Investigating Mainstreaming DRR into the Critical Infrastructure at District Mardan

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Dedicated to

MY BELOVED LATE FATHER

&
MY FAMILY

for their everlasting love and continuous support

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(Salman Mulk)

ABSTRACT

Over the past few decades, there has been an increase in the rate of disaster events. These disasters claimed precious lives and destroyed developments, gained during the previous years or even centuries. These developmental gains included critical facilities such as schools, hospitals, fire stations, blood banks, power stations and transport networks. Pakistan has also seen and experienced some of the worst disasters of the history which had uprooted and destroyed number of schools and health facilities.

The theme of this research study is to investigate mainstreaming of Disaster Risk Reduction (DRR) into Critical Infrastructure (CI) i.e. in schools and hospitals and to evaluate the implementation issues in this regard. Field data was collected through structured questionnaires from schools and hospitals. School questionnaire was based and designed on Comprehensive School Safety Framework by UNISDR while for hospitals, Pan American Health Organization (PAHO) and World Health Organization (WHO) "Hospital Safety Index" (HIS) tool was used.

The research statistics confirms that there is a huge gap in mainstreaming of DRR into CI due to the implementation issues. Schools and hospital both lack awareness on DRR, lack disaster plans and have been left on the mercy of fate against disasters. Guidelines and Recommendations have been proposed in the light of findings of this study, which if implemented could bring fruitful results and make the CI resilient for upcoming disasters.

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INTRODUCTION

1.1 Introduction

There has been an increase in the rate of disaster events in the past few decades. These disaster events include Italy earthquake 2016, Japan earthquake and tsunami 2011, Haiti earthquake 2010, 2008 Sichuan earthquake, Afghanistan blizzard 2008, Nargis cyclone 2008, 2005 Pakistan earthquake, Indian Ocean tsunami 2004, 2003 Bam earthquake, European heat wave 2003, Gujarat earthquake 2001, 2000 Mozambique flood, and Orissa Super Cyclone 1999 (Zarin. 2015)

Besides these historic disasters, the most recent list of 2017 includes a trio of super-strong hurricanes, Harvey, Maria and Irma which occurred in August and September through the Atlantic, Mexico City earthquake of magnitude 7.1 which killed 369 people, earthquake 2017 near IRAN-IRAQ border which killed 620 people and injured more than 8,000 and flood 2017 which hit India, Nepal and Bangladesh in which 14,000 people died (Brueck. 2017).

Increase in the frequency of these disasters is due to the climate change which has amplified exposure of populations in vulnerable areas against such disasters. Disaster risks are influenced by number of risk factors. Climate change, environmental degradation, poverty, inequality, increased exposure of the populations in vulnerable area and unplanned urban growth and development are the main drivers of increasing disaster risks (UNISDR Global Assessment Report,2015).

Disaster can sweep away years of development in minutes. Disasters not only claim precious human lives but also wipe out all the development gained through the previous years or even centuries. They destruct infrastructure, decrease productivity and cause social tensions (IFRC, 2007). The gains of development included critical facilities such as hospitals, schools, power stations, transport networks, fire stations, blood banks. Relief and recovery responses are highly dependent on these facilities. Critical facilities when disrupted, have multiple consequences. In post disaster situation, these facilities are of great importance for affected populations and countries. For instance, during the Gujarat earthquake of India in 200, the Bhuj and many other

hospitals were damaged, which not only caused more deaths but also squeezed response capacities (ADPC, 2015).

The disruption of critical facilities can even lead to secondary disasters; for instance, East Japan earthquake and tsunami 2011 brought the secondary disaster of nuclear leakage. The great Earthquake of Tohoku which jolted Japan on March 11, 2011 followed by tsunamis, exposed how severely the devastation of CI can disturb societies. Even after one month of the quake, 430,000 households were out of electricity and gas (Bach, Gupta, Nair and Birkmann. (2013).

Pakistan, like other South Asian countries, is among those which is greatly affected by the risks related to the climate change (Ali and Erenstein. 2016). Pakistan has remained among the most susceptible countries in the world ranking on Global Climate Risk Index (Abubakar. 2017). It was ranked twelfth among the most susceptible countries in 2012, eighth in 2015, and seventh in 2017 amongst the top countries of the world which is exposed to the climate change phenomena warming (Kreft. & Eckstein.2013).

Pakistan has also seen and experienced some of the worst disasters of the history. Kashmir earthquake of 2005 and flood, 2010 wiped away developments of the decades. The 2005 earthquake and flood 2010 resulted in huge damage to CI. The tremor demolished 388 of the 796 health facilities in the affected area causing several disease outbreaks. About 20,000 people injured and over 17,000 school-age children died in the collapsed schools. A total of 4,844 educational buildings were demolished, out of 9,000 schools in the affected areas. (Ahmed. 2015). In flood 2010, mostly rural areas were affected. Throughout the country, 515 facilities (5.3 percent) were damaged out of 9,721 health facilities. Out of 515, 329 health facilities (3.4 percent) were partially damaged and 186 health units (1.9 percent) were fully damaged (ADB report, 2010).

Like, other provinces of the country, Khyber Pakhtunkhwa (KP) is also susceptible to number of natural hazards which include floods, monsoon torrential rains, earthquake, landslides and cyclones. (PDMA, KP. 2018) They have inflicted widespread damage to the human lives and CI, throughout the province from time to time. Due to the specific geography and topography of KP, it has increased vulnerability to floods, earthquakes and torrential rains. Besides natural disasters, the province is also facing threats of the complex and human induced disasters. The incidents of

terrorism have increased in the last two decades and caused great damages in terms of human and property loses especially to schools.

Floods in KP are generally produced due to intense rainfall in the catchments of Rivers Kabul Indus and Swat during the monsoon season, which is increased by snowmelt. The province faced major floods in year 1976, 1982,1988, 1992, 2005, 2006, 2007 and 2010 (PDMA. 2018). These floods have caused great damaged to the CI i.e., schools and hospitals. In flood 2010, about 11% of the total health facilities were damages or destroyed in KP and Sindh. While schools destroyed in KP were 5.6% of the total education facilities (NDMA. 2010).

The province of KP has also remained vulnerable to the earthquakes hazards. Earthquakes history of the province includes earthquake of 1842, 1992, 1993,1994,1995,2000,2001,2002, 2005 and 2015 (Ali and Naeem. 2004). About 7,669 schools were affected in Balakot earthquake, 2005. About 5,690 primary and middle schools were damaged. Approximately 574 health units had been partially damaged or demolished (World Bank report. 2005).

In this context, the investigation of critical facilities i.e., schools and hospitals (which is the focus of this research study) in terms of natural and man-made hazards, is of high importance. This study will investigate that what measures have been taken so far against natural hazards in the schools by the concerned department and stakeholders and what gaps exists on the ground in mainstreaming DRR into schools and hospitals.

1.2 Critical Infrastructure

CI play an important role in functioning of a society. They are useful not only in routine but emergency situations to support response and recovery activities. CI include a series of engineered systems, assets and facilities which are vital for routine societal functions, as well as continued economic and societal functioning in the post disaster event (Moteff and Parfomak.2004).

CIs are usually divided into socio-economic infrastructure and physical systems. Socio-economic infrastructures comprise of facilities such as schools and hospitals but also disaster management services, public administration, and recreational areas. Physical CI includes all basic services

such as information and telecommunication technologies, water supply, waste (water) management, electricity and transport. (German, FMI. 2009)

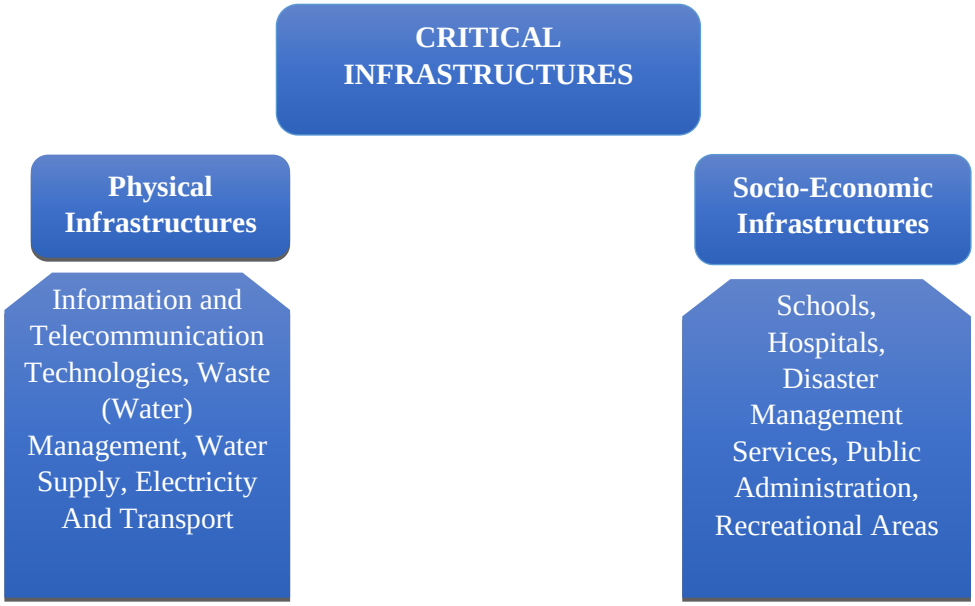


Fig 1.1: Types of Critical Infrastructure

Source: Federal Ministry of the Interior of the Federal Republic of Germany (FMI) (2009)

