DISASTER EDUTAINMENT AND EMERGENCY RESPONSE TRAINING CENTER

ARC 512
Seminar II

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Abstract

Bangladesh has been exposed to many natural disasters, i.e., cyclones, floods, due to its geographical location. The people living in the riverbanks and the coastal area have always been coping with disasters. However, the rapid urbanization and the recent urban hazards indicate the extreme vulnerabilities of the cities of the country, especially the megacity, Dhaka.

More than 8,800 people lost their lives in the recent Nepal earthquake in April, 2015. If the same situation happens in Dhaka, more than fifty percent of the structures will collapse. The casualties will rise manifold as our emergency response is not highly efficient. The scenario will be unimaginably devastating. The project aims to develop the emergency response of the city.

The site, Fire Service and Civil Defense Training Complex, at Mirpur 10, provides a great opportunity to create the exposure the firemen in our country needs; during 9/11 the firemen were portrayed as heroes, the situation is not similar in our country. Furthermore the project aims to create aspiration among the citizens, especially the younger generations, of the country to consider a career in civil defense. To paint firefighters as heroes again, and deservingly so, because they are the first responders in any case of disaster, anywhere in the world.

Nonetheless, the condition of the infrastructure of Dhaka city is quite complicated and it is not possible to improve the efficiency of emergency response teams. Therefore, an idea to use citizens as the first line of defense was envisioned. This project provides a guideline for the citizens to train themselves as emergency responders.

Disaster Edutainment and Emergency Response Training Center- creates within the visitors a familiarity that inspires them to get more involved; it chisels their knowledge with hands on experience through simulators. Simulators that can replicate certain scenarios in different disasters, will add another dimension to education, which is entertainment.

Acknowledgement

All graces to Almighty Allah for everything.

I am thankful to my parents for their unconditional love and support; to the mentors of BRAC University for guiding me through five years.

I am grateful to my brother, cousins and my friends for their constant moral support.

...and everyone else who kept me in their prayers.

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1.1 Background

Bangladesh, a relatively small country, became independent in 1971 after hundreds of years of oppression. Forty four years have passed after the liberation and since then Bangladesh have shown an impressive track record in extreme poverty reduction. In the past decade alone, the economy has grown at nearly 6 percent per year, and human development went hand-in-hand with economic growth. Poverty dropped by nearly a third, coupled with increased life expectancy, literacy, and per capita food intake. More than 15 million Bangladeshis have moved out of poverty since 1992.

This has aggravated the population shift to urban areas. The urban share of the total population of 150 million people amounted to approximately 29 percent in 2013, compared to 21 percent 20 years earlier. By 2050 the population will have grown to 200 million, and 52 percent will live in urban areas. The economy of Bangladesh was mostly dependent on agriculture, however, the contribution of agriculture to GDP fell from 30 percent in 1990 to 20 percent in 2010, whereas the contribution of urban sector to GDP increased from 37 percent to an estimated 60 percent over the same period (Bangladesh Urban Resilience Project, 2014).

Recent urban hazards in Dhaka indicate the extreme vulnerability of this megacity. The collapse of Rana Plaza on 24th April, 2013, alone caused the death of 1,127 people. It happened mainly because of the poor construction of the building, poor site location and sub-standard building materials. The disaster worsened with the lack of local capacity to perform search and rescue; this included heavy lifting equipment and specialized training. The search and rescue program depended fully on ad-hoc decisions which highlighted the deficiencies of emergency response during any disaster in Dhaka city. A total of 7 million people live in the jurisdiction of Dhaka City Corporation and 15 million in the wider Dhaka metropolitan area, all of these people are susceptible to any major disasters in Dhaka city.

The geographical location of Bangladesh has made this country vulnerable to cyclones and floods. The coastal region of the country has faced many disastrous cyclones. From 1980 to 2008 alone, Bangladesh has experienced 219 severe climatic events which cost around 16 billion USD (UNDP, 2011). As a result, Bangladesh government has taken initiatives to reduce disasters in the coastal area. However, economic growth of the cities has attracted people from the low-lying areas in the search of financial solvency. The industrial boom, especially in the readymade garments sector, has allowed more rural to urban migration. The concentration in the urban slum areas are increasing day by day. Therefore, in the urban context, natural and manmade calamities cause a number of after effects, these increase future vulnerabilities by disrupting city's functionality and causing injuries and fatalities. Moreover, the frequency of these events is increasing with the vulnerabilities of the urban areas. As a result, disaster risk reduction has become more and more important. The major urban disaster risks are found in flood and water logging, earthquake and fire hazards.

On top of that, due to the continuous process of urbanization, the cities are becoming more prone to physical, social and economic vulnerabilities. According to Shaw, 2013, urbanization has resulted in the construction of unstable buildings in informal and unplanned settlements, as well as critical lack of facilities and basic urban services, intensified pollution and the loss of natural, open spaces such as water bodies and greeneries. These have both long term and short term effect on the day-to-day life of urban dwellers, particularly on the informal settlement dwellers.

Dhaka covers an area of 360 sq km under the jurisdiction of Dhaka North and South City Corporation; there are 10 zones and 92 wards. Among these the most densely populated ones are, Lalbagh, Bangshal, Rampura and Sutrapur. The density of urban areas is increasing with the stresses put upon the coastal areas by climate change. The urban communities are compelled to adapt to changes and mitigate risks.

However, the situation of Dhaka city is not quite favorable to its dwellers. The frequency of natural hazards is increasing with the exponential raise of climate change. It is imposing a noteworthy risk to city dwellers, mostly on the urban poor. Physical, social and economic vulnerabilities characterize the urban context of Dhaka, and particularly the slum areas. These vulnerabilities amplify the risk of urban hazards; moreover, they are also entangled with one another.

A number of non-government organizations, along with local government, help prepare urban dwellers for potential disasters. However, these attempts are not integrated; as a result, the city is not acquiring any organized and sufficient solutions.

1.2 Project Rationale

It is not just economic growth that is fueling urbanization; climate change is also playing a vital role in this. Climate change has made it a state of emergency to migrate from the low-lying rural areas to the urban areas. As a result, urban expansion has become a common and universal development challenge. According to Anna, 2011, urban expansion can thus be costly, wasteful and ecologically destructive; by 2050, the urban population of the developing world will be 5.3 billion, Asia alone will host 63% of the world's urban population, or 3.3 billion people. The UN predicts that there will be millions of environmental migrants by 2020, and climate change is one of the major drivers (Anna, 2011).

However, it is felt that sufficient experience is lacking with how to cope with these issues. Firstly, there is a massive gap in information, an astonishing lack of knowledge about how we should respond to the effects of disaster. Secondly, urban poor are the most vulnerable in the event of any disaster; therefore we need to raise awareness among the urban poor to mitigate disaster risk. Thirdly, technological advancement is also needed for the better understanding of disasters. These technologies have be developed out of greater research investments into meteorological science, better understanding on how to use those technologies in the field and more wholesome appreciation of the social and cultural dimension into which those technologies might be implanted.

In order to minimize these problems, emergency response team should be more prepared and agile. Like any other countries, the first and the foremost emergency responder during any sort of disaster is the Fire Department. In Bangladesh Fire Department has been integrated with the Civil Defense department since 1982 and has been named Fire Service and Civil Defense Department (FSCD). Nonetheless, the ratio of fire stations to the population of Dhaka city is very poor. Even though with the development of technologies the public services should

develop, it has not happened in our country. The situation has worsened to a state where the development of these services in order to make them efficient will require major changes in the city's infrastructure.

Therefore, besides developing these government response teams, such as, fire department, local hospitals, police stations, one should emphasize on the non-government organizations working in this sector. In the case of Rana Plaza, we noticed that these organizations and general people came to help besides the government. Hence, a center is needed to support this act and to further develop the community emergency response to an efficient level. A center that will reveal the lifestyle of a fireman for young generation to aspire, where the fear associated with disaster can be overpowered through entertainment. This will have an edutainment sector which will provide disaster related education through entertainment for general people, an institute to further develop the community emergency response skill, a fire station with ancillary facilities and a clinic.

1.3 Project Introduction

Project Name: Disaster Edutainment and Emergency Response Training Center

Location: Mirpur 10, Dhaka, Bangladesh

Site Area: 11 Acres

Client: Fire Service and Civil Defense Department

Dhaka was originally designed to home a million people before the country’s independence in 1971, however, Dhaka has now grown into a chaotic megacity of more than 12 million dwellers (Ansary, Jahan, 2014). In addition, Dhaka is loaded with haphazard and unplanned development. There is also significant risk of flood and earthquake. A low to moderate level of earthquake may cause severe damages to the life and property that may go beyond the capacity of Dhaka City Corporation.

Disasters are frequent events in Bangladesh. Disaster research in Bangladesh has been dominated by geographical approach probably because disasters are mainly considered as physical phenomena. However, although many disasters are related to physical phenomena,

they mostly affect society, community, people, institutions and the overall environment. The city loses its structure, people lose their belongings. Re-developing after a disaster in more difficult than coping with the disaster, it takes years to finally overcome the effects of a major disaster. Especially, in developing countries like Bangladesh, the socially, economically and environmentally vulnerable people have to start from beginning after any disaster. Moreover, the trauma prevails within the victims. The survivors of the Rana Plaza incident still face psychological trauma more or less.

The reasons behind Dhaka being a vulnerable megacity have already been discussed. The importance of an institution to integrate the attempts to reduce disaster risk has also been established. Therefore, this thesis project emphasizes on the commonly associated fear with disaster. This project has explores the architectural intervention on disaster education. Using technology and architecture, the fear of facing a disaster has been blended. An edutainment center that functions just like a theme park, instead of rides, it has simulators, that simulates disasters, exaggerates these to a certain point so that people will get a firsthand experience of disasters and learn what to do during a disaster. This will also motivate them to get further involved in disaster response, learn more about a firefighter's lifestyle.

The institute will follow a proper curriculum and provide a different types of course to improve the skill of the amateurs in this sector. We have already seen examples of different organizations and volunteer groups working for disaster risk reduction, they can develop their skill in this institute.

A fire station is the face of government in case of a disaster, hence a properly designed station with all the amenities will inspire the fire fighters to be more dedicated to their profession. Furthermore, this will allow the citizen to aspire the life of a firefighter, to dedicate their lives in the profession.

1.4 Aims and Objectives

Every natural disaster causes obvious physical damage to communities' inhabitants and infrastructure. However, many disasters also leave important psychological effects on people that tend to be much less visible and overlooked. Being exposed to disasters can be so traumatic that it changes how individuals see the world and their future. Researches show that,

the psychological impact of disasters occur differently among men and women, boys and girls; it is because they have distinct physical vulnerabilities that shape their ability to recover. On average, disasters and their subsequent impacts kill more women than men. Especially in our country, in the coastal areas, many women refuse to go the cyclone shelter because of gender issues. Sometimes they do not want to go there without their husbands. In urban areas on the other hand, a lot of people panic in case of disasters. For example, during the Nepal earthquake, there were many incidents where people tried to evacuate their buildings in such a hurry that they injured themselves. There were incidents where people tried to get on the ground floor from tenth or eleventh floors using the stairs and panicked in the midway. The government, on the other hand, is not equipped enough to perform rescue and relief task in the most effective manner. Therefore, building awareness is a must, especially in the slum areas which are more vulnerable to disasters. Each and everyone should know what to do in case of emergency; they should be empowered by enabling them to tackle these and other challenges, because local people and organizations are the main actors in risk reduction and disaster response in any case.

Therefore, this thesis project is an attempt to provide a way of using the resources of both government and local for disaster risk reduction. Firstly, the main objective is to find a holistic approach to reduce socio-economic vulnerabilities to disaster through community based disaster risk reduction and a central base to organize all the attempts.

Secondly, this aims to address the issue on a large scale and provide adequate facilities for disaster management in Dhaka city.

Thirdly, this will attempt to meet the need of technological and professional support through research and studies.

1.5 Basic Programme

The functions can be divided into two segments, for disaster edutainment and emergency response,

for disaster edutainment,

- orientation zone, to orient people with the objectives of the center,
- simulators, that simulate different scenarios during disaster,
- evaluation zone, to know one's position,
- seminar halls,
- auditorium,
- equipment zone,
- exhibition hall,
- class rooms,
- instructors lounge,
- administration,

for emergency response,

- fire station
- clinic

CHAPTER 02: SITE APPRAISAL

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2.1 Site Location

The site is located at mirpur 10 noad, Dhaka. It is surrounded by Begum Rokeya Avenue and Mirpur road on two sides. There are many civic spaces around the site. The site is under the jurisdiction of Bangladesh Government.

2.2 Site Rationale

Geographically the site is located at a public hub of Dhaka city. Therefore, it is useful for the exposure that the fire service of our country needs. There is already a training complex for professional firefighters, however, the complex is shifting to Purbachal. Hence, the whole area can reveal itself to the public and reveal the lifestyle of a fireman. It can become the annual disaster education zone for the school children, for the slum dwellers as they the most vulnerable ones.

Figure 01: Site (Google Image)

Secondly, this area is directly related with emergency response, there is already a proposal for a clinic that will serve disaster affected people. So, there is opportunity for emergency response team to develop and grow.

Thirdly, the site is surrounded by major primary roads of the city. It is highly accessible and it is surrounded by mixed use zones. In the Metro Rail Plan there is supposed to be a metro station at the mirpur 10 junction, which is adjacent to the site.

Figure 02: Infrastructure Map (Author)

Figure 03: Solid Void Map (Author)

2.3 Site Surroundings

The site is surrounded by different zone, there is sports are, the national stadium, swimming pool and the indoor stadium are located right beside the existing site. This site is the location of

a future metro station. The noad is always busy traffic and there are multistoried shopping centers, residential zone, the famous mirpur benarashi palli.

The mapping shows more open spaces around the site, but those are not accessible for the public. There are a number of schools around the site as well.

