

Management of Flooding in Karachi, Pakistan

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Photo courtesy of Getty Images.

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Preface

Severe floodings are a common occurrence in Karachi, Pakistan occurring mainly in the summer due to heavy monsoon rainfall. However, floodings may also occur because of dam's burstings and glacial lake ice breaking due to high summer temperatures. Floodings have several negative impacts on the society, to which the National Disaster Management Authority (NDMA) of Pakistan is responsible for addressing.

Construction projects for real estate can prove to be fatal during high rainfall and flooding. Water can enter the existing sewage system during heavy rains and it can turn the roads into fast-flowing rivers. This causes destruction to the already weakened infrastructure as well as additional health hazards.

There are two seasonal rivers for drainage, the Lyari river and Malir river. According to the Orangi Pilot Project documentation, there are 43 storm water drains that are carried over the two rivers, allowing disposal of waste. Prior to the partition of 1947, the population of Karachi was about 450,000 people. The Gutter Baghicha was a sewage system consisting of more than 1,000 acres of underground pipes. Post-partition, there were about 800,000 people that migrated to Karachi alone but the Gutter Baghicha was reduced to 480 acres due to settlements.

The whole country experiences power outages for several hours, also known as "load-shedding". With flooding, citizens can go for days without electricity. Due to poor infrastructure and lack of insulation, they may be electrocuted. Karachi is a large city but only consists of two landfill sites, located next to each other in the west. From the east, it is about 40 km to reach the site. Due to the distance, solid waste is dumped at the several informal sites along the Korangi Creek. This solid waste blocks the drainage to the sea.

The Orangi Pilot Project created a proposal of a sewage system that consisted of trunks on both sides and were connected near disposal points. It was accepted as the Greater Karachi Sewage Plan. The United Kingdom invested one million pounds. The Korangi Waste Water Management Project was a 100 million US dollar project. After redesigning to use the current system, the cost went down to 26 million and therefore, the loan for the rest was cancelled, therefore the poor infrastructure was continued to be used. There is no permanent institution for research or monitoring of the flooding problems in Karachi or in Pakistan for that matter. The only ones who can accurately depict what happens at maximum points of flooding, behavior patterns, etc., are the local residents.

Mission Statement of the NDMA

The mission of the National Disaster Management Authority of Pakistan (NDMA) is to act as the implementing, coordinating, and monitoring body for disaster management as well as provide guidelines for preparing disaster management plans by different ministries or departments and provincial authorities⁴. The NDMA is responsible for coordinating response in the event of any threatening disaster. Promotion of general education and awareness in relation to disaster management is implemented by the NDMA⁴.

Statement of Purpose

The purpose of this plan is to coordinate with the Orangi Pilot Project in order to create a proposal of a cost-effective sewage system to enhance sanitation⁴. It is imperative to incorporate the Orangi Pilot Project due to the imminent threat to families in low income settlements, those most greatly impacted by disasters like flooding⁴. This proposal would allow the NDMA to create an effective evacuation plan for floodings as well as dealing with the repercussions of the disaster⁴.

Authorities

The National Disaster Management Authority of Pakistan states the composition of the organization as:

“The Federal Government shall, immediately after issue of notification under sub-section (I) of section 3 of NDMA Act 2010, establish an Authority to be known as National Disaster Management Authority. The National Authority shall consist of such number of members as may be prescribed and shall include [the Director General] as its chairperson. There shall be a Director General of the National Authority, to be appointed by the Federal Government, on such terms and conditions, as may be prescribed.”⁴

In order to carry out assigned tasks, an organizational structure is divided into three wings: Administration & Finance Wing, Disaster Risk Reduction, and Operations. Their functions are as described below:

Administration & Finance Wing⁴

- *Manage all administrative and financial matters of NDMA.*
- *Provide complete administrative support to NDMA Operations Wing.*
- *Order, procure, transport and keep record of relief goods.*
- *Management of human resource and related matters.*
- *Management and maintenance of NDMA transport vehicles.*

Disaster Risk Reduction Wing⁴

- *Handle all matters related to Disaster Risk Reduction policies, risk insurance, flood related issues, disaster awareness, and National Disaster Management Committee (NDMC).*
- *Implement, execute projects and evaluate all matters related to National Disaster Management Plan (NDMP).*
- *Monitor and evaluate plans, strategies at national, provincial, and district level as well as civil sector.*

- *Mainstream disaster risk reduction into development sector.*
- *Manage international cooperation, global frameworks, and regional organizations.*
- *Coordinate with United Nations agencies, bilateral/multilateral organizations and international non-governmental organizations (INGOs)/ non-governmental organizations (NGOs).*