Under the Homeland Security Presidential Directive7 (HSPD-7) of United States of America, the newest list was updated by DHS in 2008, covering 18 groups of key sectors as follows:

1) Energy
2) Government Facilities
3) Healthcare and Public Health;
4) Information Technology;
5) Critical Manufacturing
6) Dams
7) Defense Industrial Base
8) Emergency Services
9) National Monuments and Icons
10) Nuclear Reactors
11) Materials and Waste

12) Postal and Shipping
13) Transportation Systems
14) Water
15) Banking and Finance
16) Chemical; Commercial Facilities
17) Communications
18) Agriculture and Food

1.3 Schools and Hospitals as CI

The notion of CI is constantly evolving. The list and definition of critical facilities may vary from nation to nation and between societies according to needs and availability. For instance, schools are not listed in the above-mentioned group of sectors given by Department of Homeland Security (DHS) although in Asia and other developing regions, educational infrastructure are key structures that houses hundreds of students for schooling and during emergencies also act as evacuation shelters.

Additional areas are regarded functionally as infrastructure facilities such as hospitals and schools, the production of goods and services, the spreading of finished products to markets (Barrentine and Bauer, 2013).

1.4 Impact of Disasters on Schools and Hospitals

Disasters have a major educational, health, physical, economic and psychosocial impact on women, children and aged persons. Disasters can destroy not only human lives but also can demolish school and health units. It affects the resiliency of communities, disrupts educational cycles and force children to drop out of school (WHO Media center, 2009). According to Freeman and Warner (2001), earthquakes, floods, landslides and hurricanes have severe impacts on community infrastructures.

As described by Mili (2003), the integrity of CI is at risk worldwide because they are increasingly vulnerable to local turbulences. The titanic Sichuan 2008 earthquake injured

400,000 people while 88,000 people died or left missing. 40% of all schools in Sichuan were impacted in which thousands of children were killed and injured. Damaged or destroyed hospitals were counted 11,000. This and other similar disasters highlight mounting concern over the effects of calamities on health and education (UNISDR report, 2010).

Table 1.1: Impact of Disasters on CI Throughout the World

Event	Year	Place	Impact
India Earthquake	2001	Gujarat	11,600 schools and more than 1,200 health units including 2 district hospitals devastated
Indian Ocean tsunami	2004	Aceh, Indonesia	Destroyed 3,415 schools, 517 health facilities.
Pakistan Earthquake	2005	Kashmir	More than 10,000 school buildings collapsed. Around 574 health services had been destroyed or partly damaged.
Indonesia Earthquake	2006	Yogyakarta	More than 3,000 buildings (including schools and universities) were badly impacted and resulted in the closure of 17 hospitals.
China Earthquake	2008	Sichuan	Around 10,000 plus children passed away in schools and 7,000 classrooms destroyed

Source: ADPC report, (2015)

1.5 Damages to the Schools and Hospital in Flood 2010, Pakistan

Pakistan experienced extreme torrential rains in the middle of July 2010. These rain spells continued till September and caused a heavy flood of 2010. More than 20 million people affected due to the flood 2010, as per statistics of National Disaster Management Authority (NDMA). The secondary hazards such as landslides and flash floods instigated by the rain caused severe damage to infrastructure in the affected areas. The flood 2010 devastated entire villages, inundated urban low-lying areas, wrecked homes, and damaged thousand acres of farming lands.

1.6 Health Sector Damage

According to the initial damage need assessment (DNA) report of flood 2010, which was assessed by NDMA, stated that a total loss of *PKR 4,222 million* (*US$49.67 million*) occurred to the health sector.

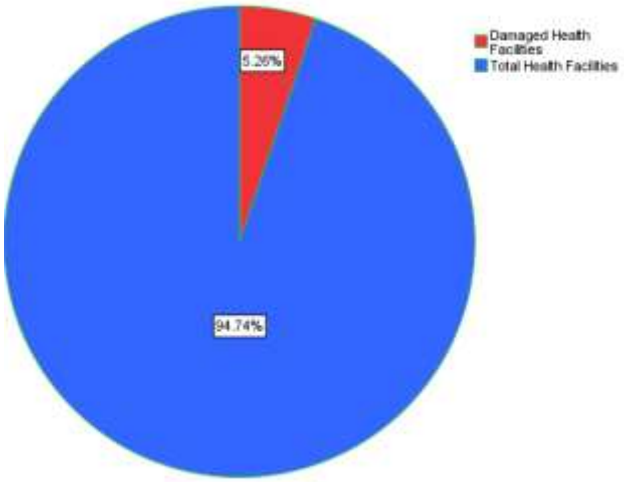


Fig 1.2: Damage to Health Facilities in 2010 Flood

In flood 2010, 515 (5.3 percent of the total) health facilities were partially damaged or destroyed throughout the country. About 11 % of total health services were damaged or destroyed in KP and Sindh. In FATA, 8 % while 2 % or less damaged was received to health units in the rest of the provinces.

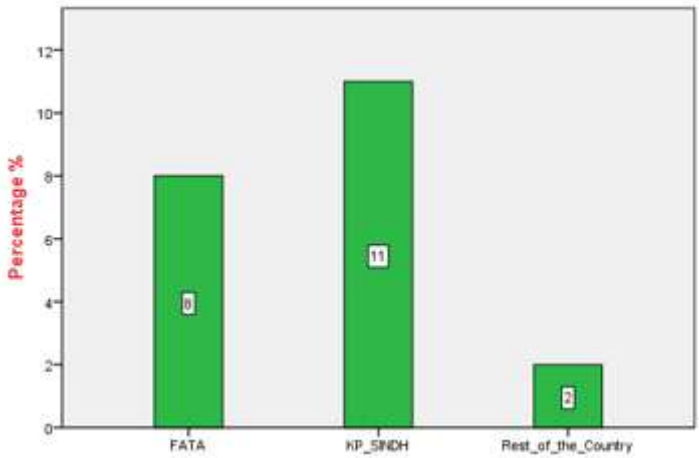


Fig 1.3: Province Wise Percentage of the Damaged Health Facilities in Flood 2010

1.7 Education Sector Damage

Total damaged caused to the education sector was *PKR 26,464.3 million (US$311.3 million*) stated by NDMA preliminary DNA report 2010.The unparalleled floods had damaged a total of 10,407 educational institutions out of which 3,741 were fully demolished while 6,666 were partly destructed. The affected institutions were 6.2 % of the total buildings in the country. Sindh and Punjab were the two worst affected provinces where 18.5 % and 8.8 % of the pre-flood educational facilities damaged or destroyed.