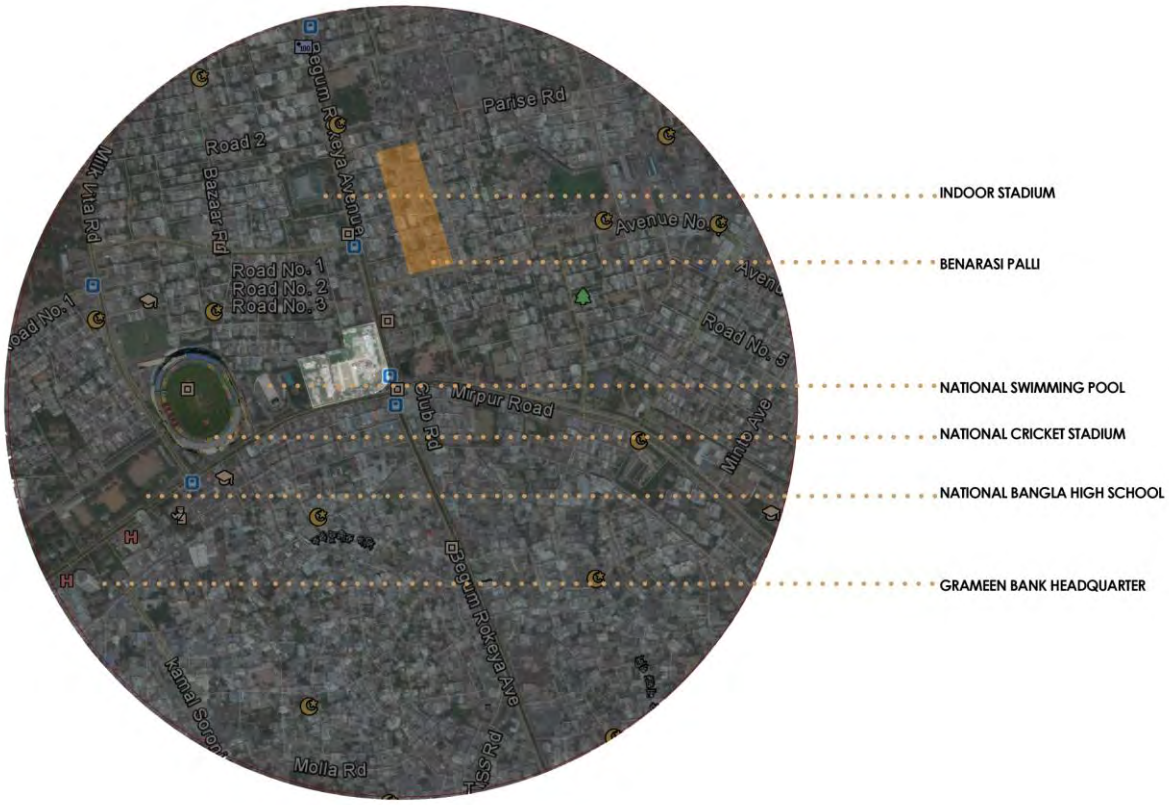

Figure 04: Site Surrounding (Author)

2.4 Site Photographs

Figure 05: Site Images (Author)

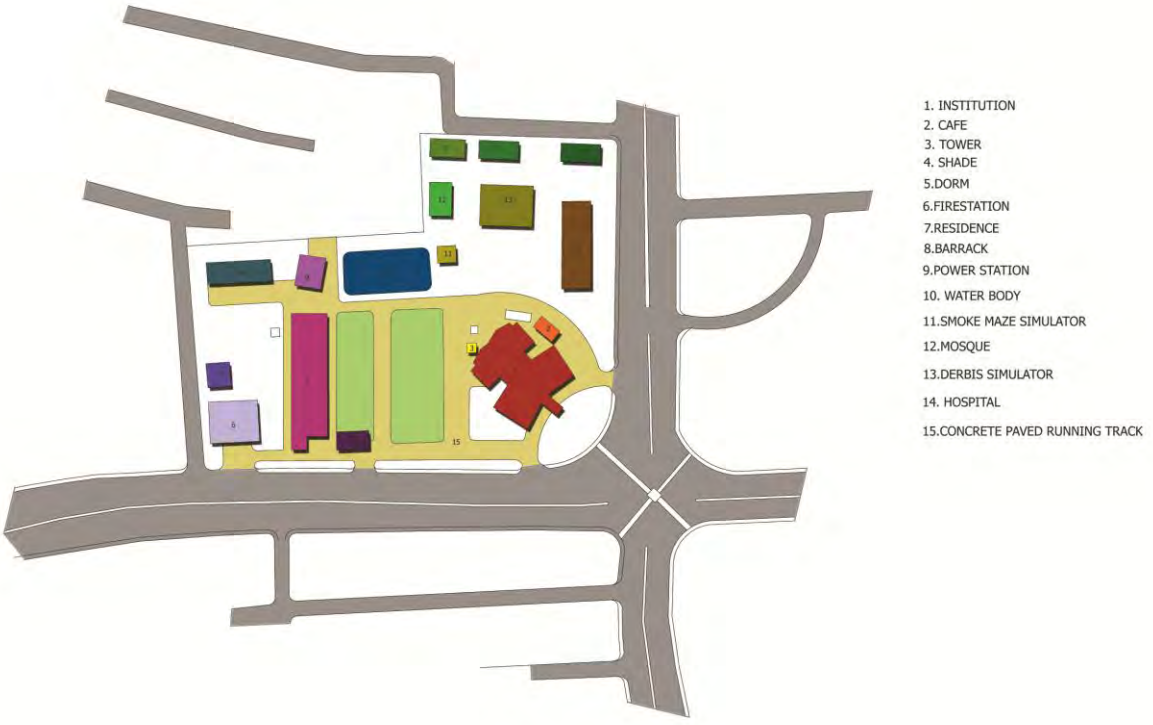

Figure 06: Existing Site (Author)

Figure 07: Site Images (Author)

2.5 SWOT Analysis

Strengths

- Wide roads on all sides of the site
- Footpaths along the roads
- Number of universities and schools
- Number of markets
- Important Landmarks around the site
- Large amount of green
- Presence of water bodies and open space

Weakness

- Illegal car parking
- No proper bus stops
- Rickshaw banned
- Some areas are restricted
- Restricted green
- Restricted water bodies
- Restricted open space

Opportunities

- Reduce surrounding traffic
- Footpaths extends to form plaza
- Encourage pedestrian activities
- Connect all civic spaces
- Space for vendors
- Maximize the utilization of the area by proper planning and creating public spaces.
- Incorporate the green spaces and create large open spaces, parks, gardens, landscaped plaza, etc.

- Preserve eco system, home of other animals, birds.
- Plantation can make the air clean

Threats

- Rapid development of infrastructure can lead to unplanned growth
Increase in land value.
- Unplanned settlement, unfavorable growth, encroachments
- Unplanned development can create adverse environmental
impacts

CHAPTER 03: LITERATURE REVIEW

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3.1 City Overview

Dhaka is the capital city of Bangladesh. It has a populations of more than 18 million people in the Greater Dhaka Area and has become the tenth largest city in the world. It is surrounded by Buriganga, Turag, Balu and Shitalakshya river. It is one of the major cities of South Asia, being Bangladesh's seat of government and an important financial and cultural center, alongside Chittagong. It is historic city and was called the City of Mosques and the Venice of the East.

Modern Dhaka is one of the fastest growing megacities in the world. It has a diverse economy, a high literacy rate, 74.6% and rapidly developing infrastructure. Its transport system is undergoing huge redevelopments, the construction of a number of flyovers, a metro system, and elevated expressway and the Hatirjheel canal and bypass project have changed the scenario of Dhaka city's transport system. However, the city faces major challenges, for example, poverty, pollution, crime, congestion, political violence, lack of amenities and poor management. The city faces water logging every year during the monsoon season and makes it difficult for the city dwellers, whether they come from the upper class or urban poor, to travel and live in this city.

3.1.1 Geography

Dhaka is located in central Bangladesh at 23°42′N 90°22′E, on the eastern banks of the Buriganga River. Geographically, it is at the center of the country. The city lies on the lower reaches of the Ganges Delta and covers a total area of 360 square kilometres (140 sq mi). It consists of 49 thanas-

Lalbagh, Kotwali,Hazaribagh, Sutrapur, Ramna, Motijheel, Paltan, Dhanmondi, Mohammadpur, Tejgaon, Gulshan, Mirpur, Pallabi, Shah Ali, Turaag, Sabujbagh, Dhaka Cantonment, Demra, Shyampur, Badda, Kafrul, Kamrangir char, Khilgaon, Uttara etc. In total the city has 130 wards and 725 mohallas. Dhaka District has an area of 1,463.60 square kilometres (565 sq mi) with a

population of 18,305,671 in 2012; and is bounded by the districts of Gazipur, Tangail, Munshiganj, Rajbari, Narayanganj, Manikganj. Tropical vegetation and moist soils characterize the land, which is flat and close to sea level. Moreover, there are swamps in the peri-urban area of the city. This leaves Dhaka susceptible to flooding during the monsoon seasons owing to heavy rainfall and cyclones.

3.1.2 Climate

Dhaka is within the monsoon climatic zone. It experiences a hot, wet and humid tropical climate. Its annual average temperature is 25 °C (77 °F). Approximately 87% of the annual average rainfall which is 2,123 millimeters (83.6 inches) occurs between May and October. Nonetheless, with the increase of air and water pollution due to traffic congestion and industrial waste are causing serious problems affecting public health and the quality of life in the city. Water bodies and wetlands around the city are exponentially disappearing to accommodate the land scarcity of Dhaka city. They are being filled up to construct multi-storied buildings and other real estate developments. It is also threatening the biodiversity. The scenic beauty of the Buriganga river has already been destroyed due to the uncontrollable amount of waste disposal into the river.

Climate change is one of the main reasons of migration from rural to urban areas that has caused a steep rise in the slum population of Dhaka. This has raised the human induced environmental problem. The fear of water-borne diseases and outbreaks of several other diseases have increased manifold. A UN and WWF report shows that Dhaka tops the risk of climate change in Asia.

3.1.3 Demography

The population of Dhaka (areas under the jurisdiction of the Dhaka South City Corporation and Dhaka North City Corporation) stands at approximately 7.0 million. The city, in combination with localities forming the wider metropolitan area, is home to over 15 million as of 2013. The population is growing by an estimated 4.2% per year, one of the highest rates amongst Asian cities. The continuing growth reflects ongoing migration from rural areas to the Dhaka urban region, which accounted for 60% of the city's growth in the 1960s and 1970s. More recently, the

city's population has also grown with the expansion of city boundaries, a process that added more than a million people to the city in the 1980s. According to Far Eastern Economic Review, Dhaka will become a home of 25 million people by the year 2025. The literacy rate in Dhaka is also increasing fairly quickly. It was estimated at 62.3% in 2001. The literacy rate had gone up to 72.7% by 2010 which is significantly higher than the national average of 56.5%.

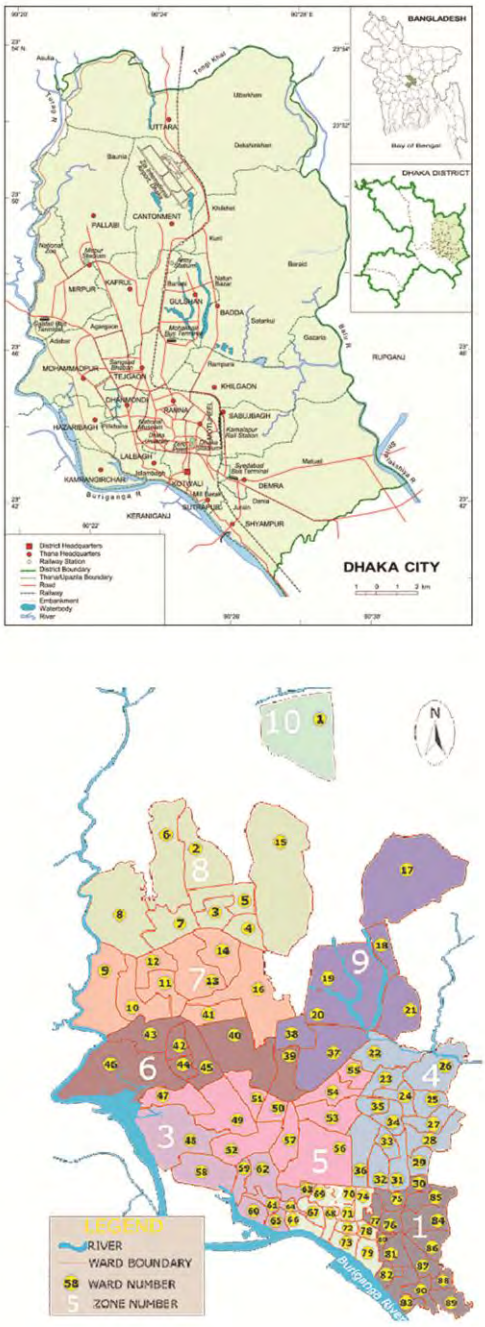

Figure 08: Dhaka Map (Google)

3.2 Urban Hazards

In the urban context of Bangladesh, the increasing frequency of natural hazards as a result of increasing climate change poses significant risk to city dwellers. Hazards include floods, earthquakes and fires. Climate change aggravates these hazards through direct and indirect avenues. It increases the frequency and severity of floods. Moreover, with rural-urban migration increasing as a result of the climatic changes experienced throughout Bangladesh, hazards in urban areas are magnified. Increasing population pressures accompanied by poor infrastructure and a lack of public services heightens the risks posed (Cavill and Sohail, 2004; Dewan, 2013).

Within Dhaka, hazards are most extreme amongst communities inhabiting low-lying slum areas. The existing physical, economic and social vulnerabilities of slum residents heighten their poverty, marginality and disenfranchisement, making them highly susceptible to disasters and their lasting effects. Within slum communities, children, women and the elderly can be understood to be more vulnerable due to having a greater lack of autonomy. The government budget for DRR is severely limited, and there is a critical lack of insurance, development plans, emergency teams and early warning systems in some areas (Shaw, 2013). Of the four ADPs within which World Vision work, Dhaka Shishu ADP and Kamalapur ADP are considered by World Vision"s staff to be most exposed to disaster risk. Their construction on weak foundations and low lying topography reinforces their climatic vulnerabilities.

3.2.1 Floods and Water logging

Due to the location of Dhaka"s slums on relatively low lying terrain, flooding and subsequent water logging is common experiences. Slums along the water"s edge are particularly exposed, yet these are inhabited by almost 30 per cent of Dhaka"s population (Shaw, 2013). In recent years, Dhaka has faced extensive water logging during the monsoon (May to October). Flooding is caused by both the increasing water levels of peripheral river systems, heavy rainfall and seasonal tidal affects. After a flood, parts of the city become waterlogged for several days. During normal flooding, many roads become inaccessible for as much as eight hours, whilst during heavy rainfall; this can increase to a period of twelve hours and upwards (Shaw, 2013). Flooding has become as common and regular a problem as water pollution, traffic congestion, air and noise pollution and solid waste disposal. The main causes of such water logging are inadequate drainage systems, natural siltation, the absence of inlets and outlets, a lack of

proper maintenance of the existing drainage system, and the disposal of solid waste into the drains and drainage paths. In some of the slum areas, water lays stagnant year round, obstructing mobility and posing serious health hazards.

Dhaka receives about 2,000 mm of rainfall annually, of which almost 80% falls during the Monsoon. Floods are one of the main natural hazards affecting the city and are associated with river water overflow and rain water stagnation. The city has become more vulnerable to intense urban flooding due to heavy and unpredictable rainfall in recent years. The drainage capacity of the city has also decreased alarmingly due to development of unauthorized settlements. Illegal occupation of drainage canals and wetlands by land grabbers has further contributed to the problem.

