to force political outcomes. This tactic is often effective, but can only be effectively carried out in an urban area where there is the population necessary to participate, and economic and daily life activity can be effectively interrupted by such actions. The flip side of this dynamic is that politicians are aware that political protests and opposition are much easier to organize in urban areas than in rural zones. For countries with weak political institutions and poorly performing governments and economies, large urban centers can easily turn from a source of power to a source of critical instability, as seen in the 2011 protests in Cairo that led to the ouster of President Mubarak. Keeping the populations of megacities at least marginally content with government policies is arguably a higher priority for politicians than satisfying the demands of rural populations. When the needs and expectations of urban and rural populations diverge, and there are not the resources to satisfy both, it is likely that rural areas and smaller cities will fear losing out to the megacity. In the longer term, failure to address the needs of rural communities by investing in rural development has the potential to increase rural-urban economic

migration, further stressing the capacity of the megacity to absorb and provide for a growing population.

## Conclusions

While we can draw some basic inferences about the potential issues and problems facing megacities by studying Dhaka, the reality remains that any community--megacity, rural, or nation--is unique. A myriad of factors determine the economic, social, and political stability of any political unit. These factors interact to create second- and third-order effects. For this reason, the more information we can gather on a specific megacity, the better able we will be to understand its unique strengths and weaknesses and move away from more generalized expectations.

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## Appendix A: Humanitarian Crisis

| Recovery Services                  |                                           |                                                  |                                               |
|------------------------------------|-------------------------------------------|--------------------------------------------------|-----------------------------------------------|
| Financial Assistance               | Insurance/ Re-insurance                   | Loans/ Micro-Financing                           | Debt Forbearance and Cancellation             |
| Outside Aid                        | Health, Nutrition, Water & Sanitation     | Emergency Shelter, Camp Coordination/ Management | Protection                                    |
| Vulnerable Commerce                | Farming, Fishing & Food Production        | Housing Construction and Maintenance             | Industry and Commerce                         |
|                                    |                                           |                                                  | Early Recovery, Logistics, Emergency Telecoms |
| Readiness and Response             |                                           |                                                  |                                               |
| Civil/Military Authority           | Executive Order/ Emergency Administration | Command & Control Infrastructure                 | Military Readiness                            |
| Emergency & Response               | Fire and EMS Services                     | Civilian Volunteer Corps                         | Route Trafficability                          |
| Preparation and Warning            | Planning and Preparedness                 | Monitoring and Forecasting                       | Multi-Hazard Warning Service                  |
|                                    |                                           |                                                  | Dissemination/ Alert Broadcast                |
| Services Failures                  |                                           |                                                  |                                               |
| Utilities                          | Shelter Destruction/ Degradation          | Water and Sanitation                             | Communications                                |
| Health & Medical Service           | Hospitals and Emergency Rooms             | Availability of Health Care Personnel            | Mortuary Affairs                              |
| Law Enforcement/ Policing          | Policing                                  | Criminal Justice System                          | Prisons and Jails                             |
|                                    |                                           |                                                  | Facilities/ Property Protection               |
| Sources of Human-Behavioral Hazard |                                           |                                                  |                                               |
| Standard Conditions                | Infrastructure Failure                    | Hazardous Working Conditions                     | Housing/ Density Issues                       |
| Human Caused Events                | Industrial Fire Explosion                 | Conflict                                         | Influx of IDP's/ Refugees                     |
| Contamination and Degradation      | Failures in Ecological Security           | Chemical Spill                                   | Nuclear/ Radiological                         |
|                                    |                                           |                                                  | Gas Leak                                      |
| Natural Hazards                    |                                           |                                                  |                                               |
| Ecosystem Disruptions              | Epidemics/ Pandemic                       | Severe Insect Infestation                        | Commodity Destruction / Infection             |
| Wildfire                           |                                           |                                                  |                                               |
| Climateological Hazards            | Flood                                     | Severe Storm                                     | Tsunami/Tidal Surge                           |
|                                    |                                           |                                                  | Drought                                       |
| Geophysical Events (and Space)     | Earthquake                                | Landslide                                        | Volcanic Activity                             |

Appendix B: Intrastate Violence Framework