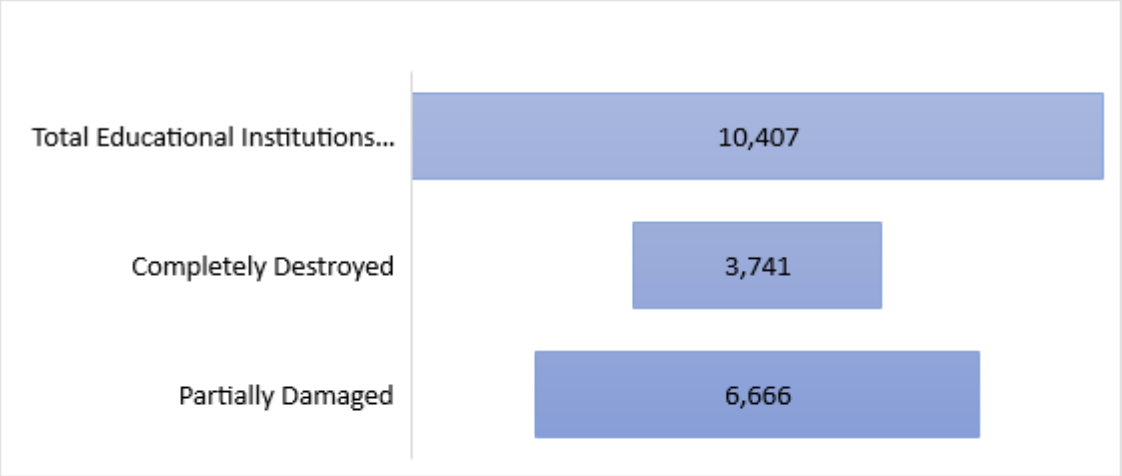


Fig 1.4: Damaged and Destroyed Education Institutes in Flood 2010

1.8 Problem Statement

DRR policies for CI has been already formulated and framed at national level by local and internal experts. Great paper work has been done in this regard which provide guidelines to mainstream DRR into development, CIs and to reduce disaster risks. But still, excessive gap has been witnessed and experienced by the continuous realization of disasters, causing disruption within the society. The problem statement highlights what are those major hurdles, issues or reasons which are impeding and obstructing the DRR interventions at schools and hospitals.

1.9 Objective

- To identify gaps in mainstreaming DRR into CI.
- To evaluate implementation issues and to propose guidelines for mainstreaming DRR into CI.

1.10 Research Questions

- What are the gaps in mainstreaming DRR into CI?
- What are the implementation issues in mainstreaming of DRR into CI?

1.11 Scope

This research study has been carried out in Urban area (14 UCs) of the district Mardan. The data has been collected from a sample of 81 schools including Primary, Middle and High and 3 hospitals from the city area. Mardan is second biggest city after Peshawar and has become a center of educational institutes and health facilities. According to 2017 Census, population of the district is 2,373,061. Besides, inland opportunities, disaster risks also prevailed in the city due to its geography. The district is exposed to *Kalpani nullah* which runs in the heart of the city and merges into River Kabul at Nowshera. Unfortunately, most of the schools are located near or at the bank of the *nullah.* These exposed and vulnerable schools had been severely hit in the floods of 2007 and 2010. Riverine floods, Monsoon torrential rains, earthquakes and bomb explosions have remained the most active hazards in the city which have subsequently damaged or affected the schools and hospital CI of the city.

1.12 Significance

This research provides an insight into mainstreaming DRR gaps and implementation issues into schools and hospitals. The literature on this topic is rarely available in the context of Pakistan. Such study has not been carried out in district Mardan regarding identifying gaps of DRR into CI i.e., schools and hospitals. This study will establish to find out, not only the gaps in DRR but also will dig out the implementation issues regarding its mainstreaming. This effort will attempt to

come up with conclusion and recommendation relevant to DRR mainstreaming in schools and hospitals which will provide a guideline for future implementation.

DRR integration and its implementation into critical infrastructure lead nations towards resilience, prosperity and achieving sustainable development goals (SDGs). Mainstreaming DRR into schools and hospitals will result in saving valuable lives and reducing casualties. DRR integration will reduce the magnitude of damage to school and hospital infrastructure. Restoring schools and hospitals will have a direct effect on disaster management because these two infrastructures are useful both in routine and emergency situations. Schools are usually needed for camp or shelter points while hospitals provide health services in emergencies.

1.13 Organization of Thesis

The second Chapter includes literature review, work done previously on the same topic and in same context by different countries and researchers. Methodology, which is the third chapter elaborates the procedures that how data was collected for this research and what mechanism was adopted for selection of the sample size. Fourth chapter is analysis and interpretation of the surveyed data. Fifth chapter has highlighted the implementation issues in mainstreaming of DRR into CI while chapter six which is the final one, comprises of conclusion and recommendations.

Chapter 02

LITERATURE REVIEW

2.1 Definition of Critical Infrastructure (CI) by Different Nations

Different nations and communities have defined CI in different ways according to their needs and availability. No universal and standardized definition of the CI has been evolved so far. Definition of the CI may vary from nation to nation, which is given below.

2.2 Definition of CI by United States

The United States Public policy mentioned the definition of "infrastructure" thirty years ago. The Council of State Planning Agencies in its report, defined "infrastructure" as:

"a wide array of public facilities and equipment required to provide social services and support to private sector economic activity."

According to the report, infrastructure encompassed water and sewer systems, airports, roads, ports bridges and public buildings, and might also comprise schools, fire safety, health facilities, electric power production, jails, recreation facilities, waste disposal and communications services (Vaughan, R. Pollard, R.1984)

After the terror attacks of 9/11, 2001, the USA PATRIOT Act of 2001 was passed by the Congress. The act defines the "critical" infrastructure as

"systems and assets, whether physical or virtual, so vital to the United States that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health or safety, or any combination of those matters "(Sec. 1016(e)).

Germany

"CI are organizations and facilities of major importance to the community whose failure or impairment would cause a sustained shortage of supplies, significant disruptions to public order or other dramatic consequences." (German FMI,2009)

European Union

"CI means an asset, system or part thereof situated in Member States which is important for the maintenance of vital societal functions, health, safety, security, economic or social well-being of people, and the disruption or destruction of which would have a significant impact in a Member State because of the failure to maintain those functions" (Council Directive European Commission, 2008)

UNISDR

"The physical structures, facilities, networks and other assets which offer services that are vital to the social and economic functioning of a community or society" (UNISDR, 2017).

Pakistan

The National Disaster Risk Reduction Policy-2013 of Pakistan uses the term 'key-infrastructure and lifeline' and defines it as "those facilities, structures and services whose disruption or destruction would seriously affect peoples' lives and livelihoods including those whose functioning is crucial in a post disaster situation i.e.

a) Educational and Health Facilities; Key Government Buildings
b) Water Supply and Sanitation, Electricity, Transport and Communication
c) Irrigation and Flood Protection

2.3 Are all Infrastructures Critical?

Not all infrastructures are crucial. A CI is a collection of indispensable assets. An asset, a subset of a CI, is something of the high geographical area. A jurisdiction can be a private or public sector. A private sector jurisdiction is privately owned and operated by an individual or a legal entity such as a corporation and has control of the asset. A public-sector jurisdiction is one in which the assets are owned by the citizens and controlled and operated by a government agency, entity or employee.

It is possible that an asset can be classified as CI to both the private sector and the public sector. An example would be a privately owned medical clinic that is operated by a private concern and

intended to earn a profit, but it supplies a critical service on which the public depends (Brian and Bennett, 2007).

2.4 Why to Mainstream DRR into Hospitals and School Infrastructures

DRR is part of sustainable development but inappropriate development processes can lead to increased vulnerability to disasters. An important part of Disaster Risk Management (DRM) is DRR which aims to minimize vulnerabilities and disaster risks through prevention or mitigation and preparedness. When DRR becomes embedded into regular development practices, and fully institutionalized, it is known as DRR mainstreaming.

The word "Mainstream" obviously derives from the metaphor of a small, isolated flow of water being drawn into the mainstream of a river where it will expand to flow smoothly without loss or diversion. Therefore 'mainstreaming risk reduction' describes

"a process to fully incorporate disaster risk reduction into relief and development policy and practice."

It means radically expanding and enhancing DRR so that it becomes normal practice, fully institutionalized within an agency's relief and development agenda.

It is a dynamic process with a dual purpose:

a) Ensuring that development is protected through DRR elements

b) Ensuring that development does not increase people's vulnerability to disasters

Disasters set back development.

- Disasters impact various sectors like Agriculture, Health, Education, Infrastructure, Housing etc.
- This causes diversion of resources to rehabilitation and reconstruction and sometime postponement/cancellation of development programs.

Development can also create disaster risks.

- DRR considerations not featuring into project design, thus increases the risks, and increasing the negative impact of disasters on the socio-economic set up of the country. (NDMA, Pakistan)

Reasons for Mainstreaming DRR in to Development.

- to guarantee that the design of development programs and projects take into account potential disaster risks in the local community;
- to ascertain that all the development programs and projects do not further increase vulnerability to disaster in all thematic areas: social, physical, and economic and environmental;
- to ascertain that all the disaster relief and rehabilitation programs and projects are designed to contribute to reducing future disaster risks in the community

2.5 Disasters and Hospitals

A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources (UNISDR, 2009). Disaster impacts may include loss of life, injury, disease and other negative effects on human physical, mental and social well-being, together with damage to property, destruction of assets, loss of services, social and economic disruption and environmental degradation.