The western part of Dhaka city is protected from river flooding by an encircling embankment. During most of the monsoon period, the water level of the river remains higher than the water level inside the city area. This indicates that the city drainage is heavily dependent on the water levels of the peripheral river systems. Hence, draining of water by gravity flow is not always possible. In order to facilitate and improve storm water drainage, installation of drainage pumps at some of the flood control and drainage (FCD) structures connected to rivers, has been considered.

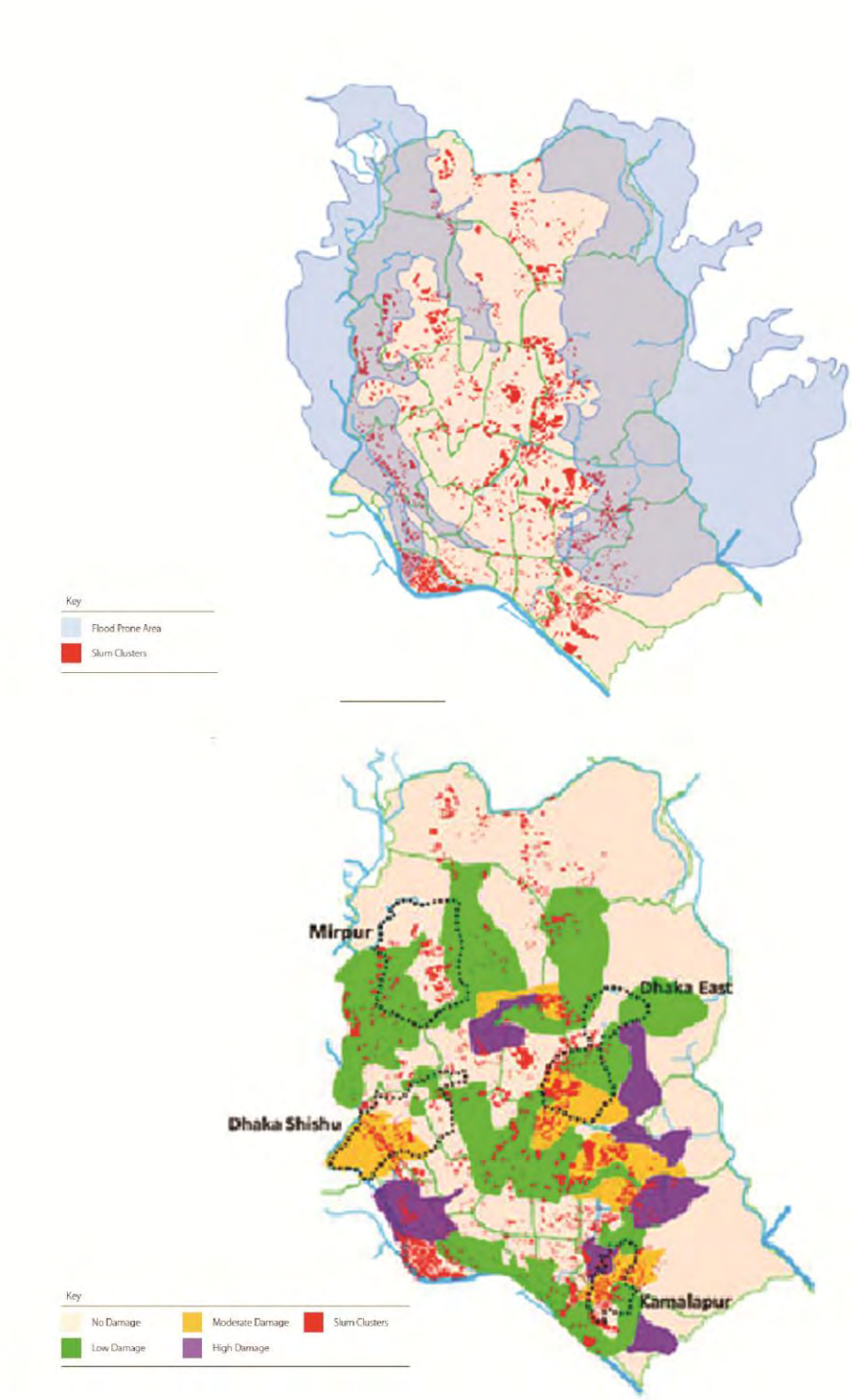

Figure 09: Dhaka Flood Vulnerability Map (Google)

3.2.2 Earthquake

Bangladesh has been directly affected by earthquakes in the recent and distant past, and is likely to suffer more in the near future (UNB, 2010). In 1762, a major earthquake submerged 150 square kilometers of land. Five hundred people in Dhaka, then a small town, were killed. Between 1850 and 1950, seven earthquakes with magnitude from 7.0 to 8.7 on the Richter scale struck the region. More recently, since 1997, Bangladesh has experienced several earthquakes of magnitude higher than 5 (GoB, n.d.a).

The National Building Code of Bangladesh (DMM, 2012) specifies three seismic zones, identified through a series of seismic-tectonic studies. These zones identify the level of earthquake risk faced by particular areas; Zone III being the most at risk, and Zone I the least at risk (depicted in Figure 5). Seismic zoning in Bangladesh indicates that Dhaka is under Zone II, and as such is at a real risk of an earthquake of significant magnitude.

In fact, globally, Dhaka is one of the most vulnerable cities to earthquake according to the Earthquake Disaster Risk Index of Stanford University (World Bank, 2013). In the urban context, major earthquake risk is associated with the high vulnerability of buildings to collapse due to inadequate construction materials and processes. The urban DRR framework report has found that, in some areas, construction according to official building codes was followed for less than 10 per cent of buildings (Shaw, 2013). Representatives of the Comprehensive Disaster Management Programme (CDMP) have specified that 78,000 out 326,000 buildings in Dhaka are vulnerable to collapse. This vulnerability was demonstrated by the Rana Plaza building collapse in April 2013. Even those not living in large structures are at risk from falling objects, leaking gas lines and fires resulting from earthquakes.

In addition to these direct impacts, earthquakes can cause liquefaction of soils, rendering built-up areas further vulnerable to structural collapse. Liquefaction is a process wherein sand and silt become more compact and force ground water upwards. The resulting fluidity at the upper level fails to support structures, causing buildings to sink and collapse (USGS, 2013). Dhaka"s largely shallow water table and soft sediment terrain make it highly susceptible to this phenomenon (Stone, 2011; Ansary and Rashid, 2000).

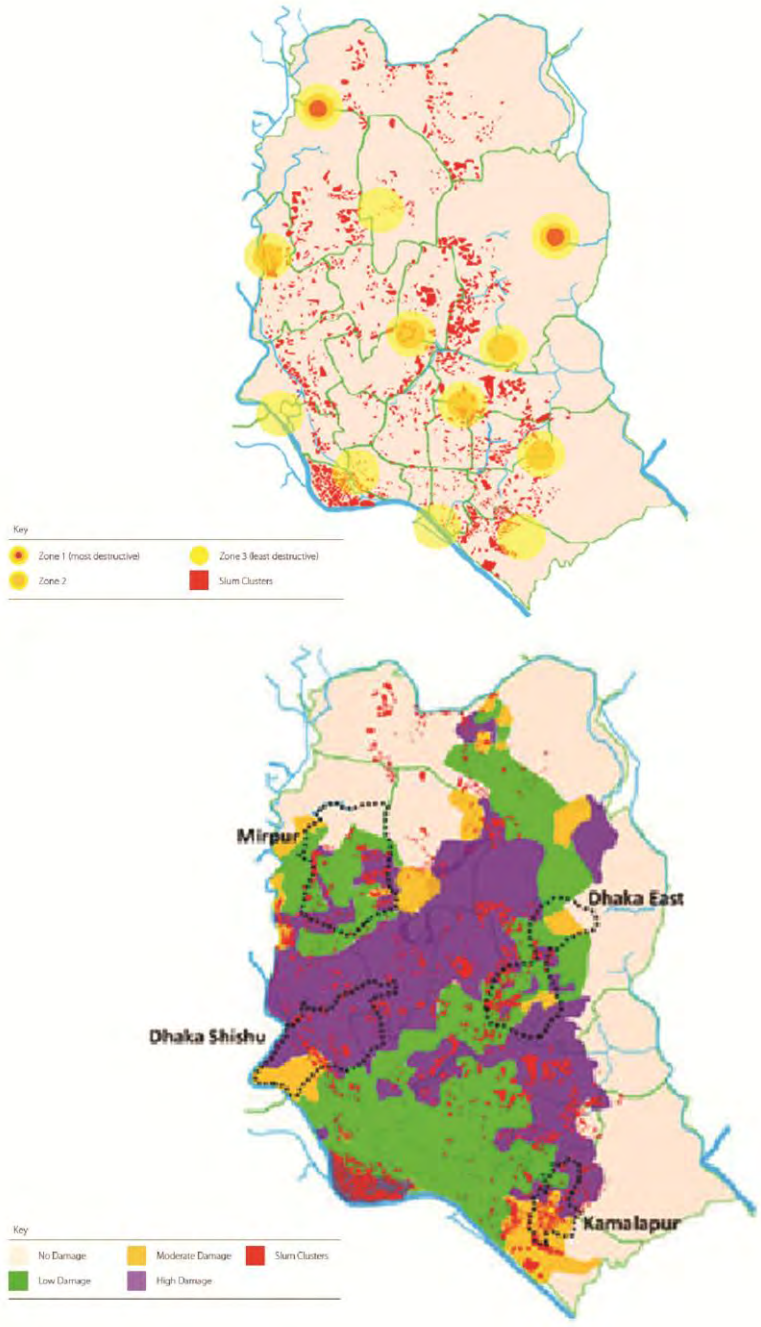

Figure 10: Dhaka Earthquake Vulnerability Map (Google)

3.2.3 Fire

Fire is a frequently occurring hazard in Bangladesh"s urban areas and causes huge losses in life and assets every year. Within the urban context, the slum areas are at greatest risk from fire hazards, as has been evidenced by past fire events (Huq, 1999). Rapid and unplanned urbanization in Bangladesh has forced people into slum areas that have unsafe working and living conditions, presenting greater risks of fire hazards with no increase in mitigation measures. Of the field sites examined in this research, both Dhalpur City Palli and Balurmath have recently been subject to significant fires. These have diminished the already poor living conditions within which residents live.

Rather than having natural causes, urban fires are often a result of anthropogenic activity. At the domestic level, fire outbreaks result from the use of gas cookers. However, industrial units are also a central source of fires in slum areas (DIPECHO, 2010). An example comes from the Nimtoli slum tragedy on 3rd June 2010. Here, 117 people died and at least another 150 people suffered critical burns. The main source of the fire was an unauthorized chemical warehouse on the ground floor of a residential building within the slum. The overlapping of industrial and residential zones put residents at high risk from mishandling of dangerous chemical substances. It is estimated that 80% of Old Dhaka"s residential housing contains unauthorized factories or warehouses (Imam, 2010). A lack of government regulation on these units, fostered by an understaffed inspection department and the adverse interests of politicians with ownership stakes, heightens inherent fire risks (Human Rights Watch, 2013). As such, Dhaka"s political economy contributes to increased risks, greater damage and heightened challenges for the future mitigation of urban fire hazards.

Crowded conditions alongside limited mechanisms for fire responses in slums exacerbate the damage caused by fires. The compact alignment of houses means that fires spread very quickly through slum neighborhoods and dense resident populations make evacuation very difficult. In Dhaka, the mean duration of fires were significantly higher in slums, with an average of 68 minutes, compared to 28 minutes in the non-slum residential areas (Maniruzzaman, Haque 2013). Fire fighters have reported delays in responding to slum fires due to the narrow streets and lack of hydrants or other sources of water to extinguish the fire (CBS News, 2010). This has been reported by teachers in the Mirpur area. Moreover, research within Moinanbagh slum confirmed that conditions are too cramped to allow access to fire vehicles. Hence, fire risks are

unavoidable until infrastructure, public services and underlying political, social and economic vulnerabilities are addressed.

Record of Fire Accidents from 1990 to 2014

The fire service department of the government says that nearly 150 workers died due to fire accidents in garment factories from 1990 to 2000. Over this period, at least 40 incidents of fire have been recorded in different garment factories. In the year 2000 alone, three major fire accidents in three different factories claimed at least 60 lives and injured over 200 people.

In 1990, a fire in the Saraka Garments in Mirpur Dhaka left 32 workers dead in stampede. In September 2000, 12 women workers died in a stampede following a fire in Globe Knitwear in Dhaka. In October of the same year 50 workers were seriously injured in stampede following a fire in another Dhaka factory. The year ended with the Narsingdi incident where 50 workers died.

Tazreen Incident

UPI reported on Sunday Nov 25, 2012 that at least 137 people were killed of which 124 dead bodies recovered due to a fire at a Garments Factory at Ashulia area near Dhaka city. The fire started Saturday night and quickly moved through the lower floors of the building. The fire left scores of workers trapped on the upper floors while rescue workers contended with difficult access. The main difficulty to put out fire was lack of proper access road for the fire fighting vehicles.

Nimtali Tragedy

On 3rd June 2010, at least 125 people, mostly women and children, were killed and many others injured in the Nimtali fire in the Old Dhaka. After the tragedy, the government compensated each of the victim families with an amount of Tk 1, 20,000.

Four fire incidents same day in Dhaka

Other than in the factories, four separate incidents of fire have been reported in the capital on Friday afternoon 3rd Feb 2014. A total of 20 units of fire-fighters from different stations, Fire Service and Civil Defence (FSCD) and the headquarters doused the blazes that originated in four different areas of the capital.

The same day second fire broke out in Hajaribagh area at a leather factory in Hajaribagh around 2:30pm in the afternoon of 13th Feb 2014. Md Mainul Islam, officer-in-charge of Hajaribagh police station said a devastating fire broke out at at „Jeans Treat Ltd", adjacent to Karim Leather, at around 2:30pm. FSCD official Mohammad Ali said the fire first broke out at the warehouse of the factory made of which was made of bamboos and tins and spread engulfed the factory. He said the fire might have originated from an electric short circuit but the amount of loss inquired in fire could not be known yet.

“A total of 11 units of the firefighters from different stations of the FSCD fought for over one and a half hours to douse the fire together with police and local people”, said FSCD Mobiloizing officer Shahjadi Sultana. She said the firefighters brought the fire under their control after 4pm.

The third fire broke out in Dhanmondi area at the 2nd floor of Archeda Plaza, a six-storey building in the afternoon. Shahjadi Sultana said four units of fire-fighters brought the blaze under the control around 3pm but the cause of the fire could not be known.

The fourth fire broke out in Bongshal area at a warehouse of motor parts at Mokimbazar in around 2pm. The FSCD Mobilising officer said almost the entire warehouse was damaged in the fire. Abul Hasan, officer-in-charge of Bongshal police station, said the warehouse located at the ground floor of the building was shut during the fire. “The fire might have originated from an electric short circuit,” the OC said.

In Motijheel another fire broke out at a building in Motijheel however the local people managed to douse it before the FSCD officials reached the spot, said Shahjadi Sultana.