Operations Wing⁴

- *Manage National Emergency Operations Center (NEOC).]*
- *Supervise and coordinate relief and rescue operations (inland and foreign).*
- *Prepare situation updates/briefs.*
- *Make contingency plans for the country.*
- *Supervise all matters related to Urban Search and Rescue (USAR) teams.*
- *Make briefs/presentations for the Prime Minister, President, members of Senate and National Assembly and other dignitaries.*
- *Coordinate relief effort with federal/provincial authorities, armed forces, and organizations.*
- *Contingency plans for the full spectrum of disasters faced by Pakistan.*

Definitions

- ❖ **Disaster:** a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources⁵
- ❖ **Incident Command System (ICS):** standardized approach to the command, control, and coordination of emergency response providing a common hierarchy within which responders from multiple agencies can be effective⁶
- ❖ **International Disaster Assistance (IDA):** an IDA account provides critical humanitarian assistance in response to natural disasters, conflicts, and other emergencies around the world⁷
- ❖ **Local Health Official (LHO):** individual tasked with the lead authority in a public health emergency
- ❖ **Mutual Aid Agreement:** provides mechanisms to quickly obtain emergency assistance in the form of personnel, equipment, materials, and other associated services⁸
- ❖ **National Oversight Disaster Management Council:** council established by the government of Pakistan to improve the transparency in the distribution of flood relief⁹

Communication Plans

To prepare and respond to flooding events, the Pakistan Government, in collaboration with the National Disaster Management Authority of Pakistan, will devise an Incident Command System (ICS) to maximize response effectiveness. This will be achieved by identifying Local Health Officials in each of the 8 districts, developing a registry of skilled staff in partner agencies for surge capacity, and using a joint database for emergency information and contact information.

- Internal Communication:
 - Staff Directory + Chain of Command (cell phones, text, landlines)
 - Communication Methods
- External Communication:
 - Contact Information of External Agencies & Organization
 - Briefings
 - Responsibilities for External Communication
 - Public messages (easy-to-understand, translated in local languages)
 - Local media

Mutual Aid Agreement

This Mutual Aid Agreement will help utilize opportunities to create a wider, more effective humanitarian response to flooding in Pakistan. The main objectives of the agreement are as follow:

- Strengthen and develop existing humanitarian coordination structures in districts of Karachi¹⁰
- Support capacity to deliver responsible humanitarian action through local authorities and agencies¹⁰
- Generate local evidence for humanitarian strategy through data collection, analysis, monitoring and evaluation mechanisms¹⁰

Mutual aid agreements should be with the following entities:

- Médecins Sans Frontières /Doctors Without Borders
- USAID
- UN agencies
- World Food Programme (WFP)

Concept of Operations

Population vulnerability

Pakistan ranks 9th in terms of flood-affected countries worldwide¹. Since June 2020, 400 people have died, 400 were injured, and over 200,000 homes were displaced due to flooding in the Sindh province¹. The Sindh province, located in Southeastern Pakistan, is the most affected region. Karachi received record breaking rainfall in August 2020, measuring 490 millimeters (19 inches) of rain. 200 millimeters occurred within just twelve hours¹. Urban flooding was caused due to clogged stormwater drains. More than two million people in the Sindh province have been affected by the floods and over 65,000 people have been in relief camps¹.

Due to the poor standard of hygiene set up in relief camps, there has been an increase in the spread of infectious diseases¹. Flooding has been shown to cause epidemics of waterborne outbreaks such as diarrheal and enteric diseases due to contamination of water. This occurs due to inappropriate sewage disposal systems and disruption of purification¹. Direct contact of polluted water may cause skin and eye infection such as dermatitis and conjunctivitis¹. Post-monsoon season also marks the beginning of the malaria epidemics. Previously during the 2006 Karachi floods, there was a sharp increase in the incidence of malaria and the prevalence of cerebral malaria had increased as well. Pakistan also does report a rise of Hepatitis A due to their failing water and sanitation supply¹.

Sewage System

It is essential that adequate sanitary and hygienic provisions are needed in flood affected regions. This includes a proposal to reconstruct a correctly built sewage system to withstand the capacity of the high rainfall¹. As recommended by the Orangi Pilot Project, the Greater Karachi Sewage Plan should be implemented into full effect. According to the 2010 design plan, the objective of the project was to address the sewage disposal problems of Karachi and to save the citizens of Karachi from health hazards and protect the environment and marine life¹. The scope of the plan included constructing two intercepting conduits that would be built along both sides of the Lyari river¹.

Relief Camps

As mentioned earlier, a primary concern post-flooding was the conditions of the relief camps. Many of those who had lost their homes due to the floods were displaced into camps that had become breeding sites for infectious pathogens¹. It was noted that flood relief expenditure for 2010-2011 year were as followed. Table 1 below describes the cost of this expenditure.