Disasters causes both direct and indirect losses. The physical destruction caused by a disaster is considered a direct loss, and includes the human victims, environmental degradation (i.e., the alteration of the habitat), and damage to buildings, infrastructure, and urban spaces.

Indirect losses are generally divided into social and economic effects. Social effects include the interruption of transportation, communications (including the mass media), and other public services. They can include the negative image that a country or region might acquire in the wake of a disaster. Economic effects include the cost of reconstruction and rehabilitation, the impact of reduced production or consumption on trade and industry, the potential discouragement or flight of foreign investment, and the lack of access to basic services such as health care.

Schools and hospitals are the main critical facilities and need to be protected. Hospitals, and health facilities in general, are exposed systems that can receive damage as a result of intense natural phenomena. In the case of structurally unsafe hospitals and health centers, natural disasters endanger the lives of occupants of the buildings, and limit the capacity to provide health services to disaster victims.

Usually, hospitals can have a large population of resident patients, outpatients, staff members and visitors. In the event of a disaster, they must continue to treat the patients who were already in their care, while tending to the needs of the injured. For this to happen, the staff must be in place and must know how to respond to the situation. It is just as important, however, for the infrastructure and equipment to remain functional after disaster impact.

Due to the high cost of health facilities and the vital services they provide, major damage can have a severe impact on public finances and the production capacity of a country due to the high costs of repair and reconstruction. A building may remain standing after a disaster but remain incapable of providing medical care due to nonstructural damage. In most buildings the cost of non-structural components (electrical systems, telecommunications, water supply system, fuel storage, medical gases) is considerably higher than that of structural components. This is particularly true of hospitals, where between 85% and 90% of the value of the facilities lies in the architectural elements, the mechanical and electrical systems, and the medical equipment. Even a seismic event of lesser magnitude can damage nonstructural elements. These key components of a hospital, those most directly linked to its purpose and function, are the ones most likely to be affected or destroyed by earthquakes.

2.6 Disasters and Schools

The most vulnerable and exposed population of the society usually receive great damages in disasters. Catastrophic events disproportionately affect the most vulnerable groups - children, minority groups, the elderly, landless tenants, people with special needs, population that is food insecure; and women. Disasters have a major impact on children and youth and education systems. The school going children are considered the most exposed and vulnerable resource of the society due to their weak physical and mental capabilities in terms of disaster reduction. Disasters not only disrupt the school infrastructure but also halt educational services. Teachers

get affected and students miss their classes. Schools closure or repeated or prolonged use of schools as emergency shelters also affect the smooth functioning of the education environment which in turn impacts educational outcomes and a child's overall development.

The Asia Pacific region of the world where Pacific Ring of Fire is located is considered one of the most vulnerable and exposed region in the world in terms of natural disasters. In Asia Pacific region, disasters have had significant and sometimes massive negative impacts, undermining the education of hundreds of thousands of children in 2015 alone.

In the two earthquakes of Nepal, which occurred on 25th April and 12th May, 2015, a total of 8,891 people was confirmed dead, 605,254 houses destroyed and 288,255 houses damaged. During the height of the emergency, some 188,900 people were temporarily displaced. An estimated 3.2 million children were directly affected both physically and mentally by the earthquake. Of these, around 870,000 children were left without permanent classrooms and an additional half a million required support to return to learning (UNOCHA report, 2015).

The disruption caused by Nepal Earthquake 2015, in schools is given below by the Education Cluster and Ministry of Education Nepal (Save the Children report, 2016)

- Damaged 8,242 public primary and secondary schools.
- Damaged 25,134 classrooms in public primary and secondary schools.
- Damaged 4,416 toilets and water, sanitation and hygiene facilities in schools.
- Damaged 1,791 compound walls.
- Damaged 1,292 classrooms in tertiary education facilities.

2.7 Global, Regional and National Initiatives for Safe Hospitals and Schools

Global and regional priorities for safe schools and hospitals have been set in various initiatives such as:

- The Yokohama Strategy is the output of the World Conference on Natural Disaster Reduction, held in Yokohama, Japan, from 23 May to 27 May 1994. It delivers guidelines for natural disaster prevention, preparedness and mitigation.
- International Conference on Disaster Mitigation in Health Facilities. In 1996, Pan American Health Organization (PAHO), the Government of Mexico with the support of IDNDR and the World Bank convened this conference to reduce the structural impact of disasters on hospitals.
- The Hyogo Framework for Action 2005-2015 (Kobe, Hyogo, Japan, from 18 to 22 January 2005) was a ten years plan for making the world safer from natural hazards.
- The UN Decade on Education for Sustainable Development was an Education for Sustainable Development (ESD) initiative of the United Nations. In December 2002, the United Nations General Assembly, through its Resolution 57/254, declared a Decade of Education for Sustainable Development (2005- 2014). It sought to mobilize the educational resources of the world to help create a more sustainable future.
- Islamabad Declaration on School Safety, May 2008. Islamabad Declaration on School Safety adopted at the Islamabad International Conference on School Safety urges resilient schools as a matter of regional and national priority.
- Bangkok Action Agenda on School Education and DRR, Nov 2007. The Asia Pacific Regional Workshop on School Education and DRR greeted 304 participants from 24 countries from the Asia and Pacific region. The goal of the workshop was to contribute toward reducing the vulnerability of school children to disasters and helping to decrease the loss of lives.
- Ahmedabad Action Agenda for School Safety Jan 2007 to make the schools resilient against natural hazards.

- The 2006-2007 World Campaign on Disaster Reduction. It was launched in Paris in June 2006 by UN/ISDR secretariat and UNESCO, with support from the French Government. Its theme was: "Disaster Risk Reduction Begins at School".
- Regional Consultation of South East Asia Regional (SEAR) Members Countries on Keeping Health Facilities Safe from Disasters (in New Delhi, India 15-17 of April 2008)
- Kathmandu Declaration on Protecting Health Facilities from Disasters (27th Health Minister's Meeting in Kathmandu in September 2009). Health Ministers from WHO's 11 Member States in South-East Asia committed themselves to making health facilities more resilient by adopting the Kathmandu Declaration on Protecting Health Facilities from Disasters.
- One Million Safe Schools and Hospitals Initiative (Manila on 8 April 2010) is a global advocacy initiative and its goal is to make schools and hospitals safer from disasters. This initiative is part of the 2010-2011 World Disaster Risk Reduction Campaign on "Building Resilient Cities.
- The Sendai Framework for Action 2015-2030 (18 March 2015 in Sendai City, Miyagi Prefecture, Japan)

2.8 The Case Studies:

Case 1: DRR in School Curricula "Bangladesh"

Bangladesh has set an example of a highly centralized textbook-driven integration of DRR into formal school curricula, but the pedagogical innovation and teacher capacity building still needs improvement and are thus far lag.

In Bangladesh, different regions are affected by different kinds of hazards for example, drought in the north, cyclone and tidal surges in the south, river erosion and "floods in the middle of the country. The National Curriculum and Text Book Board (NCTB) has introduced disaster and climate change-related themes (i.e., hazards, vulnerability, preparedness) within chapters in many different textbooks, such as Bangla, English, Social Science, General Science (grades 5-7).

Chapters within textbooks are regularly updated and reviewed by the NCTB to make them more risk management oriented (Ministry of Women and Children's Affairs, 2010).

In contrast to the above-mentioned textbook and knowledge oriented DRR integration in formal school curricula, awareness raising and skills oriented DRR learning examples exist through co-curricular and extra-curricular activities supported by local and international NGOs.

- A drawing and project design competition on building safer communities has been developed by the International Federation of Red Cross and Red Crescent Societies and Bangladesh Red Crescent Society and this has been shared with the National Curriculum Board of Bangladesh for their feedback and dissemination.
- A one-day school fair (by Oxfam GB) and a student club (by Plan Bangladesh) were used for awareness-raising and student participation in school safety and disaster risk reduction (European Commission, 2010).

The incorporation of interactive ways of teaching and learning for DRR within the formal curriculum remains still a challenge. A working paper by ADPC and Action Aid Bangladesh (2010) highlights the issue: 'there is a need to give more emphasis on pedagogy', as 'at the present DRR is included only into TEXT version in different grades'. (UNICEF, 2012)

Case 2: School Safety in "China"

Hazards and risk knowledge (Assessment)

Identification of natural hazards causing threats to schools is in process at the national level. The Ministry of Education (MOE) is implementing a monitoring and warning system to alert local education commissions and education bureaus about possible natural disasters and other safety risks and offer advice about emergency preparedness and response, as well as disaster reduction in middle schools, primary schools, and kindergartens. In 2009, a nation-wide school safety assessment implemented by MOE was technically and financially supported by UNICEF China office.