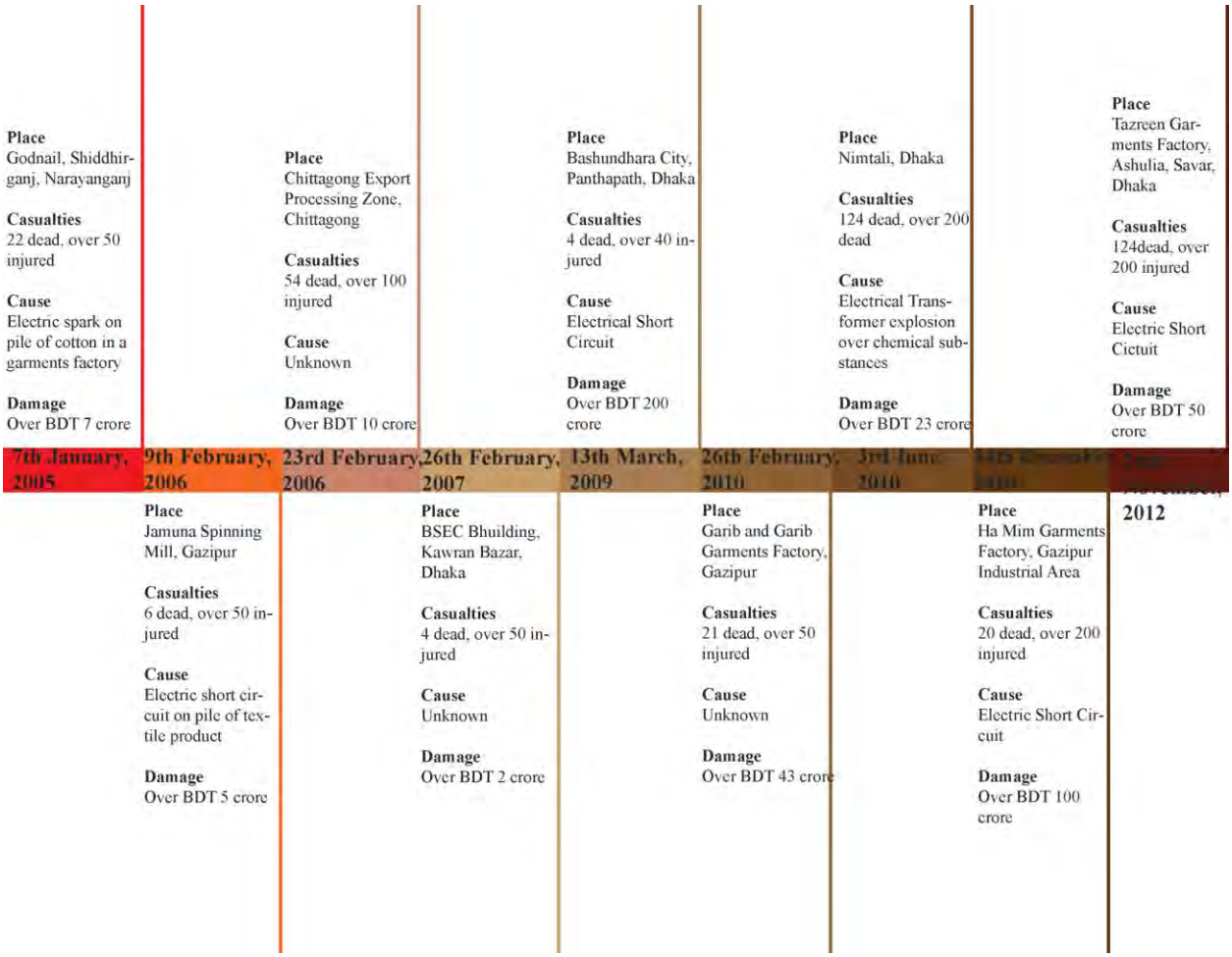

Figure 11: Timeline of Recent Fire Incidents (Author)

3.2.4 Infrastructure Collapse

When the Rana Plaza factory building collapsed in the Bangladesh capital on 24th April 2013 at Savar, Dhaka, at least 1,129 garment workers were killed, crushed under eight stories of concrete. A total of 2,515 people were rescued from the building alive, but some suffered terrible injuries. It is considered the deadliest garment-factory accident in history, as well as the deadliest accidental structural failure in modern human history. The building contained clothing factories, a bank, apartments, and several other shops. The shops and the bank on the lower floors in the same building immediately closed after cracks were discovered. Warnings to avoid using the building after cracks appeared the day before but had been ignored. Garment workers were ordered to work also next day and the building collapsed during the morning rush-hour. The immediate cause was starting heavy generators on the roof following power cut and the building collapsed in minutes leaving no time to escape. Fire Service, Police, Rapid Action Battalion and even Army came to the spot immediately but most of the surviving victims were rescued by local volunteers using simple tools.

3.2.5 Multiple Hazards

The natural hazards described here cannot be considered in isolation, particularly in the urban context. In fact, the event of one kind of disaster can itself prompt exposure to further hazards, consequently subjecting urban residents to a multitude of risks and vulnerabilities. For example, the event of an earthquake may also cause fires to start within the city due to falling objects, electrical faults and other accidents. Moreover, blockages caused by earthquakes can obstruct fire vehicles, limiting access to the source of the fire, and hence exacerbating its effects. This could leave to further and catastrophic loss of life and damage to assets. The hazard maps above indicates how Dhaka is exposed to this multitude of hazards, showing flood susceptible areas, liquefaction zones and indicating the slum areas, where fire hazards are most intense. It is clear, then, that many areas of Dhaka, and particularly the slum areas are at high risk from multiple hazards, which have the potential to occur simultaneously.

3.3 Emergency Preparedness

"Emergency Preparedness is the discipline of dealing with and avoiding both natural and manmade disasters." It involves mitigation, preparedness, response and recovery in order to lessen the impact of disasters. Emergency management requires a partnership among all levels of government (local, State, and Federal) and the private sector (business and industry, voluntary organizations, and the public). Successful preparedness requires detailed planning and cooperation among each sector. Emergency preparedness ranges from the Federal Emergency Management Agency (FEMA) developing an all inclusive plan to mitigate natural disasters to the individual ensuring their car has plenty of fuel for a possible evacuation.

The following principles illustrate the emergency preparedness concept. Emergency preparedness at all levels considers and takes into account all hazards, all phases, all stakeholders and all impacts relevant to disasters. Anticipation of future disasters and preventive and preparatory measures build disaster-resistant and disaster-resilient communities. Sound risk management principles (hazard identification, risk analysis, and impact analysis) are used in assigning priorities and resources. Unity of effort among all levels of government and all elements of a community are integrated. Broad and sincere relationships among individuals and organizations are incorporated to encourage trust, advocate a team atmosphere, build consensus, and facilitate communication. Activities of all relevant stakeholders are synchronized to achieve a common purpose. Creative and innovative approaches are used to overcome disaster challenges. Emergency preparedness uses a science and knowledge-based approach; based on education, training, experience, ethical practice, public stewardship and continuous improvement. Management consists of four phases: Mitigation, Preparedness, Response, and recovery.

Mitigation: Mitigation is the ability to limit death and economic damages by lessening the impact of disasters. The mitigation phase primarily focuses on preventing future emergencies or minimizing potential effects by reducing the probability an emergency will take place or reducing the effects of unavoidable disasters.. Mitigation can place before and after an emergency happens. Effective mitigation requires a sound understanding of risk management.

Preparedness: Preparedness is the state of being ready for action during a disaster or emergency. The preparedness phase is achieved and maintained through a continuous cycle of planning, organizing, training, equipping, exercising, evaluating and taking corrective action (The Preparedness Cycle). Evacuation plans and emergency shelters are examples of preparedness plans. Preparedness takes place before a disaster takes place.

Response: Response consists of actions taken to prevent death and further damage during an emergency situation. The response phase is putting the preparedness phase into action. Examples of response include evacuating a disaster area, seeking shelter, etc. Response activities take place during an emergency.

Recovery: Recovery is the ability to return to a state of normal function with minimal suffering and disruption of services following a disaster. Disaster and financial assistance are examples of recovery that aids individuals and communities. Recovery assistance can be provided at local, state, federal, or private sector levels. The recovery phase takes place following a disaster.

3.3.1 Response

The response phase of an emergency may commence with Search and Rescue but in all cases the focus will quickly turn to fulfilling the basic humanitarian needs of the affected population. This assistance may be provided by national or international agencies and organizations. Effective coordination of disaster assistance is often crucial, particularly when many organizations respond and local emergency management agency (LEMA) capacity has been exceeded by the demand or diminished by the disaster itself. The National Response Framework is a United States government publication that explains responsibilities and expectations of government officials at the local, state, federal, and tribal levels. It provides guidance on Emergency Support Functions that may be integrated in whole or parts to aid in the response and recovery process.

On a personal level the response can take the shape either of a shelter in place or an evacuation.

In a shelter-in-place scenario, a family would be prepared to fend for themselves in their home for many days without any form of outside support. In an evacuation, a family leaves the area

by automobile or other mode of transportation, taking with them the maximum amount of supplies they can carry, possibly including a tent for shelter. If mechanical transportation is not available, evacuation on foot would ideally include carrying at least three days of supplies and rain-tight bedding, a tarpaulin and a bedroll of blankets.

Donations are often sought during this period, especially for large disasters that overwhelm local capacity. Due to efficiencies of scale, money is often the most cost-effective donation if fraud is avoided. Money is also the most flexible, and if goods are sourced locally then transportation is minimized and the local economy is boosted. Some donors prefer to send gifts in kind, however these items can end up creating issues, rather than helping. One innovation by Occupy Sandy volunteers is to use a donation registry, where families and businesses impacted by the disaster can make specific requests, which remote donors can purchase directly via a web site.

Medical considerations will vary greatly based on the type of disaster and secondary effects. Survivors may sustain a multitude of injuries to include lacerations, burns, near drowning, or crush syndrome.

3.4 Community Emergency Response Training

A local government agency, often a fire department, police department, or emergency management agency, agrees to sponsor CERT within its jurisdiction. The sponsoring agency liaises with, deploys and may train or supervise the training of CERT members. The sponsoring agency receives and disburses federal and state Citizen Corps grant funds allocated to its CERT program. Many sponsoring agencies employ a full-time community-service person as liaison to the CERT members. In some communities, the liaison is a volunteer and CERT member.

As people are trained and agree to join the community emergency response effort, a CERT is formed. Initial efforts may result in a team with only a few members from across the community. As the number of members grow, a single community-wide team may subdivide.

When not responding to disasters or large emergencies, CERTs may

- raise funds for emergency response equipment in their community;
- provide first-aid, crowd control or other services at community events;

- hold planning, training, or recruitment meetings; and
- conduct or participate in disaster response exercises.

Some sponsoring agencies use Citizen Corps grant funds to purchase response tools and equipment for their members and team(s) (subject to Stafford Act limitations). Most CERTs also acquire their own supplies, tools, and equipment. As community members, CERTs are aware of the specific needs of their community and equip the teams accordingly.

3.4.1 Community Emergency Response

The basic idea is to use CERT to perform the large number of tasks needed in emergencies. This frees highly trained professional responders for more technical tasks. Much of CERT training concerns the Incident Command System and organization, so CERT members fit easily into larger command structures.

A team may self-activate (self-deploy) when their own neighborhood is affected by disaster. An effort is made to report their response status to the sponsoring agency. A self-activated team will size-up the loss in their neighborhood and begin performing the skills they have learned to minimize further loss of life, property, and environment. They will continue to respond safely until redirected or relieved by the sponsoring agency or professional responders on-scene.

Teams in neighborhoods not affected by disaster may be deployed or activated by the sponsoring agency. The sponsoring agency may communicate with neighborhood CERT leaders through an organic communication team. In some areas the communications may be by amateur radio, FRS, GMRS or MURS radio, dedicated telephone or fire-alarm networks. In other areas, relays of bicycle-equipped runners can effectively carry messages between the teams and the local emergency operations center.

The sponsoring agency may activate and dispatch teams in order to gather or respond to intelligence about an incident. Teams may be dispatched to affected neighborhoods, or organized to support operations. CERT members may augment support staff at an Incident Command Post or Emergency Operations Center. Additional teams may also be created to guard a morgue, locate supplies and food, convey messages to and from other CERT teams and local authorities, and other duties on an as-needed basis as identified by the team leader.

In the short term, CERTs perform data gathering, especially to locate mass-casualties requiring professional response, or situations requiring professional rescues, simple fire-fighting tasks (for example, small fires, turning off gas), light search and rescue, damage evaluation of structures, triage and first aid. In the longer term, CERTs may assist in the evacuation of residents, or assist with setting up a neighborhood shelter.

3.4.2 CERT Member Roles

The Federal Emergency Management Agency (FEMA) recommends that the standard, ten-person team be comprised as follows:

- CERT Leader. Generally, the first CERT team member arriving on the scene becomes team leader, and is the designated Incident Commander (IC) until the arrival of someone more competent. This person makes the IC initial assessment of the scene and determines the appropriate course of action for team members; assumes role of Safety Officer until assigned to another team member; assigns team member roles if not already assigned; designates triage area, treatment area, morgue, and vehicle traffic routes; coordinates and directs team operations; determines logistical needs (water, food, medical supplies, transportation, equipment, and so on.) and determines ways to meet those needs through team members or citizen volunteers on the scene; collects and writes reports on the operation and victims; and communicates and coordinates with the incident commander, local authorities, and other CERT team leaders. The team leader is identified by two pieces of crossed tape on the hard hat.
- Safety Officer. Checks team members prior to deployment to ensure they are safe and equipped for the operation; determines safe or unsafe working environments; ensures team accountability; supervises operations (when possible) where team members and victims are at direct physical risk, and alerts team members when unsafe conditions arise.
- Fire Suppression Team . Work under the supervision of the Team Leader to suppress small fires in designated work areas or as needed; when not accomplishing their primary mission, assist the search and rescue team or triage team; assist in evacuation and transport as needed; assist in the triage or treatment area as needed, other duties as assigned; communicate with Team Leader.

- Search and Rescue Team . Work under the supervision of the Team Leader, searching for and providing rescue of victims as is prudent under the conditions; when not accomplishing their primary mission, assist the Fire Suppression Team, assist in the triage or treatment area as needed; other duties as assigned; communicate with Team Leader.
- Medical Triage Team . Work under the supervision of the Team Leader, providing START triage for victims found at the scene; marking victims with category of injury per the standard operating procedures; when not accomplishing their primary mission, assist the Fire Suppression Team if needed, assist the Search and Rescue Team if needed, assist in the Medical Triage Area if needed, assist in the Treatment Area if needed, other duties as assigned; communicate with Team Leader.
- Medical Treatment Team . Work under the supervision of the Team Leader, providing medical treatment to victims within the scope of their training. This task is normally accomplished in the Treatment Area, however, it may take place in the affected area as well. When not accomplishing their primary mission, assist the Fire Suppression Team as needed, assist the Medical Triage Team as needed; other duties as assigned; communicate with the Team Leader.