Table 1: Estimated Expenditure for Flood Relief Program¹

Food Items	
Particulars	Expenditure
Family Packs	Rs. 1,041,823.624
Drinking Water	Rs. 19,792,382
Non Food Items	
Particulars	Expenditure
Tents, Plastics Sheets, Mosquito Nets	Rs. 1,020,306,020
Dewatering Pumps	Rs. 18,800,220
Miscellaneous	
Transportation	Rs. 71,709,340
Misc	Rs. 59,931,223
Total Expenditures	Rs. 2,232,362,809

It is imperative to increase funding to ensure that those affected by the floods are not adversely impacted even further by contracting dangerous infectious diseases in these camps. As

per the National Disaster Management Authority of Pakistan, funding was provided by relevant stakeholders, federal and provincial resources, and international support¹. Local NGOs should ensure that get provisions that include water purification kits, shelter items, hygiene supplies, etc. Aside from rations and shelter, health professionals (local and non-local) should be able to provide immediate medical attention, as well as ensure that all health precautions are being taken in these camps¹. It is important to increase funding for medical supplies and vaccinations for Hepatitis, Malaria, and other infectious diseases as it has been noted that these diseases are likely to spike after a flooding disaster¹.

Matching Resources to Needs

Field Assessment. In collaboration with key public and private sector stakeholders, a rapid field assessment will help identify critical needs and assess the extent that public health, medical care and human services infrastructures and delivery are affected. Moreover, standardized reporting practices will facilitate data capture prior to a flooding emergency and leveraged into actionable information to support field operations. A vulnerability analysis and mapping should also be conducted to identify affected populations and their needs.

Human Services. In parallel to establishing situational awareness, it is important to ensure continued service delivery when in the event that a flooding emergency disrupts services, and efficiently process requests for assistance. To address unmet human services needs created or exacerbated by the disaster improve outcomes for client populations and meet surge requirements for new disaster-caused needs¹¹. This will address the following:

- food security and nutrition
- health
- shelter and non-food items
- water, sanitation and hygiene (WASH), logistics
- emergency telecommunications
- epidemiological and environmental surveillance

Resources should be conceptualized to include financial resources, manpower, and specific supplies and equipment. Finally, they should be allocated for and accessible and accountable to those responsible for execution.

Evaluating Effectiveness of Response

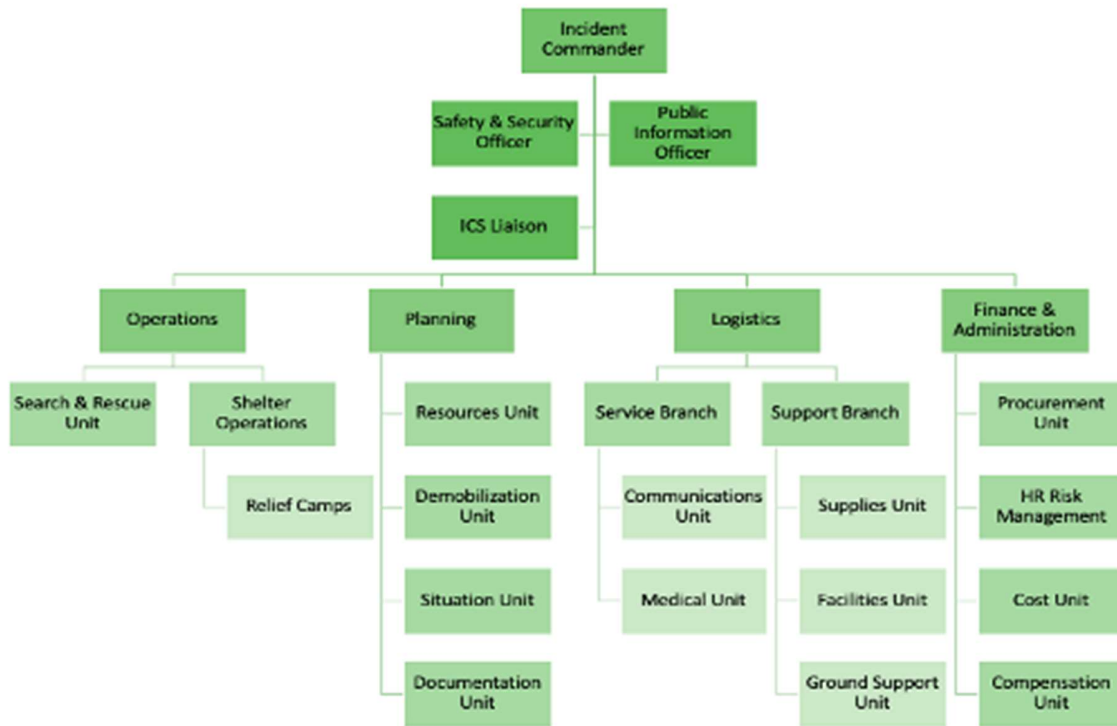
To evaluate the effectiveness of the response, personnel and responders should participate in training activities and drills. The training process involves explaining the provisions of the plan to the administrators and personnel of the departments that will be involved in the emergency response and include a flooding response simulation. Moreover, to ensure a comprehensive approach, involving vulnerable populations is key to the planning process. It is important for communities to be aware of the response system, what is expected of them, and steps they can take for risk mitigation in the event of a flooding. To measure the effectiveness of the response, the plan should be regularly evaluated and adjusted as needed. is how quickly it gets an organization back to normal operations in the case of a major emergency.