One dimension of the assessment was on the vulnerability of existing school buildings. The earthquake sector leads the assessment on school location if it is in an earthquake zone, land and resource sector leads the assessment on landslide, mudslide, etc., and water conservancy sector leads the assessment on possible flood threats to schools. Locally, the Education Department of the Sichuan Province (EDSP) is helping in the identification of natural hazards posturing threats to schools.

Regular reassessment of risks is planned; MOE and UNICEF are collaborating to develop school safety management manual including checklists in 2011-2012 for each school to regular reassessment of risks.

- MOE, Ministry of Construction, and National Development and Reform Commission (NDRC) jointly released the Design Instructions for School Planning and Construction after the Sichuan 2008 Earthquake.
- MOE and UNICEF collaborated and prepared the draft of National Guidelines for Safe School Construction and Management, and the draft is currently under revision.
- The sites are assessed before the schools are built in accordance with national regulation, performance objectives are determinate by the country level government.
- The quality monitoring bureau leads monitoring on safety of equipment installation.
- Supervision of school constructions (or retrofitting) by qualified engineers is in process.
- From year 2000 to 2005 the first and second session of school renovation and maintenance was conducted; from 2006 to the present, long-term mechanism of school building maintenance are conducted (in 2009 the school safety project for primary and secondary schools started).

- Emergency preparedness plans were developed in most schools in the Sichuan Earthquake affected counties. The students, teachers, staff, and school administrators in most of the schools were trained on what to do before, during and after a hazard event.
- School education on disaster response and knowledge about safety has been organized for students and teachers.

- Schools will receive early-warning notification to be disseminated by safety monitoring staff of townships/villages/communities.

Regular school drills to practice and improve skills and plans are implemented at least once a year in most schools in the Sichuan Earthquake affected counties. In Ganzi Prefecture, Sichuan Province, each school will do monthly drill. (Bastidas, 2011)

Case: 3 Legislating Hospital Assessment in Colombia

The Colombian Seismic−Resistant Construction and Design Standards, known as NSR−98 were signed into law in 1998. The law requires that essential buildings situated in earthquake prone areas be assessed as to their vulnerability within a period of three years and inspected or reinforced within a period of six years. This obliges the national, departmental and municipal governments to include budget allotments to that end in the coming years and consider this type of investment in future development plans.

Essential buildings were those buildings serving the community that must function during and after an earthquake, whose operation cannot be moved rapidly to an alternate location, such as hospitals with complexity levels of 2 and 3, as well as centers responsible for lifeline operation and control.

These buildings must be modified or retrofitted to bring them up to a seismic safety level equivalent to that of a structure newly designed and constructed in accordance with the requirements of this law and its regulations, within a period no greater than six years from the date this law goes into effect.

Equipped with this judicial instrument, the Colombian Ministry of Health and the National Department for the Prevention and Management of Disasters will be able to strengthen their nationwide program to promote seismic vulnerability assessments of all existing hospitals and their retrofitting, where necessary. (PAHO,2000)

Case:4 Vulnerability Assessment: A tool for setting health sector priorities in Chile

The 1985 earthquake in Chile was especially destructive to the country's health infrastructure. The event damaged 180 of the 536 institutions in its area of influence, and left 2,796 of the 19,581 available beds out of service. Due to this experience, a project was formulated with the objective of identifying measures to reduce the vulnerability of the most important hospitals from each of the 26 health services divisions in the country.

A group of 14 hospitals was finally selected as a representative sample of the different types of construction and the level of exposure to seismic hazards. Each of the hospitals was the focus of an intense assessment, including structural, non−structural, functional, and organizational aspects. The assessment's starting point was the integrity of the structure and the safety of its occupants. The project included the following activities: (PAHO,2000)

• A description of the health system;

• A brief description of seismicity in Chile;

• Training of personnel;

• Analysis of structural and nonstructural vulnerability;

• Estimation of the vulnerability of the area and development of mitigation plans.

The effectiveness of the assessment was tested when an earthquake with a magnitude of 7.3 on the Richter scale hit the city of Antofagasta on 31 July 1995. The city hospital, which had been evaluated a few days earlier, partially lost its operating capacity due to broken water pipes, broken windows and lighting systems, damage to equipment (hemodialysis and boilers), and general damage in the structural and nonstructural systems. Immediate evacuation of the hospital was considered.

2.9 Pakistan Policy on Mainstreaming DRR into Health (Hospitals/Health facilities) and Education (Schools) sectors

Historical perspective

Historically, disaster management in Pakistan was limited on the 'Emergency Response Approach'. Disasters were encountered under the Calamity Act of 1958 and the disaster response strategy was mainly built on a reactive approach. When the United Nations International Strategy for Disaster reduction(UNISDR) replaced the International Decade for Natural Disaster Reduction (IDNDR) in 2002, it was recognized that disaster should no longer be dealt in a "reactive" manner but will be respond in a proactive manner. The focus was led on to reduce the underlying vulnerabilities and to address its root causes.

In 2005, the Hyogo Framework for Action (HFA) was endorsed in Kobe, Japan by 168 countries including Pakistan. It urges all countries to make efforts to reduce their disaster risk by 2015. The HFA called for the establishment of appropriate legal and institutional arrangements for managing disaster risks (HFA 2005-2015).

Prior to the Oct 2005 earthquake there was no institutional set up available at the national level to respond to the disaster of this magnitude. After this terrible earthquake, the proposal for the establishment of Disaster Management System (DMS) was presented to the Prime Minster (PM) of Pakistan in 2006 at the same time all the provincial assemblies along with PM approved this proposal and led the federal government to legislate on DMS. The Government of Pakistan publicized the National Disaster Management Ordinance (NDMO) in 2007 to lead a comprehensive National Disaster Management System in the country. Later, this NDMO developed into the National Disaster Management Act in December 2010. Under 2010 Act, the National Disaster Management Commission (NDMC) was established at the national level, and was made obliged for setting guidelines and policies for disaster risk management and was to formulate the National Plan. The NDMA was accordingly established in 2007 in line with the Act, which is responsible for the implementation, coordination and monitoring for DRM at the national level.

A national framework for disaster risk management, known as the National Disaster Risk Management Framework (NDRMF), was prepared by NDMA in 2007. The NDRMF offers strategic guidance for disaster management in the country. In March 2010, the NDMA presented the National Disaster Response Plan (NDRP) defining roles and tasks of the important stakeholders in crisis response including Standard Operating Procedures (SOPs).

The National DRR Policy was approved by NDMC on 21st Feb 2013 by the PM of Pakistan. It provides an overall guiding framework for encountering the high levels of disaster risk prevailed in Pakistan. The policy aims to promote priority measure to reduce the existing vulnerability. The policy helps as a guiding framework both for DRR and relevant development plans and programs to focus attention upon priority issues.

2.10 DRR Policy 2013, Health and Education Sector

According to the DRR policy of Pakistan, published in 2013, the vulnerability of various infrastructure systems and services needs to be assessed against multiple priority hazards. Against findings from these sector-specific assessments, DRR strategies and plans need to define a program to promote and enforce appropriate construction norms and location requirements, suggest eventual retrofitting activities and measures to mitigate non-structural damage as well as appropriate preparedness, operation and maintenance procedures. Sector-specific DRR plans or strategies should also guide safer reconstruction through better-quality and risk-informed planning, engineering and building following destructive events.

2.11 National Disaster Response Plan (NDRP-2010), Health and Education Sector

The NDMP 2010 has very comprehensively identified the role of health sector in the chapter "Disaster Response Function" part V of the document. Under the heading of "Medical Service", following points are given for response activities in the early disaster stage.

Checklist - Assessment of Health Services

- Determine the functional status and capacity of local public and private health institutions/organizations.
- Determine the availability of skilled health workers in the affected or nearby area.
- Verify the availability of standardized protocols, essential drugs, supplies and equipment.
- Determine the capacity of existing logistics system, especially as they relate to the procurement, distribution and storage of essential drugs and medical supplies.

The Standard Operating System (SOP) of the different sectors have been defined including health and education sector of the NDRP 2010. The Ministries of Health and Education have been assigned different roles in preparedness and response stage.

2.12 Ministry of Health (MoH)

Emergency preparedness:

Following SOPs must be followed in preparedness stage form the health department.