Because every CERT member in a community receives the same core instruction, any team member has the training necessary to assume any of these roles. This is important during a disaster response because not all members of a regular team may be available to respond. Hasty teams may be formed by whichever members are responding at the time. Additionally, members may need to adjust team roles due to stress, fatigue, injury, or other circumstances.

3.4.3 CERT Training

While state and local jurisdictions will implement training in the manner that best suits the community, the Citizen Corps CERT program has an established curriculum. Jurisdictions may augment the training, but are strongly encouraged to deliver the entire core content. The Citizen Corps CERT core curriculum for the basic course is composed of the following nine units:

- Unit 1: Disaster Preparedness Topics include identifying local disaster threats, disaster impact, mitigation and preparedness concepts, and an overview of Citizen Corps and CERT. Hands on skills include team-building exercises, and shutting off utilities.

- Unit 2: Fire Safety Students learn about fire chemistry, mitigation practices, hazardous materials identification, suppression options, and are introduced to the concept of size-up. Hands-on skills include using a fire extinguisher to suppress a live flame, and wearing basic protective gear. Firefighting standpipes as well as unconventional firefighting methods are also covered.
- Unit 3: Disaster Medical Operations part 1 Students learn to identify and treat certain life-threatening conditions in a disaster setting, as well as START triage. Hands-on skills include performing head-tilt/chin-lift, practicing bleeding control techniques, and performing triage as an exercise.
- Unit 4: Disaster Medical Operations part 2 Topics cover mass casualty operations, public health, assessing patients, and treating injuries. Students practice patient assessment, and various treatment techniques.
- Unit 5: Light Search and Rescue Operations Size-up is expanded as students learn about assessing structural damage, marking structures that have been searched, search techniques, as well as rescue techniques and cribbing. Hands-on activities include lifting and cribbing an object, and practicing rescue carries.
- Unit 6: CERT Organization Students are introduced to several concepts from the Incident Command System, and local team organization and communication is explained. Hands-on skills include a table-top exercise focusing on incident command and control.
- Unit 7: Disaster Psychology Responder well-being and dealing with victim trauma are the topics of this unit.
- Unit 8: Terrorism and CERT Students learn how terrorists may choose targets, what weapons they may use, and identifying when chemical, biological, radiological, nuclear, or explosive weapons may have been deployed. Students learn about CERT roles in preparing for and responding to terrorist attacks. A table-top exercise highlights topics covered.
- Unit 9: Course Review and Disaster Simulation Students take a written exam, then participate in a real-time practical disaster simulation where the different skill areas are put to the test. A critique follows the exercise where students and instructors have an

opportunity to learn from mistakes and highlight exemplary actions. Students may be given a certificate of completion at the conclusion of the course.

Citizen Corps CERT training emphasizes safely "doing the most good for the most people as quickly as possible" when responding to a disaster. For this reason, cardiopulmonary resuscitation (CPR) training is not included in the core curriculum, as it is time and responder intensive in a mass-casualty incident. However, many jurisdictions encourage or require CERT members to obtain CPR training. Many CERT programs provide or encourage members to take additional first aid training. Some CERT members may also take training to become a certified first responder or emergency medical technician.

Many CERT programs also provide training in amateur radio operation, shelter operations, flood response, community relations, mass care, the incident command system (ICS, and the National Incident Management System(NIMS).

Each unit of Citizen Corps CERT training is ideally delivered by professional responders or other experts in the field addressed by the unit. This is done to help build unity between CERT members and responders, keep the attention of students, and help the professional response organizations be comfortable with the training which CERT members receive.

Each course of instruction is ideally facilitated by one or more instructors certified in the CERT curriculum by the state or sponsoring agency. Facilitating instructors provide continuity between units, and help ensure that the CERT core curriculum is being delivered successfully. Facilitating instructors also perform set-up and tear-down of the classroom, provide instructional materials for the course, record student attendance and other tasks which assist the professional responder in delivering their unit as efficiently as possible.

Citizen Corps CERT training is provided free to interested members of the community, and is delivered in a group classroom setting. People may complete the training without obligation to join a CERT. Citizen Corps grant funds can be used to print and provide each student with a printed manual. Some sponsoring agencies use Citizen Corps grant funds to purchase disaster response tool kits. These kits are offered as an incentive to join a CERT, and must be returned to the sponsoring agency when members resign from CERT.

Some sponsoring agencies require a criminal background-check of all trainees before allowing them to participate on a CERT. For example, the city of Albuquerque, New Mexico require all volunteers to pass a background check, while the city of Austin, Texas does not require a

background check to take part in training classes but requires members to undergo a background check in order to receive a CERT badge and directly assist first responders during an activation of the Emergency Operations Center in Austin. However, most programs do not require a criminal background check in order to participate.

3.5 Disaster Edutainment

A portmanteau word fuses both the sounds and the meanings of its components, as in smog, coined by blending smoke and fog, or motel, from motor and hotel. In linguistics, a portmanteau is defined as a single morph which represents two or more morphemes.

The definition overlaps with the grammatical term contraction, but contractions are formed from words that would otherwise appear together in sequence, such as do and not to make don't, whereas a portmanteau word is formed by combining two or more existing words that all relate to a singular concept which the portmanteau describes. Portmanteau should also be distinguished from compounds, which do not involve the truncation of parts of the stems of the blended words. For instance, starfish is a compound, not a portmanteau, of star and fish (a hypothetical portmanteau of these words might be stish).

The word Edutainment is a portmanteau, it is a combination of education and entertainment. The idea is to spread education through entertainment in order to dissipate the fear associated with disasters. This can be done through simulators,

- First Aid Training Room: Using first-aid dummies, the visitors will practice first aid trainings in this section.

- Rainstorm Simulation Section: By experiencing simulated winds and torrential rains, the visitors will learn how to protect themselves from a rainstorm. Rainstorm simulation section shall consist of three sections; Observation area, changing rooms, simulation room. Natural lighting is not required for this section.

- Fire Fighting Training Room: In this section the visitors can shoot water using real extinguishers and extinguish a fire on a large screen. The room shall be connected to

the area, where the fire extinguishers used in the fire fighting training shall be refilled. Natural lighting is not required for this section.

- Smoke Maze Room: The visitors will practice how to escape from smoke generated by fire and develop proper ability to take effective action against such situations. Natural lighting is not required for this section.

- Children"s Section: Educational and entertaining films for the children will be presented in this section. Furnished with necessary facilities for child care, play tools and including an attendant room.

- Medical Room: Includes a waiting area, doctor and nurse room and a consulting room.

- 4D Video Display Room: Visitors will watch 3D movies using 3D glasses and experience realistic scenery of the earthquakes. The theatre is furnished with special visual and sound systems and seats. In this section visitors are admitted to the theatre in groups and watching images of real earthquakes, experience and understand the earthquakes and circumstances during an earthquake. Natural lighting is not required for this section.
- Earthquake Simulation Section: The intention is to develop consciousness against earthquakes and train visitors about handling the emergency by experiencing simulated earthquakes. This section shall be equipped with necessary technical infrastructure to create artificial earthquakes of various intensities and shall be furnished in form of a living space as to include kitchen, bedroom, etc. Since there shall be two vibration panels of 3 tons each on the floor, the room should be located/designed as a separate unit. Each panel shall have a capacity of 9 people. Natural lighting is not required for this section.
- Emergency Communication Experiment Room: In this section the visitors will learn, which division/department they will contact with and how to communicate during an emergency.

- Fire Prevention Game: The visitors shall be experiencing fire fighting with using game machines.

- Orientation Stage: Before visiting each training area, visitors will be gathered at the Orientation Stage, which shall be located nearby/within the lobby. Registration formalities will be carried out in this section and general information about the Centre and relevant facilities will be presented.

- Liquefaction and Earthquake Mechanism Training Room: Devices such as the liquefaction display mechanism, which is to explain to the visitors the liquefaction occurs during an earthquake, the seismic waves and tsunami mechanisms as well as a scale model to introduce concept of tectonics shall be presented in this section.

3.6 Fire Department

A fire department or fire brigade, also known as a fire and rescue service or simply fire service, is a public or private organization that provides predominantly emergency firefighting and rescue services for a certain jurisdiction, which is typically a municipality, county, or fire protection district. A fire department usually contains one or more fire stations within its boundaries, and may be staffed by career firefighters, volunteer firefighters, or a combination thereof (referred to as a combination department).

A fire department may also provide "fire protection" or fire prevention services, whereby firefighters visit homes and give fire safety advice and fit smoke alarms for members of the public. In many countries fire protection or prevention is seen as an important role for the fire service, as preventing a fire from occurring in the first place can save lives and property.

Fire departments are organized in a system of administration, services, training, and operations; for example:

- Administration is responsible for supervision, budgets, policy, and human resources.

- Service offers protection, safety, and education to the public.
- Training prepares skilled people with the knowledge to perform their duties.
- Operations performs the tasks to successfully save the public from harm.

A fire service is normally set up where it can have fire stations and sophisticated fire engines strategically deployed throughout the area it serves, so that dispatchers can send fire engines, fire trucks, or ambulances from the fire stations closest to the incident. Larger departments have branches within themselves to increase efficiency, composed of volunteers, support, and research.

- Volunteers give advantages to the department in a state of emergency.
- Support organizing the resources within and outside of the department.
- Research is to give advantages in new technologies for the department.

Figure 12: Fire Service in Germany (Google)

3.6.1 History of Firefighting

Ancient Rome

The earliest known fire department was formed in Ancient Rome by Egnatius Rufus who used his slaves to provide a free fire service. These men fought fires using bucket chains and also patrolled the streets with the authority to impose corporal punishment upon those who violated fire-prevention codes. The Emperor Augustus established a public fire department in 24 BCE, composed of 600 slaves distributed amongst seven fire stations in Rome.

1600s and 1700s: Property Insurance Companies, Public Funding, and Improved Firefighting Technology

Fire departments were again formed by property insurance companies beginning in the 17th century after the Great Fire of London in 1666. The first insurance brigades were established the following year. Others began to realize that a lot of money could be made from this practice, and ten more insurance companies set up in London before 1832: The Alliance, Atlas, Globe, Imperial, London, Protector, Royal Exchange, Sun Union and Westminster. Each company had its own fire mark, a durable plaque that would be affixed to the building exterior. A company's fire brigade would not extinguish a burning building if it did not have the correct fire mark.

Amsterdam also had a sophisticated firefighting system in the late 17th century, under the direction of artist Jan van der Heyden, who had improved the designs of both fire hoses and fire pumps.

The city of Boston, Massachusetts, established America's first publicly funded, paid fire department in 1679. Fire insurance made its debut in the American colonies in South Carolina in 1736, but it was Benjamin Franklin who imported the London model of insurance. He established the colonies' first fire insurance company in Philadelphia named the Philadelphia Contributionship, as well as its associated Union Volunteer Fire Company, which was an unpaid (volunteer) company.

In 1754, Halifax, Nova Scotia established the Halifax Regional Fire and Emergency, which is today Canada's oldest fire department.

In 1773, the city of Petersburg, Virginia established one of the first fire departments in the United States and it was also made up of unpaid volunteers.

1800s: Fire Companies and Municipal Fire Departments

In the 19th century, the practice of fire brigades refusing to put out fires in buildings that were uninsured led to the demand of central command for fire companies. Cities began to form their own fire departments as a civil service to the public, obliging private fire companies to shut down, many merging their fire stations into the city's fire department. In 1833, London's ten independent brigades all merged to form the London Fire Engine Establishment (LFEE), with James Braidwood as the Chief Officer. Braidwood had previously been the fire chief in Edinburgh, where the world's first municipal fire service was founded in 1824, and he is now regarded, along with Van der Heyden, as one of founders of modern firefighting. The LFEE then was incorporated into the city's Metropolitan Fire Brigade in 1865 under Eyre Massey Shaw.

Established in 1853, the Cincinnati Fire Department is the oldest paid fully professional municipal fire department in the United States.

In 1879, Notre Dame University established the first University-based fire department in the United States.

1900s: Motorized Fire Departments

In 1906, the first motorized fire department was organized in Springfield, Massachusetts, after Knox Automobile of Springfield produced the first modern fire engine one year earlier.

3.6.2 Fire Pole

A fireman's pole (also called a sliding pole, fire pole, or tom) is a wooden pole or a metal tube or pipe installed between floors in fire stations, allowing firefighters responding to an alarm to quickly descend to the ground floor faster than by using a standard staircase.

The device was invented in the 1870s by David Kenyon, in Chicago, Illinois, although it is often incorrectly credited to the Boston Fire Department.

Overview

Firefighters usually remain above the ground floor of fire stations until they receive a call for help, after which they descend, don their firefighting gear, and board the fire engine as quickly as possible. Until 1878, spiral staircases or sliding chutes were common, but not particularly fast. Fire houses were also equipped with spiral staircases so the horses would not try to climb the stairs into the living quarters. The fireman's pole allows firefighters to move down much more quickly, although it is not suitable for climbing up. The pole connects the ground floor to the ceiling of the floor above through a hole in the ground floor ceiling. To use a pole, a firefighter puts his/her arms around it, steps into the hole, and uses his/her legs to control the speed of the descent, somewhat similarly to the technique used for fast-roping.

History

Capt. David B. Kenyon of Chicago's Engine Company No. 21 (an all-black engine company) worked in a three-story fire station; the ground floor containing the firefighting equipment, the floor above being the floor for recreation and sleeping, and the top floor being the hayloft which was used to store the winter supply of hay for the fire engines' horses. During transport, the hay was secured to a wagon using a wooden binding pole, which was stored in the hayloft when not in use. Firefighter George Reid slid down the pole to respond to a call for help once, which inspired Captain David Kenyon to create a permanent pole.

In 1878 he convinced the Chief of Department to make the necessary hole in the building and install the pole, after agreeing to pay for any necessary maintenance. The Company crafted a pole out of a Georgia pine beam by shaving and sanding it into a 3" diameter pole which they gave several coats of varnish and a coat of paraffin.

After being the target of many jokes, people realized Company 21 was usually the first company to arrive when called, especially at night, and the Chief of Department ordered the poles to be installed in all Chicago fire stations. In 1880 the first brass pole was installed in the Boston Fire Department.

Safety Issues

Losing one's grip on the pole can result in falling from a great height; the firefighter may hit an object such as a door extending from a truck; poor speed control can result in injured or even broken legs upon impact with the floor; and burns can occur due to friction against the pole.

Slide poles can be made safer. Cushions can be placed around the base of the pole to soften landings. Other safety features include railings, baskets or closets that surround part of the opening, weight-activated doors that open only when weight is applied to the pole to prevent accidental falls, and exhaust control systems that prevent fumes from the apparatus bay from coming into the living quarters.

Despite the strong tradition and time advantage of slide poles, the National Fire Protection Association has called for the removal of all poles from US fire stations due to safety hazards. Many cities have removed poles from their stations, but some new multilevel fire stations include slide poles with appropriate safety features.