ANNEX I – THIRA

Natural	Technological	Human-caused
Resulting from acts of nature	Involves accidents or the failures of systems and structures	Caused by the intentional actions of an adversary
<ul style="list-style-type: none"> · Floods. Pakistan experiences severe floods, especially during monsoon season. In 2010, these floods devastated 78 districts and covered over 100,000 km, affecting more than 20 million people, requiring US \$10 billion for recovery and reconstruction. · Earthquake. 73,000 people died during the 2005 earthquake, 128,309 people were injured, 600,000 houses were destroyed, rendering 3.5 million people homeless. 6,000 educational institutions and 574 health facilities were destroyed or damaged. The earthquake caused extensive damage to roads, water and sanitation facilities, power, and telecommunication infrastructure and other services while civil administration in affected areas became largely dysfunctional with the 	<ul style="list-style-type: none"> · Disease outbreaks. Pakistan battled multiple infectious disease outbreaks in 2019, particularly in the capital city of Karachi. Outbreaks include, dengue, XDR typhoid, HIV. In addition, Pakistan is one of the last two polio endemic countries. Emerging and infectious diseases pose a significant threat to public health security. · Transport Accidents. Transport accidents are very common in Pakistan. Hundreds of people have been killed in train and road accidents. Recent incidents include the Air Blue crash in 2010 and the 2012 Bhoja air crash 2012 Islamabad. · Urban Fires. Pakistan has experienced major urban fire incidents in Karachi causing deaths and heavy financial damages to property. The chances of fire increases with urbanization, unplanned CNG gas filling stations in urban areas and unauthorized LPG 	<ul style="list-style-type: none"> · Displacement. Pakistan is a diverse society, ethnically, linguistically, religiously and culturally. This diversity has sometimes led towards civil conflicts amongst various social groups. These conflicts have led to loss of life and damage to property, creating insecurity for marginalized groups and causing internal displacement of communities. · Terrorist Attacks. Terrorism (bombing, kidnapping, assassination) has been on the rise in Pakistan, due to unemployment, lack of education, poverty, religious extremism, and proximity to Afghanistan.

<p>destruction of a large proportion of government buildings.</p> <ul style="list-style-type: none">· Drought. Pakistan is located in a seismically active zone, due to its proximity to the Indo-Australian and Eurasian plates. Droughts are also a significant hazard, as 60% of the country's land is classified as semiarid or arid.	<p>gas stores. The sale of petroleum products in the residential areas is also widespread in the cities. These practices, combined with poorly equipped fire services, pose a major fire risk.</p>	
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ANNEX II – ICS



ANNEX III - Community Training

Training Seminar Title: Community Preparedness for Flooding in Karachi	
Objectives of your Training Seminar (What mitigation strategy are you advocating?)	Flood Preparedness
Estimate Length of Training	1-2 hours
Target Audience and max size of audience.	Seminar to be held within small communities in order to prepare as many families as possible; about 150 people max.
Who would be a good candidate (e.g., structural engineer, health dept. official, first responder?) as Facilitator of this session? Why?	Seminar to be facilitated by members of NDMA in combination with NGOs in order to cover the large city of Karachi.
What do you want community members to do as a result of their attending this session?	<ol style="list-style-type: none"> 1. To be aware of areas to avoid (areas that tend to have high levels of water). 2. To understand what should be set aside like important items such as money, documentation, etc., to take immediately during evacuation. 3. To prepare an emergency list of contacts addresses. 4. To understand proper evacuation procedures 5. To understand the correct procedure when returning home after a disaster. 6. To understand what to do with livestock if applicable. 7. To reduce the spread of pathogens after a flood. 8. To understand procedures if individuals think they've contracted a disease immediately after a flood.

Strategies to increase community uptake of your mitigation (We have lots of useful links for checklists on the Course Home page under the Important Links page.)

1. Advertise via flyers/brochures.
2. Create a video/presentation that is comprehensible for individuals of various education levels.
3. Create flyers in both English and Urdu stating evacuation plans and other outlines mentioned in the presentation.
4. Provide kits that would be helpful in preparing families for the flood in advance.
5. Provide emergency contact cards.

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