- Prepare emergency preparedness plan on health sector and share it with Provincial health departments, NDMA, and PDMAs.
- Develop health assessment checklist, health monitoring and evaluation formats for emergency response programme.
- Prepare mass causality management plans for different hazards.
- Develop roster of medical and paramedics to be deployed in case of major disaster in any part of the country.
- Prepare a list of surgical, hospital equipment's, and medicine suppliers and share it with NDMA and P/R/S/DMA.
- Develop MOU with various medical and pharmaceutical associations for the provision of assistance in emergencies.

- Prepare an inventory of equipment, human resources, vehicles, ambulances, medicine stocks, hospitals and update this list on six monthly bases and share it with PDMAs.

2.13 Ministry of Education (MoE)

Emergency preparedness:

- Prepare emergency preparedness plan on education sector and share it with provincial education departments, NDMA and PDMAs.
- Prepare a roster of volunteer teachers and students that can be deployed as volunteers in emergency response.
- Develop education assessment checklist, monitoring and evaluation formats for emergency response programme.
- Prepare a list of ICT-based government schools and colleges that may be used for relief camps.
- Organize orientation programme to raise awareness of education authorities and professors, teachers about emergency response and role of education.
- Coordinate with NDMA for emergency response planning.

2.14 National Disaster Management Plan (NDMP)-2012-2022, Health and Education Sector

In line with the HFA five priorities, (which has now been replaced by SFA), the NDMP forwarded ten interventions in its ten-year plan from 2012-2022. NDMP envisages ten (10) disaster management interventions to create an efficient and effective disaster management system in Pakistan.

Table 2.1: The Relation between National Intervention and Sendai Framework

SFA Priorities	TARGET 4 of SFA	Intervention in DRM Plan 2012	DRMP FRAMEWORK 2007 (9 Priorities)
HFA-3: Investing in disaster risk reduction for resilience	**Target 4** Substantially reduce disaster damage to critical infrastructure related to healthcare and education and disruption to basic utilities by 2030.	**Intervention-7:** Infrastructure development for disaster risk reduction	**Priority 6.** Mainstreaming disaster risk reduction into development
		Intervention-8: Mainstreaming disaster risk reduction into development	

The intervention (7) "**Mainstreaming disaster risk reduction into development** "of the NDMP is in line with the SFA priority (3) which is "**Investing in disaster risk reduction for resilience** ". NDMP 2012 has 10 interventions which includes forty-two (41) strategies and one hundred eighteen (118) proposed priority actions/programs.

Under intervention seven (7) the strategy is to "Develop schools, hospitals and other important public facilities to be safe against Disasters" and "Enforce the building code in construction of buildings".

2.15 National Disaster Risk Management Framework (NDRMF-2007)

The NDRMF has been framed to guide the work of entire system in disaster risk management. It has been developed through wide discussion with stakeholders from local, provincial and national levels.

Nine priority areas have been identified within this framework to establish and strengthen policies, institutions and capacities over the next five years: These include: -

1. Institutional and legal arrangements for DRM
2. Hazard and vulnerability assessment,
3. Training, education and awareness,
4. Disaster risk management planning,
5. Community and local level programming,
6. Multi-hazard early warning system,
7. Mainstreaming disaster risk reduction into development,
8. Emergency response system, and
9. Capacity development for post disaster recovery.

2.15.1 Education Ministry

Following roles were assigned in the NDRMF 2007 to the ministry of education as a focal point for managing disaster risks:

- Develop a DRM plan for the Ministry covering aspects of risk reduction, preparedness and response and curriculum development on disaster risk education;
- Identify and inventory vulnerable educational institutions and infrastructure of the Ministry in hazard-prone areas;
- Implement actions to reduce vulnerability of built infrastructure in education sector in hazard-prone areas, e.g. retrofitting, renovation, rebuilding etc.;
- Construct all new schools, colleges, universities and other educational buildings located in hazard-prone areas to higher standards of hazard resilience;

- Develop capacities in schools of hazard prone areas to cater for additional water, sanitation and other administrative chores to house affected populations in the event of disaster;
- Conduct orientation programmes to raise awareness of education authorities, professors and teachers about disaster risks in hazard-prone areas;
- Develop curriculum for schools, colleges and universities on disaster risk management, particularly in hazard-prone areas;
- Implement school, college and university level activities to enhance awareness of students and to promote overall preparedness in educational institutions through conducting drills, reducing vulnerability etc.;
- Encourage local educational authorities and teachers to prepare school disaster response plans and their implementation;
- Allocate funds for safer construction and disaster preparedness activities at school, college, and university levels in hazard-prone areas;

2.15.2 Health Ministry

- Prepare disaster risk management plans for each level of health care facilities, including management of mass casualties, and epidemics and submit this plan to the NDMA for better coordination of efforts;
- Conduct hazard based mapping of all health care facilities, including vulnerability assessment (infrastructure and organizational setup) and integrate hazard resilience measures;
- Enhance disaster management capacities of health work force (all cadres at all levels) in collaboration with Provincial ministries;
- Prepare protocols and guidelines to address all priority public health issues as part of preparedness, response and recovery plans;
- Integrate disaster preparedness and response capacities into all existing and future health programs at federal, provincial and district level;

- Mobilize all available health resources and possible assets for emergency interventions
- Device strategies for community involvement in all aspects of emergency preparedness, response and recovery plans with regards to health sector;

2.16 National Heath Emergency Preparedness & Response (NHEPR)

The importance of the Heath emergency preparedness & response (HEPR) was recognized after the 2005 earthquake. During the earthquake a temporary plan was made by MoH in the PIMS hospital where all institutions and government agencies collaborated and a health cluster forum was established. NHEPR effectively responded to the earthquake 2005. With collaboration of World Health Organization (WHO), MoH established the National Health Emergency Preparedness & Response Centre in PIMS premises.

The Health Emergency cell, functioning in Federal Ministry of Health was transformed into a separate organization named, National health Emergency preparedness & Response Network. It was established on 10th March 2010 by the Government of Pakistan. It was the first step toward institutionalizing the concept of Health emergency preparedness & response in Pakistan.

NHEPRN has been assigned the role of Disaster Risk Management in Health Sector and is responsible for all aspects of health-related emergency Management including; Preparedness, Response and Recovery. It acts as focal point for all aspect of health care Preparedness, Response and Recovery in disaster situation. It develops disease surveillance system and prepare protocols & guidelines to address all health-related issue during emergencies. It builds effective linkages and coordination with all National, Regional and International agencies & stakeholders working in Health Sector.

2.17 Guidelines for Mainstreaming DRR in HEALTH by NDMA Pakistan and UNDP

NDMA and UNDP after the 2010 flood presented these guidelines for mainstreaming DRR into different sectors including health in the context of recovery stage. Integrating DRR into the health sector includes the reconstruction and retrofitting of health facilities. The location, design and construction of hospitals and other critical healthcare facilities must take all types of hazard risks into account. This needs to be given authority by clear policies on the development of health facilities, and supported by the training of healthcare personnel on incorporating DRR into the construction / development of health facilities and coordination at all levels. DRR measures are needed in order to avoid or mitigate the risk of natural hazards on the health sector.

The problem area identified by the NDMA and UNDP, where DRR measures could be mainstreamed are given below.

- Absence of land use plans leading to siting of health facilities at land vulnerable to natural hazards
- Lack of building codes and standards for health sector infrastructure
- Standard of construction
- Firefighting arrangements
- Architectural Elements
- Additional engineering works for improving the safety of the buildings
- Capacity building of the staff / health workers.
- Lifeline facilities /back up support for health sector
- Construction of ramps for persons with disabilities
- Construction of multiple exits for emergency and doors opening outwards

2.18 DRR Guidelines for Education Sector by NDMA & UNDP

Schools, colleges and university buildings are often used as emergency or evacuation centers during disasters because these structures are available throughout the country and are generally better constructed. However, it also places additional responsibility on all the stakeholders to prevent the interruption of education or ensure its swift resumption following any disaster.

The approaches used for mainstreaming DRR into the education sector are given below:

- Raising awareness about the hazards, related risks and responses possible in the area.
- Mainstreaming DRR into the national education system, in primary and secondary schools as well as within universities, to help raise awareness and understanding about different hazards (this can also be passed on by students and teachers to family members, and therefore has an additional secondary impact).
- Providing the necessary teacher training, curricula and teaching materials for teachers in all education institutions to raise awareness about DRR in the Education Sector.
- Developing school preparedness/response plans and conducting drill.
- Training teachers on what to do in a disaster and post-disaster situation.
- Promoting hazard resilient construction of new schools.