The policy of the New Zealand Fire Service is that existing fire poles not be used and that no newly constructed stations shall have them. As a result, most new fire stations are designed and built on a single level. In some older stations, particularly historic ones built on three levels, firefighters on the top floor will still use the pole because of the significant delay associated with taking the stairs.

3.6.3 Typical Circulation of a Fire Station

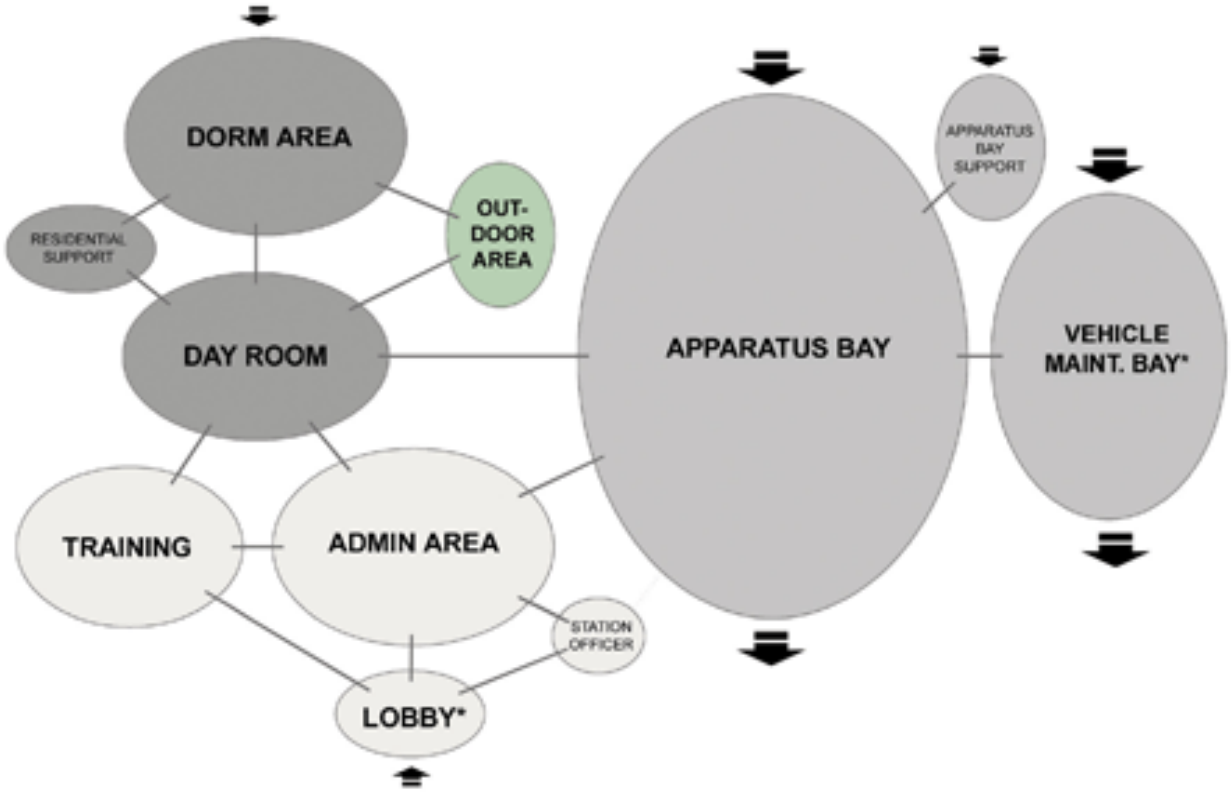

Figure 13: Fire Station Circulation (Google)

CHAPTER 04: CONTEXTUAL ANALYSIS

CHAPTER 04: CONTEXTUAL ANALYSIS

4.1 Overview of Mirpur

Mirpur is a thana of Dhaka city, Bangladesh. It is bounded by Pallabi Thana to the north, Mohammadpur Thana to the south, Kafrul to the east and Savar Upazila to the west.

4.1.1 Geography

Mirpur is located at 23.8042°N 90.3667°E. It has a total area of 58.66 km2 (22.65 sq mi) and is situated in the north-east of Dhaka city.

4.1.2 Demographics

Hazrat Sha Ali Boghdadi is a notable person of Mirpur, who comes from Baghdad and is a famous Oliu-Allah of this region. At the 2000 census of Bangladesh, Mirpur had a population of 1,074,232, of which males constituted 54.15% and females 45.85%. 610,270 were over the age of 18, and the average literacy rate was 68.9% (7+ years), compared to the national average of 48.6%. Mirpur Thana has recently been divided into the three thanas of Shah Ali, Pallabi and Kafrul.

4.1.3 History

Mirpur Thana was established in 1962. The thana consists of one union porishod, eight wards, 11 mouzas and 86 and 20 villages. Mirpur Thana (town) area was included in Keraniganj Thana during the British period (1757 to 1947) and in Tejgaon Thana during the Pakistan period (1947 to 1971). After the Liberation War following the victory day, Mirpur was independent on 31 January 1972.

4.1.4 Points of Interest

Sher-e-Bangla National Stadium;

Syed Nazrul Islam National Swimming Pool;

Dhaka Zoo;

The National Botanical Garden of Bangladesh;

Indoor Stadium;

Grameen Bank Head Office;

Institutions include,

Military Institute of Science and Technology

Bangladesh University of Professionals

SOS Hermann Gmeiner College

Dhaka Commerce College

Monipur High School

Figure 14: Sher-e-Bangla National Cricket Stadium (Google)

Figure 15: Indoor Stadium (Google)

Figure 16: Grameen Bank Headquarter (Google)

4.2 Overview of Fire Service and Civil Defense Department

Fire Service and Civil Defense is a emergency service organization of Government of Bangladesh. Every work of this department is related with public. During British rule, in 1939-1940, Fire Service was established. After the British rule ended, different fire service for Calcutta and Dhaka was established, they were called Calcutta Fire Service and Bengal Fire Service respectively.

During the second world war, Air Raid Precautions was established. It was further developed and got the name Civil Defense in 1951. For better management of work, another department named Rescue Department was established under roads and highway department.

In 1982 all three departments were combined and the current Fire Service and Civil Defense Department was established.

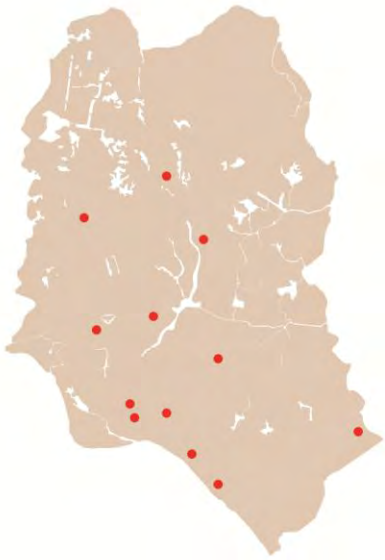

Figure 17: FSCD Training Complex, Mirpur (Google)

Figure 18: Existing Location of Fire Stations, Dhaka (Author)

CHAPTER 05: CASE STUDY

CHAPTER 05: CASE STUDY

5.1 Tokyo Rinkai Disaster Prevention Park

In the event of a large-scale disaster, such as an earthquake centered below Tokyo, The Tokyo Rinkai Disaster Prevention Park acts as a central base of operations for disaster prevention in the Tokyo Metropolitan Area that houses emergency response facilities including local disaster management headquarters, as well as institutions that compile disaster-related information and coordinate emergency disaster measures. The park is also a disaster prevention facility that acts as a core base camp for regional assistance units and a base of support for disaster medical care that functions in an integrated manner with the Higashi Ogishima region (Kawasaki City) distribution control center.

With respect to park operations, the City of Tokyo divides responsibilities with the Ministry of Land, Infrastructure, Transport and Tourism through the Urban Park Program taking into account activities during standard hours as well as times of disaster. (1) During standard operating hours, relevant organizations collaborate and perform exchanges of disaster-related information as well as a variety of simulations, training, and other activities in order to prepare for future disasters. (2) The park is also provided as a place to encourage interest among the citizens of Japan and instill within them the intelligence, knowledge, techniques, as well as values of self-help and mutual assistance, that will make it possible for them to handle an actual disaster through a wide variety of experience, studying, and training. (3) The park is also is an attractive area that takes advantage of urban concentration and ability to attract visitors to the Tokyo waterfront subcenter. The national government park covers a land area of 6.7 ha and the adjacent municipal park covers 6.5 ha, providing for a total of 13.2 ha.

Location: Nearest stations 4 minute walk from Kokusai-tenjijō Station on the Rinkai line; 2 minute walk from Ariake Station on the Yurikamome.

Figure 19: Tokyo Rinkai Disaster Prevention Park (Google)

Park Facilities:

a. Ariake no Oka Core Wide-area Disaster Prevention Base
b. Disaster Prevention Experience-learning Facility
c. Entrance Space
d. Multipurpose Plaza/ Outdoor Plaza
e. Heliport

a. Ariake no Oka Core Wide-area Disaster Prevention Base:

The Ariake no Oka Core Wide-area Disaster Prevention Base is a disaster prevention facility managed by the Cabinet Office.

Characteristics of the disaster prevention facility

- The entire facility (including the transmission antenna tower) is situated on top of a seismic isolation system.
- The facility is connected (over land and through satellite) to all government agencies as well as all prefectural and municipal governments via the CAO's Disaster Prevention Radio Communication System.
- The facility is equipped with video transmission (to Tokyo as well as Saitama, Kanagawa, and Chiba Prefectures), teleconferencing, and helicopter video transmission

capabilities.

- Emergency power source (in-house energy generation)
- Generating capacity of 1,000 kVA x 2 units (kerosene operated, with uninterruptible power supply for automatic switchover)
- 90,000 liters of fuel are in stock, making it possible to continuously operate the generator for three days (with additional fuel, it is possible to operate the generator for up to seven days).
- Recreation spaces, etc. for personnel

Locker rooms, showers, and sleeping rooms are provided (during times of an emergency, a portion of Public Park facilities may also be used as sleeping rooms).

- Initiative to keep seven days' worth of food, water (plastic bottles), and other items in stock
- The facility stores a total of 139 tons of water in two networks of water tanks, about 6 tons of water dedicated to the drinking water supply, and 133 tons of water dedicated to showers and other water systems.

Disaster Prevention Experience-learning Facility:

It is said that organized rescue efforts are usually performed seventy-two hours after an earthquake occurs. So, how would you survive during those seventy-two hours when rescue is difficult? This tour allows you to experience the flow of events starting with the development of an earthquake disaster in the Tokyo Metropolitan Area and ending with evacuation.

An earthquake measuring upper 6 on the Japan Meteorological Agency seismic intensity scale hits while you are descending in an elevator at a train station building. The floor shakes and the elevator screeches to an emergency stop. After getting out of the elevator, you walk down a dim maintenance corridor with no electricity. Visitors to the facility follow evacuation lights and broadcasted emergency guidance in search of the exit.

In a diorama where you experience repeated aftershocks through sound, lighting, and imagery, you will make your way to an evacuation area while asking a quiz with portable game machine. At the Cinema Station, you will experience a simulation of an earthquake centered under Tokyo through computer generated imagery. You've escaped the dangerous urban area and have reached a safe evacuation site. While viewing a display of disaster relief storehouses and tents,

you will learn how to survive during emergency situations. You will also be notified of quiz results.

Figure 20: Tokyo Rinkai Disaster Prevention Park (Google)

Multipurpose Plaza/ Outdoor Plaza:

The park area except the heliport and the site for disaster medical care support serves as a base camp site where emergency response units for lifesaving or restoration and incoming volunteers work in a time of disaster. Appropriate measures against liquefaction have been taken, covering main park roads and the heliport.

Disaster Prevention Facilities for the Park:

Various facilities for disaster-prevention are prepared in this park.
Those facilities are used for an emergency drill or disaster-prevention education in normal times, while in a time of disaster practically used.

・11 lamppost equipped with electric outlets and LAN connectors

・4 pergola type shelters

・4 drainage facilities for temporary toilets

・6 benches usable as field ranges

Figure 21: Tokyo Rinkai Disaster Prevention Park (Google)

5.2 Istanbul Disaster Prevention and Education Center

This International Architecture Competition is called in order to select the design of an Istanbul Disaster Prevention and Education Centre, which is to be the first institution in Turkey with the intended facilities.

Istanbul Metropolitan Municipality is willing to establish a centre fully equipped with adequate technology and facilities in order to be prepared against a disaster that may affect Istanbul and to develop public consciousness about the disasters and specifically about earthquakes. The centre will also be hosting relevant courses, congresses and seminars.

Equipped with visual and audio educational appliances and simulation systems, the centre will allow experiencing earthquake, hurricane, fire fighting, smoke, liquefaction, tsunami, first aid and emergency communications. It is also intended to offer information to the visitors through a planetarium, library, seminar/meeting halls, information boards, etc. which are to be designed using the latest technology.

The Site

The site is located in a newly developing area in the Bakırköy district on the European Side of Istanbul and is close to Atatürk International Airport. The Project site is a vacant plot, being used as a car park and covering approximately 27,000 meters square. The site is surrounded by Ayamama Creek, CNR Expo Center, WoW Istanbul Hotel and Airport Shopping Mall. With metro stations located nearby as well as the highway and metro bus lines, the site offers easy access for both the pedestrian and vehicle traffic.

Programme

- The concept shall propose the following spaces with the respective areas:

• Liquefaction and Earthquake Mechanism Experiment Room 60 m²
• Training Performance Evaluation Section 50 m²
• Exhibition Hall 200 m²
• Emergency Communication Experiment Room 30 m²
• Fire Prevention Game 30 m²
• Orientation Stage 100 m²
• Planetarium 300 m²
• Children's Section 75 m²
• Medical Room 40 m²
• 4D Video Display Room 100 m²
• Earthquake Simulation Section 75 m²
• 3 Seminar-Training Halls 100x3= 300 m²
• Conference Hall 450 m²
• Library 100 m²
• First Aid Training Room 100 m²
• Rainstorm Simulation Section 100 m²
• Fire Fighting Training Room 60 m²
• Smoke Maze Room 100 m²
• Administrative Offices 400 m²

5.2.1 First Prize

The context in which the Istanbul Disaster Prevention and Education Centre will be located, unlike many of incredible places in the city of Istanbul, does not ask for too much respect. That's why we are not fighting with the unnecessary fitting into the environment. Instead of "competing" with large and architecturally inarticulate buildings which surround the place for the construction, we've chosen "ignore". Then we formed a new microcosm, equally traditional and contemporary. Among high rise buildings, we built a flat house. We are establishing some new/old rules, proposing the space where the visitors and employees will have a bit of a different, better universe. The new urban element is in fact a very old and also characteristic for traditional local architecture confirmed in times by centuries. So that IDPEC would not be unnoticeable right until we come close to it, one lake inside the garden has a high water fountain that makes this site unique and recognizable from bigger distances. The garden is formed by

communication with the length of an athletic track surrounding it. In it, there are rhythmically alternating specialized areas. Those sections that need more peace for the students are arranged by the outer edge, and the other ones by the internal one, facing the park. The idea of the atrium is a park, garden, oasis, courtyard, playground and all of this simultaneously, shade under the canopy of trees, water in the lakes, fountain, playgrounds for children and adults. Park is in a function of a hall during the period of nice weather, in case of Istanbul its most part of the year. "Classes" are all different, as a consequence of the program placed inside of them. Above each unit there is a dome, another traditional and at the same time contemporary element, used to place solar panels on the sunny side. The outer façade of the house is protected by glass brise-soleils and the necessary shade is provided by a system of curtain rails on the ceiling. On the inner side these is a canopy, which reduces the amount of the sun rays. For the same purpose we use the trees which will be very densely planted on the northern edge of the park. Elements of the structure are steel columns that follow the line of the facade and carry a steel grid, all very low-tech.

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Figure 22: Istanbul Disaster Prevention and Edutainment Center (Google)

5.2.2 Third Prize

Disaster prevention is about information and communication, it is about network.

The flow of information before a disaster is essential to educate people and prepare for effective reactions during and after a catastrophic event. Once a disaster occurs, that same communication network is crucial for assessing the needs of victims within the disaster zone and advising on action. It also allows for emotional support and encouragement for emergency crews.

On a more tangible level, a physical network made up of roads, railways and airports, allows supplies and disaster workers to move between the site and safer areas.

The flow of information is everywhere. The elements of our program are the nodes where related flows cross. The nodes are placed on a pixilated platform (the site) that detects the flows between functions. Visitors are free to move between the nodes through the pixilated platform. The pixels are extruded to different heights accommodating different functions. A lifted pedestrian promenade allows the visitors to discover the elevated landscape.

These nodes have a significant visual identity and can be placed anywhere, in the center of any town or village. Connected to the site, they foster education before a disaster and support after. The network created can expand well beyond the site, reaching across Istanbul and the rest of the world.

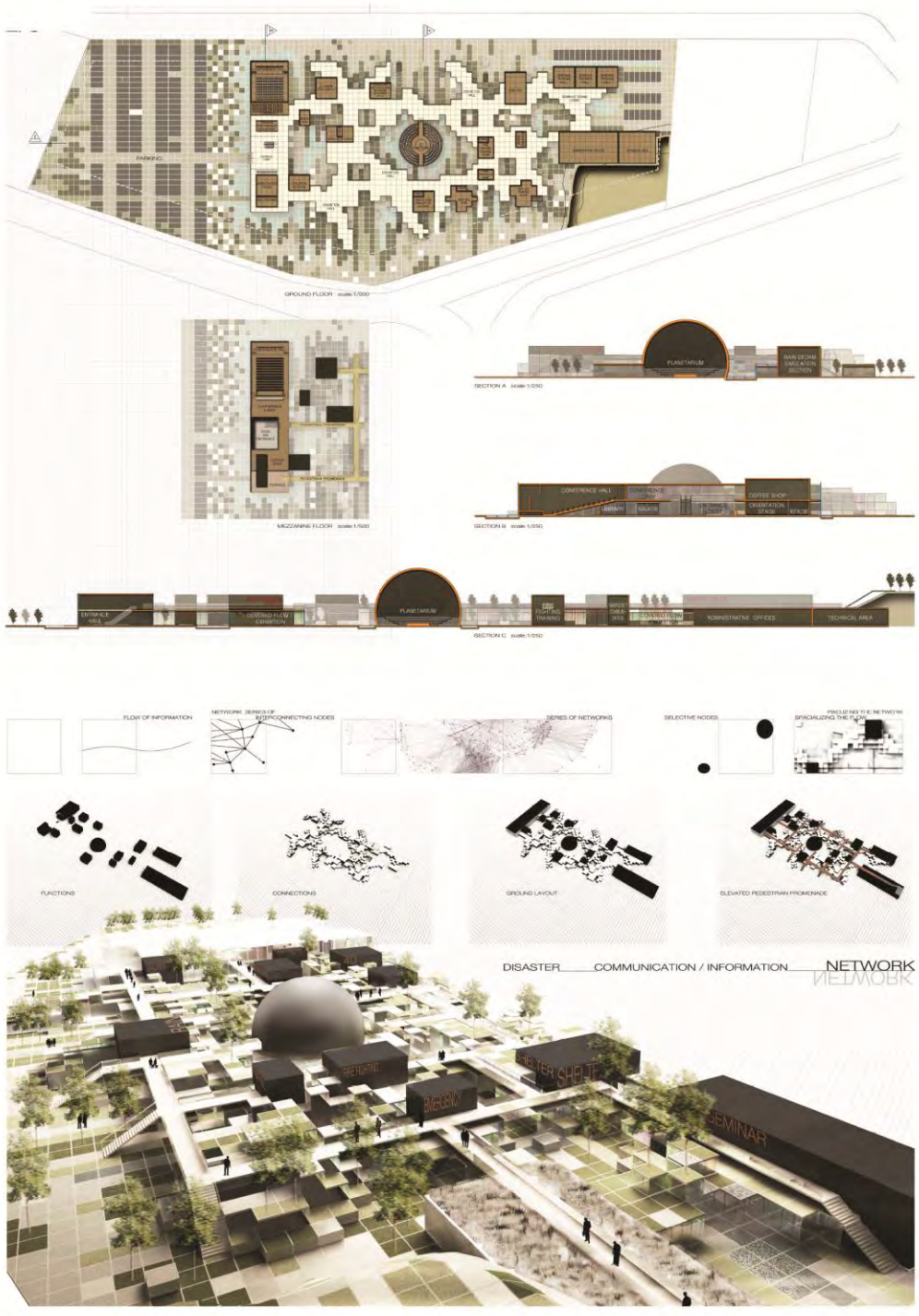


Figure 23: Istanbul Disaster Prevention and Edutainment Center (Google)

5.3 Vitra Fire Station

Architects: Zaha Hadid Architects
Location: Weil am Rhein, Germany
References: Galinsky, Zaha Hadid Architects
Project Year: 1993

After a devastating fire in 1981 that crippled the Vitra design campus in Weil am Rhein, Germany, Vitra began an extensive mission to rebuild the campus as well as redesign the masterplan, which was designed by Nicholas Grimshaw.

Almost a decade after the devastating fire in 1981, the company sought an architect to build a fire station for the Vitra campus to thwart any future reoccurrences and commissioned Zaha Hadid. Completed in 1993, the Vitra fire station would be Hadid's first realized project of her career, which would eventually launch her name and style to an international audience.

The Vitra fire station is Hadid's showcased work that delves into the deconstructivist theoretical language that she developed through her paintings as a conceptual mediator of finding spatial relationships and form. The Vitra fire station is a synthesis of philosophy and architecture that bridges the Vitra design campus to its surrounding context.

As part of the initial design process, Hadid and her associate Patrik Schumacher began relating the existing buildings on the campus to the surrounding agricultural context. The long road where the fire station would be located was envisioned as a linear landscape as if it were an artificial extension of the adjacent fields and vineyards.

The fire station was understood to be the linkage that would define the edge between the surrounding landscape and the artificiality of the campus. By implementing a narrow profile to the building, it can be perceived as an extension, or extrusion, of the landscape that conceptually runs through the building.

The fire station is a composition of concrete planes that bend, tilt, and break according to the conceptual dynamic forces that are connecting landscape and architecture. The building is thought to be frozen in motion, heightening the dynamism of the forces used to create the formal aesthetic that is suspended in a state of tension creating a sense of instability.

Concrete “shards” and planes slide past one another creating a narrow, horizontal profile. The sense of instability is intensified as horizontal planes slip over one another, while another projects out over the garage bay. Always in a state of constant uneasiness, the concrete planes embody a heavy, opaque quality that restricts views into the building except for when the walls begin to split from the building.

The interior of the fire station is just as complex formally and spatially as the exterior of the building. The series of layered walls are bent, tilted, and broken to accommodate for the functionality of the program that is sandwiched in between the walls. The second floor is slightly off balance with the ground floor, which creates a sense of spatial instability within. As the planes slide past one another and begin to manipulate according to program, visitors are subject to optical illusions that the angles and glimpses of color begin to create within.

Figure 24: Vitra Fire Station (Google)

Inside and out the Vitra fire station is a series of complex spatial arrangements that evoke a sense of illusive instability while still retaining some semblance of stability and structure. Yet all the while exhibiting simple, clean lines that converge together to create a compositional complexity throughout the station.

Today, the fire house has been converted into a museum that showcases Vitra's chair designs after the fire district lines had been redrawn.

Figure 25: Vitra Fire Station (Google)

CHAPTER 06: PROGRAM DEVELOPMENT

CHAPTER 06: PROGRAMME DEVELOPMENT

6.1 Emergency Response Training Center

Requirements	User/unit	Number of units	Area in square ft
Security office	4	1	200
Visitors‘ lounge and reception	Variable	1	500
Director‘s office	1	1	250
Assistant Directors‘ office	1	1	180
General office	6-8	1	500
Finance and Accounts	3	1	200
Meeting room	8	2	500
Board room	15	1	400
Storage and documents		1	80
Men‘s toilet			80
Women‘s toilet			80
Classrooms		5	5000
Equipment Room		1	2000
Auditorium		1	7000
Library		1	5000
Cafeteria		1	3000
Seminar Hall		2	2400
			22370

Circulation 40%			8940
TOTAL			31500

6.2 Clinic:

Requirements	User/unit	Number of units	Area in square ft
Lobby and reception	variable		800
First aid room	1	1	100
Doctor‘s office	1	4	600
Exam room	1	6	1200
Patient/recovery room	2	5	1250
Nurses/medical staff station	4	4	600
Meeting room	8	1	250
Medical storage	8	1	80
Men‘s toilet			50
Women‘s toilet			50
Kitchen	2	1	100
Male Ward		1	2000
Female Ward		1	2000
Emergency Department		1	10000
			19000
Circulation 40%			7632
TOTAL			27000

6.3 Fire Station:

Requirements	User/unit	Number of units	Area in square ft
Lobby and Reception		1	800
Preparation Room		1	1000
Meeting Room		1	800
Cafeteria		1	1500
Kitchen		1	500
Administration		1	2500
Locker		2	3000
Dormitory		1	5000
Gym		1	2000
Garage		1	13000
			30100
Circulation 40%			12040
Total			42500

6.4 Edutainment Center:

Requirements	User/unit	Number of units	Area in square ft
Liquefaction and Earthquake Mechanism Experiment Room		1	650
Training Performance Evaluation Section		1	550
Exhibition Hall		1	2100
Emergency Communication Experiment Room		1	350
Fire Prevention Game		1	350
Orientation Stage		1	1100
Planetarium		1	3300
Children's Section		1	800
Medical Room			450
4D Video Display Room		1	1100
Earthquake Simulation Section		1	800
3 Seminar-Training Halls		3	3300
Conference Hall		1	4850
Library		1	1100
First Aid Training		1	1100
Rainstorm Simulation Section		1	1100

Fire Fighting Training Room		1	650
Smoke Maze Room		1	1100
Administrative Offices		1	4400
			29150
Circulation 40%			11660
Total			41000
Grand Total			90,000

6.5 Residence

Requirements	User/unit	Number of units	Area in square ft
Formal Living Room		1	200
Dining Area		1	150
Service		1	500
Study Room		1	200
Bedroom		2	400
Toilet		3	150
			1450
Circulation 40%			550
Total			2000x2= 4000
Grand Total			1,50,000

6.6 Other Spaces:

Entrance Plaza

Multipurpose Plaza

Running Track with Football Field

CHAPTER 07: DESIGN DEVELOPMENT

CHAPTER 07: DESIGN DEVELOPMENT

Figure 26: Existing Site Model (Author)

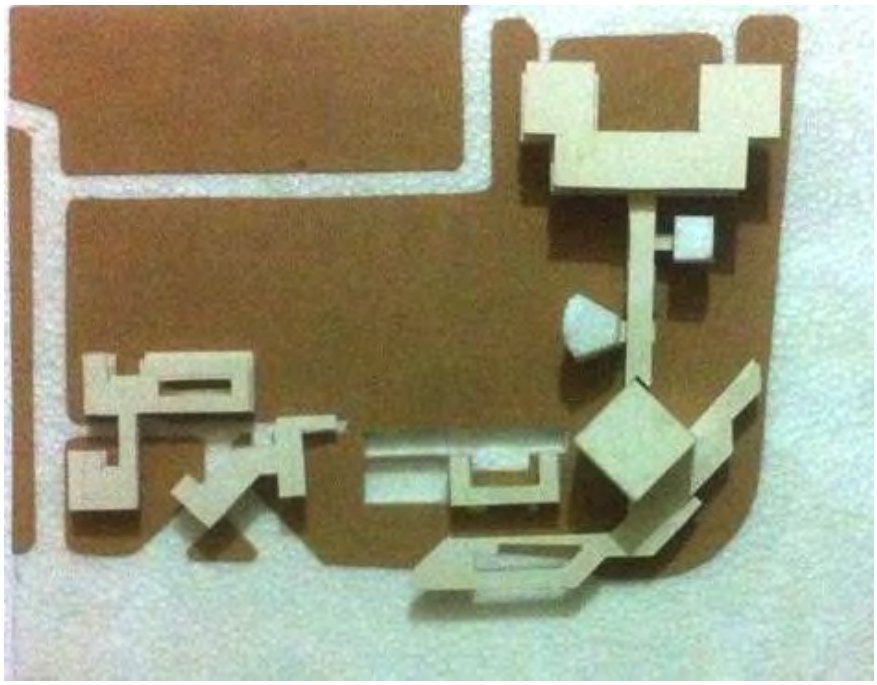


Figure 27: Development Model (Author)

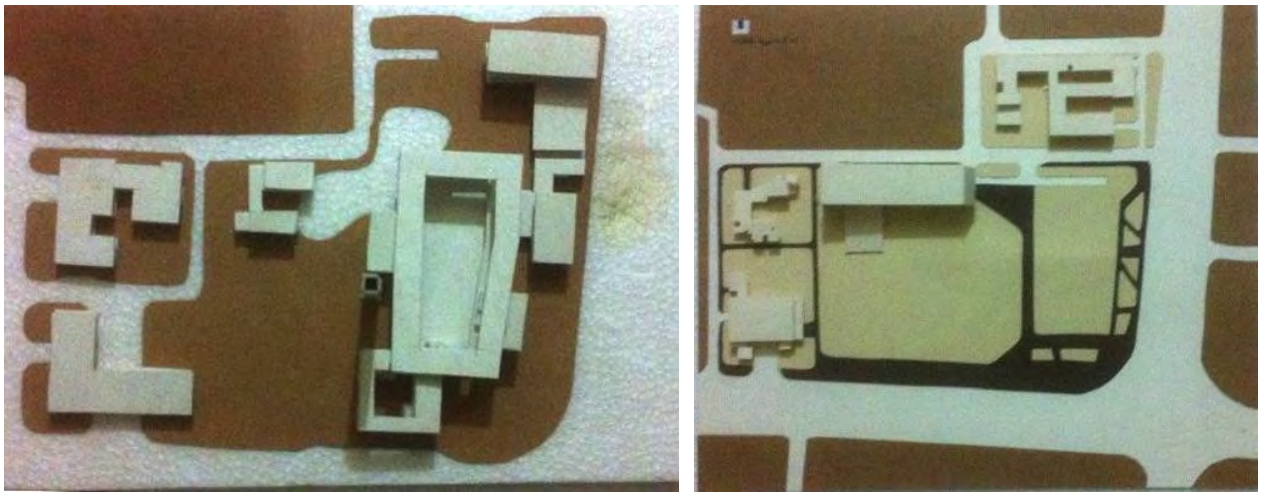


Figure 28: Development Model (Author)