2.19 School Safety Action Plan-2012 KP, Pakistan

The Plan of Action for Safe School and Educational Buildings in Khyber Pakhtunkhwa was prepared by the joint venture of NDMA, PDMA Khyber Pukhtoonkhwa with the financial and technical support of Project Strengthening the Tsunami Early Warning System in Pakistan and One UN Disaster Risk Management Joint Programmme in 2012. NDMA and UNESCO jointly assisted the KP Government in development of Plan of Action for safe schools and educational buildings in KP through a wider stakeholder consultative process.

Six key inter-linked elements of school safety that cover safe schools were utilized in developing a comprehensive school safety plan for KP. The six key school safety elements areas are;

1. Policy and Institutional Mechanisms for Promoting School Safety,
2. Technical Aspects of Seismically Safer Schools,
3. Systems/Skills/Resources-Capacity Development Requirements for Safer Construction,
4. Integrating DRR Information in Formal/Informal Education
5. Community Preparedness for Disaster Prevention and Response, and,
6. Public-Private Partnerships for Safe Schools.

The plan contains two sets of distinguishing actions- "Priority Actions" and "Strategic Actions". Priority Actions are that could be initiated and completed in a relatively short time frame, say within one to one-and-a-half year. Strategic Actions is a composite listing of those actions that will lead towards meeting the national and international obligation for safe schools and safe children, in a relatively longer time frame of three to four years.

Chapter 03

METHODOLOGY

3.1 Flow of the Study:

This research intends to find out the mainstreaming DRR issues in the critical infrastructure i.e., in schools and hospitals of tehsil Mardan of the district. There are three sub-divisions in the district i.e., Mardan, Katlang and Takht Bhai. Looking to the scope of the study, the research has been carried out in Tehsil Mardan because it was difficult to cover the whole district due to time and budget limitation.

The DRR implementation gaps will be probed out by data collection through questionnaire in the selected schools and hospitals which will help to evaluate the DRR policy against implementation gaps.

3.2 Questionnaire for Hospitals and Schools:

The questionnaires for both and schools are different. For hospitals we have taken the already available Hospital Safety Index (HIS) checklist designed by Pan American Health Organization (PAHO) and World Health Organization (WHO), which includes four modules. HSI evaluates the health facility's location, structural and nonstructural safety, and organization of hospital staff. The HSI is an assessment tool which is being commonly used by health authorities to measure the overall level of safety of a hospital or health unit in emergency situations. But in this research, we will not gauge the risk level of the hospitals by using the Index calculator which is used in the process of assessment of the hospitals. We just will use its checklist for our research to probe out the implementation gaps of mainstreaming DRR into hospitals.

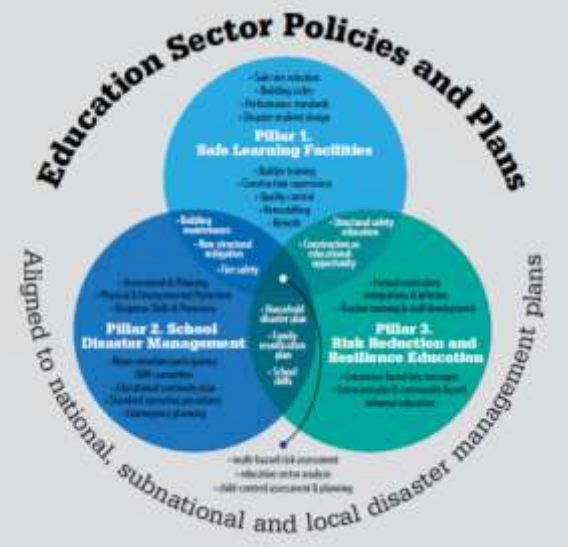


Fig 3.1: Comprehensive School Safety Framework (UNISDR.2012)

For schools, a questionnaire has been designed based on the Comprehensive School Safety Framework, produced by UNISDR in 2012. School Safety rests on three pillars which includes risk reduction education, school disaster management and safe school facilities. This agenda is aligned with the Sendai Framework for DRR and the Sustainable Development Goals 2015-2030.

School Safety questionnaire is focusing mainly on the SECOND pillar of the framework which is "School Disaster Management" and some questions have also been included on the other two pillars which are "Safe Learning/School Facilities" pillar ONE and "Disaster Risk Reduction in School Curricula" pillar THREE to meet our research objectives.

The School Safety questionnaire is addressing Assessment & Planning, Physical and Environmental Protect and Response Skills and Provisions. The questions will try to probe the DRR gaps related to above given three sections.

3.3 Sample Technique used for Schools and Hospitals:

According to the Elementary & Secondary Education Department, in the Development Statistics of (KP) 2015, the total number of government schools (i.e., primary, middle and high) at district Mardan, for the year 2013-14 is 1,745 as shown in Table 1. The number of girl's schools is 763. Due to cultural barriers, pardah system and restriction on visits of the male members to the girl's schools at KP, girls' schools have been excluded from the study. This research study is limited

only to the government boys' schools (highlighted in Table 1) in the urban area of district Mardan.

Table 3.1: District Wise Number of Government Schools in Mardan

Total	Primary	Middle	High
Boys	**810**	**96**	**76**
Girls	600	101	62
1,745	1,410	197	138

Source: Elementary & Secondary Education Department, KP

Due to the time and resources constrains, the scope of the study has been kept limited or bounded only to city or urban union councils which are 14 in number. District Mardan is divided into three sub-divisions Mardan, Katlang and Takh Bhai with headquarters at Mardan. According to the Mardan Tehsil Municipal Administration (TMA), there are seventy-five (76) union councils in district Mardan with 62 rural and 14urbans.In this study, schools will be selected from urban union councils of the sub division (Tehsil) Mardan.

Fig 3.2: Union Councils of District Mardan

The total number of schools i.e., Primary, Middle and High is 102. The study has been conducted in 81 schools of *Tehsil* Mardan which include 56 Primary, 12 Middle and 13 High schools.

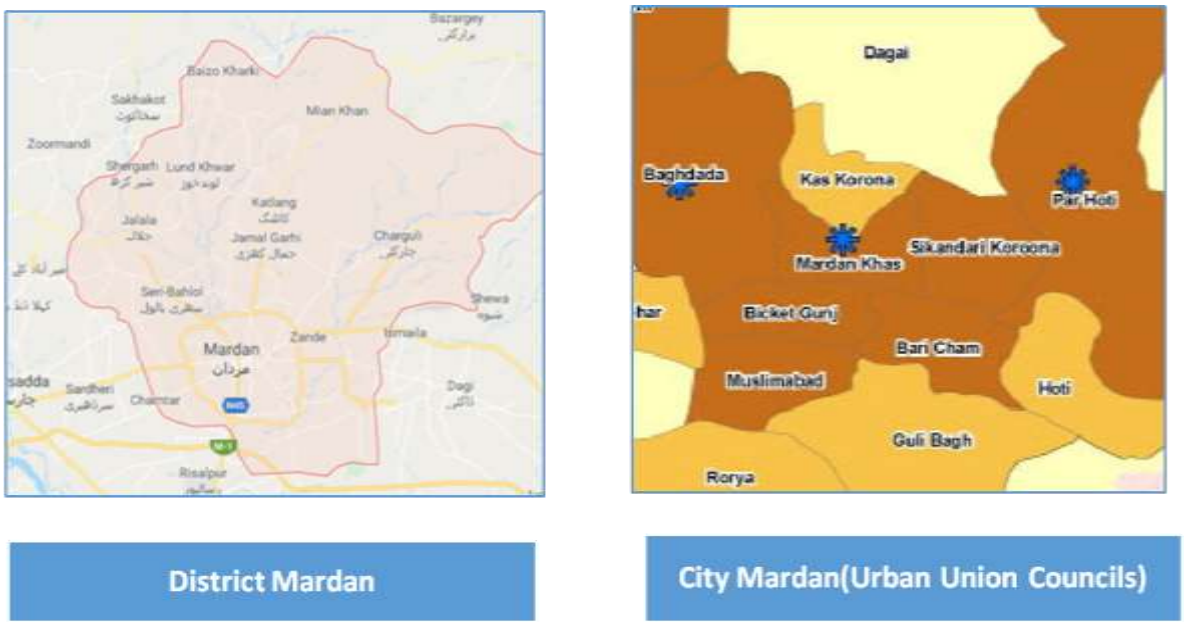


Fig 3.3: District Mardan and City Mardan Urban Union Councils Map

3.4 Sample Size of the Schools

The total number of schools (Primary, Middle, High) in urban union councils (14 in number) of the district Mardan is 102. By using "Sample Size Calculator" available at Monkey Survey, the sample size of the 102 schools with 5% margin of error and 95% confidence level is 81. It means that the data will be collected from 81 schools for our research study from total population of the schools which is 102.