Figure 29: Roofplan (Author)

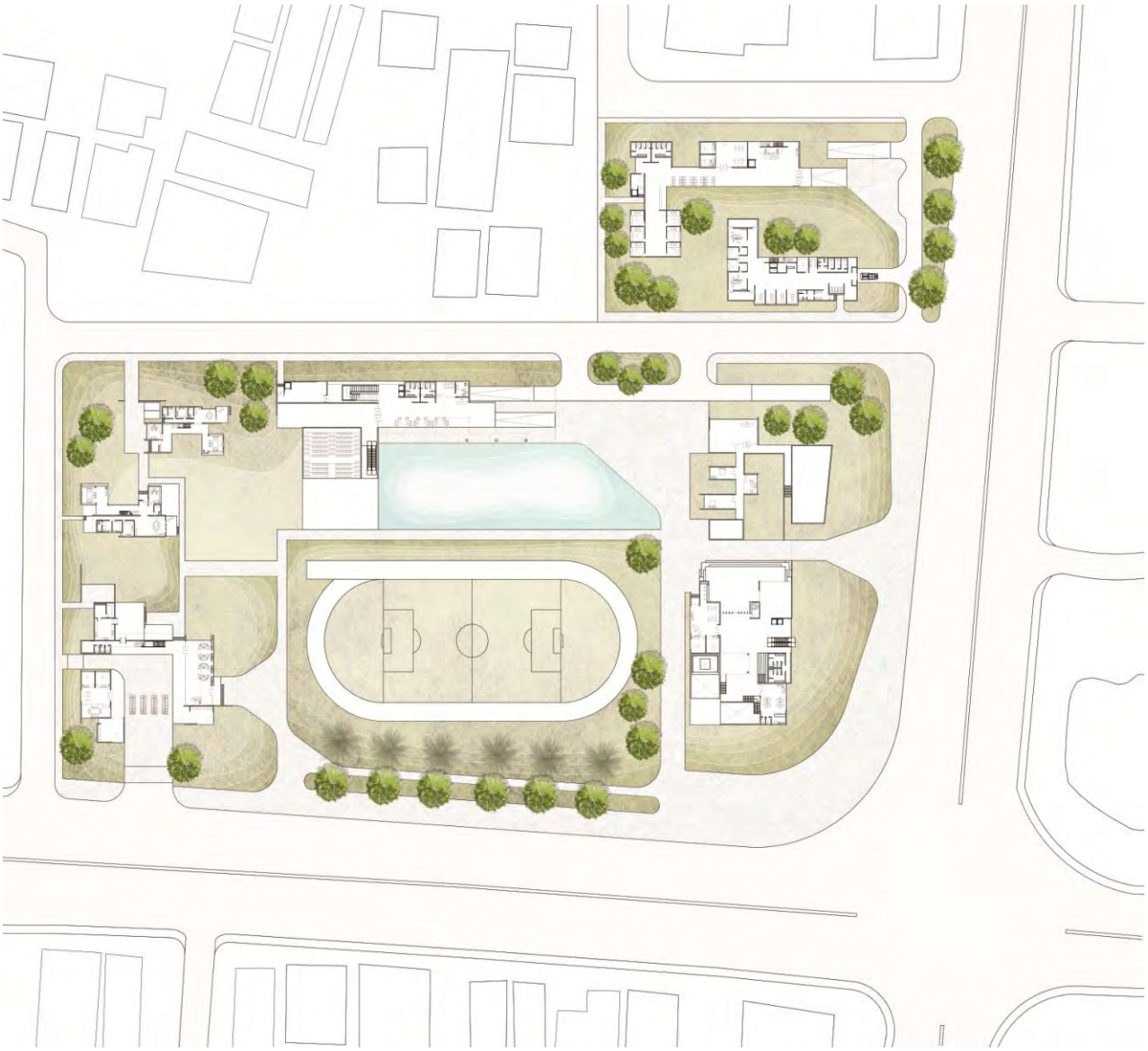


Figure 30: Ground Floor Plan (Author)

Figure 31: Institute Floor Plan (Author)

Figure 32: Institute Floor Plan (Author)

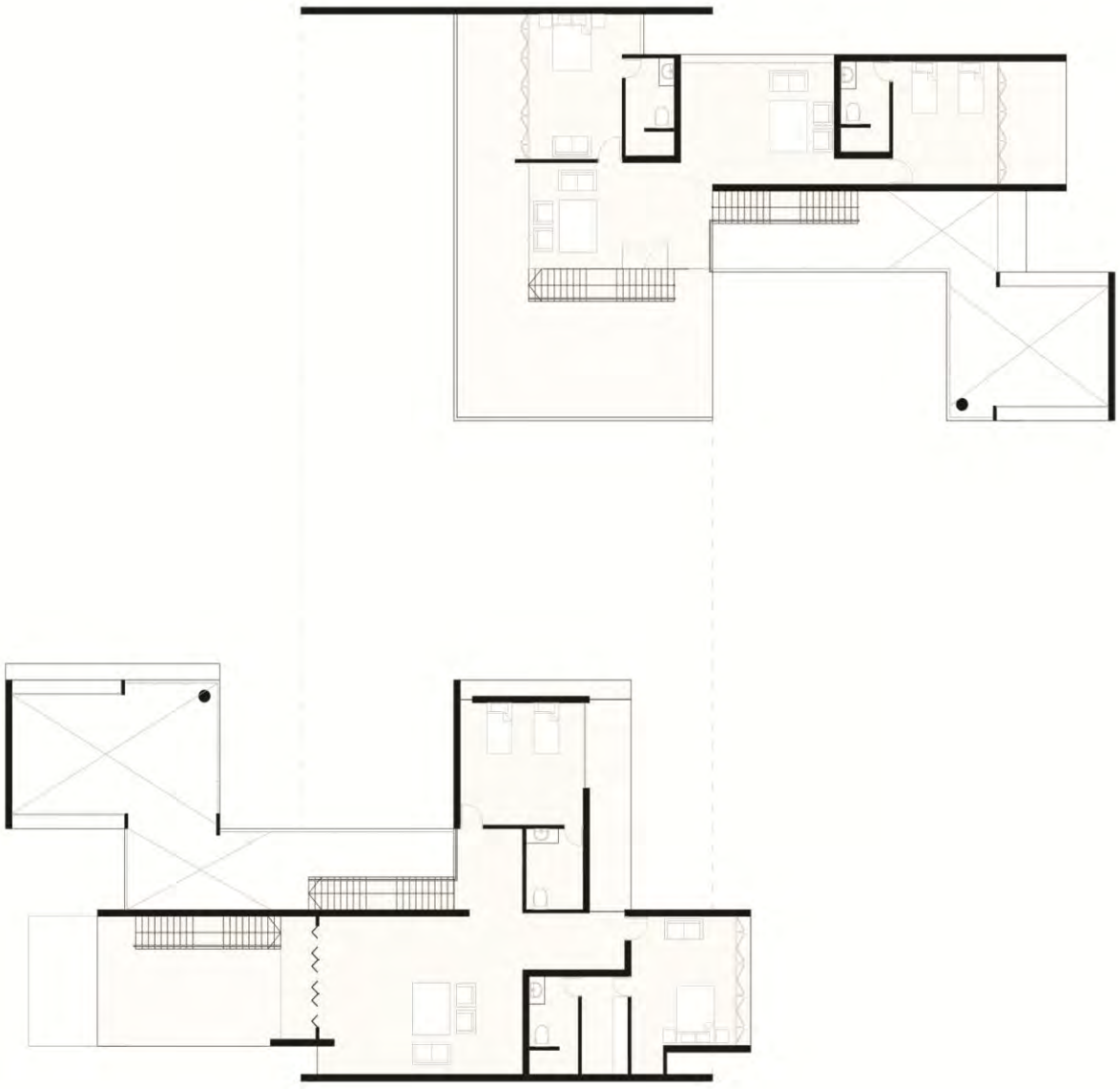


Figure 33: Residence Floor Plan (Author)

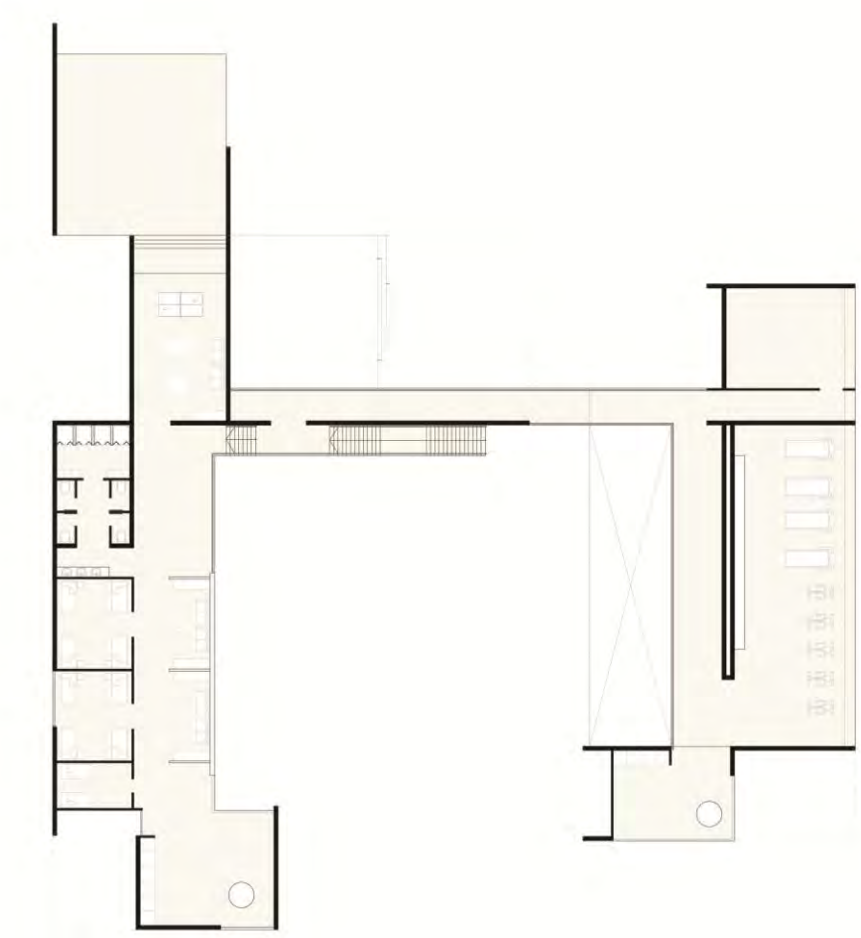
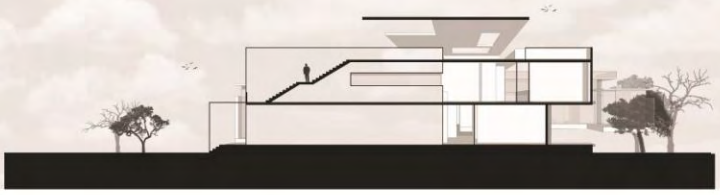


Figure 34: Fire Station Floor Plan (Author)

Figure 35: Clinic Floor Plan (Author)



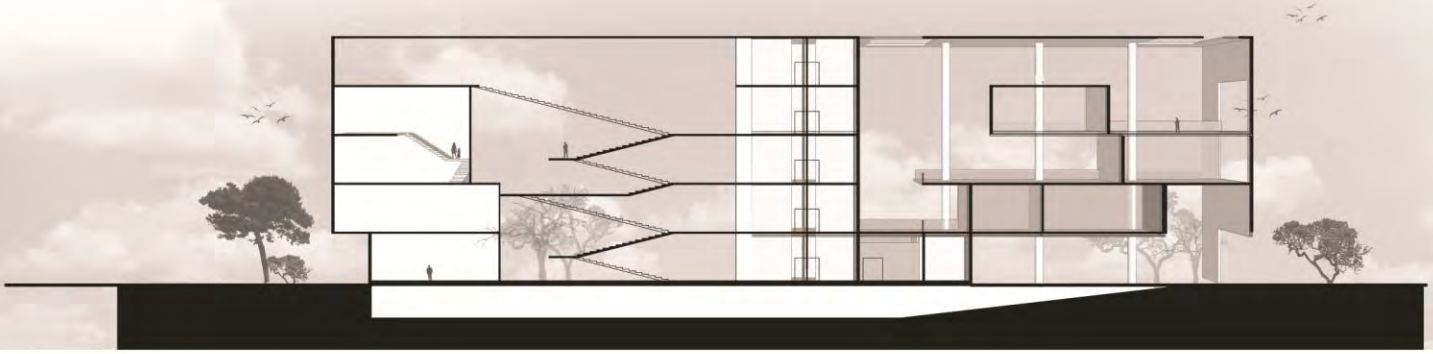


Figure 36: Sections (Author)

CHAPTER 08: CONCLUSION

CHAPTER 08: CONCLUSION

Disaster management is one of the primary services a citizen should get. After 9/11, disaster risk reduction has become a worldwide issue. With the rise of climate change and global warming, the heinousness of disasters is increasing day by day. People are dying of heat wave and what not. Even the first world countries are not being able to cope with this. Therefore, they are not trying to solve the problem single handedly, rather they are involving the citizens. Citizens should be the first line of defense, because the most technologically advanced response team will take at least three minutes to arrive at the location and then act accordingly. The most clever way is to know how to save yourself.

Since, the citizen are willing to get involved and we have seen enough examples of it, why should we not build their confidence by training them; this project is a step towards that. How we can be the change in our society; how the way we see our servicemen can change their way of helping us. In most countries, firemen are portrayed as heroes, whereas in our country they are not. Citizen's aspiration to get involved in services like this should be increased, therefore proper exposure to this lifestyle is needed. This project is an attempt to remedy the existing problems regarding disaster management.

If this project becomes successful it will play a role in changing the conventional way of providing education, this will help us to rethink and reinvent the ever existing methodologies of providing education. Technology can help us do what we want, if we can be open minded, we can change a lot of traditional ways of doing things and make our lives easier.

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