The question arises here that what number of Primary, Middle and High schools will be selected from a sample of 81 schools. The answer to this question is probed by using Proportionate Stratification technique.

3.5 Proportionate Stratified Random Sampling

Proportionate Stratification is a type of stratified random sampling (SRS). In SRS method, the whole population is split into different strata or subgroups then randomly selects the final subjects proportionally from the different strata. The proportionate stratified random sampling method has been used for schools sampling, in this research study.

In the proportionate sampling, the sample size of each stratum in this technique is proportionate to the population size of the stratum when viewed against the entire population. This means that each stratum has the same sampling fraction.

The sampling fraction is defined as the proportion of a population to be included in a sample. The sampling fraction is equal to the sample size divided by the population size (n/N). In this case the sampling fraction is given below.

Sampling Fraction= n/N = 81/102 = 0.7941	n= Sample size N= Population size

Table 3.2: Sample Size of the Schools

Stratum	Primary Schools	Middle Schools	High Schools
Population Size	70	15	17
Sampling Fraction	0.7941	0.7941	0.7941
Final Sample Size	56	12	13

It means that out of the total 70 Primary, 15 Middle and 17High schools, 56 Primary, 12Middle and 13 High schools respectively will be randomly selected for data collection from the urban union councils of district Mardan.

Explanation

Sample Size for Primary Schools

Sample size = Primary school x Sampling Fraction	(Equation 1)
Whereas	
Sampling Fraction = n/N	n= Sample size (81) N= Population size (102)
By putting the values in equation 1	
Sample size = 70 x 81/102	
= 70x 0.7941	
= 56	

Sample Size for Middle Schools

Sample size = Middle school x Sampling Fraction	(Equation 1)
By putting the values in equation 1	
Sample size = 15 x 81/102	
= 15 x 0.7941	
= 12	

Sample Size for High Schools

Sample size = High school x Sampling Fraction (Equation 1)
By putting the values in equation 1
Sample size = 17 x 81/102
= 17 x 0.7941
= 13

By adding the above three samples sizes of Primary, Middle and High schools, we will get the sample size of all the school population which was 81.

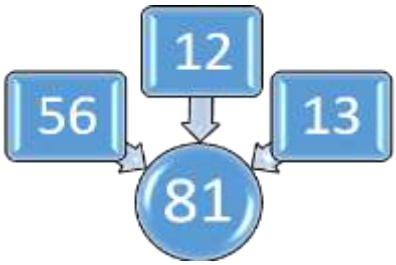


Fig 3.4: Total Number of Samples for Primary, Middle and High Schools

3.6 Sample Size of the Hospitals

According to the Khyber Pakhtunkhwa Statistics (2015), total number of government hospitals in the district Mardan is 8. Tehsil/Sub-division Mardan has 6 hospitals as shown in Table 3.3. in which two are the Tertiary and Secondary type and are located within the research scope while other 4 hospitals are located outside the scope and were not included in the study due to time and resource limitations. One private hospital has been added in research study to study and compare its preparation against disasters. Data will be collected from three hospitals two government and one private hospital of the district in city area.

Table 3.3: Number of Govt. Health Institutions in the District/Tehsil Wise

Hospitals	Mardan	Takh Bai
8	6	2

Source: Development Statistics of (KP) 2015

After identifying the sample size of schools and hospitals, a survey was conducted to obtain data from the field through 3-point Likert Scale (LS) questionnaires. Statistical Package for Social Sciences (SPSS) software was used in the research for data entry and analysis.

Descriptive statistics analysis was used to find out MEAN of the exposure and vulnerability of the schools and hospitals against natural and man-made hazards, from the choices indicated by respondents through the given LS. Graphs such as Bar i.e. simple, clustered and stack have been used in SPSS for categorical data while histograms were used for quantitative data in the analysis process.

The gap in mainstreaming of DRR into CI was sorted out by doing analysis in SPSS and then implementation issues were dug out in the light of this analysis against the attained gap of DRR. Guidelines and conclusion were proposed and derived from the analysis of the research data. At last, recommendations have been suggested for achieving best results in mainstreaming of DRR into CIs.

ANALYSIS AND INTERPRETATION

4.1.1 Demographic Information of Schools

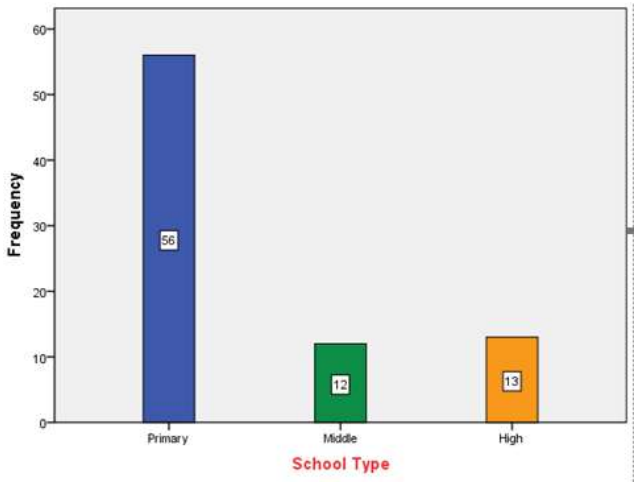


Fig 4.1.1: Number and Types of Schools

The total number of schools from where data is collected for this research study is 81 as shown in Fig 4.1.1. Types of schools are given on X-axis while the number or quantity is given on Y-axis. This sample of the 81 schools includes 56 primary, 12 Middle and 13 High schools.

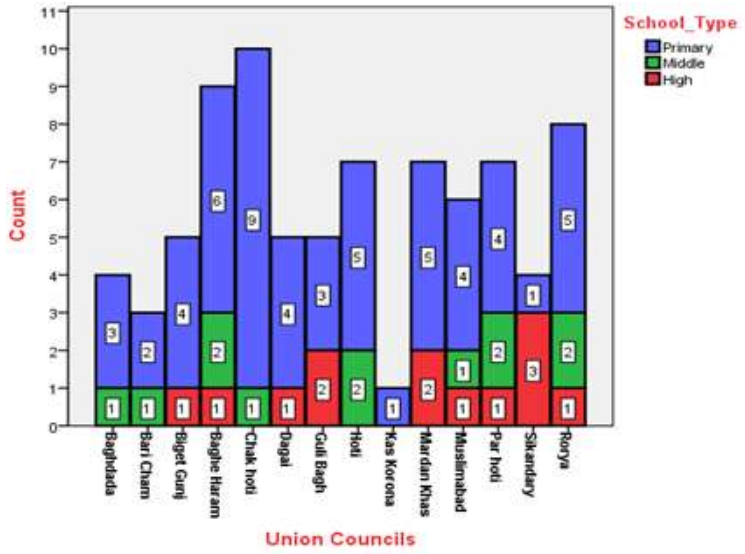


Fig 4.1.2: Type of Schools UC wise

The graph in Fig 4.1.2 depicts the frequency of schools at Union Council wise. This chart represents that data was collected from the primary schools mostly, whose collective count is 56. A sample of 13 and 12 schools of High & Middles were selected from the UCs, due to their limited number at district level.

Besides, it also shows that Chak Hoti, Bagh.e. Haram and Rorya UCs have comparatively greater number of schools and can have great damages in case of any disaster whether natural or man-made.

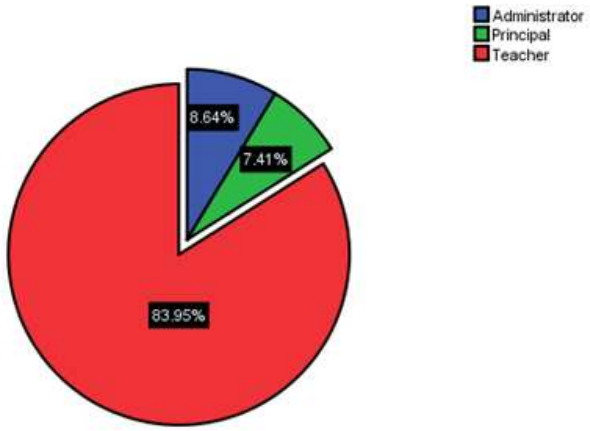


Fig 4.1.3: Respondents Percentage [%]

The chart given in fig 4.1.3, represents that school data is responded mainly by three categories of respondents. Teachers, who constitute 83.9%, Administrators 8.64% while Principals with most least percentage, of the total respondents took part in this research study.

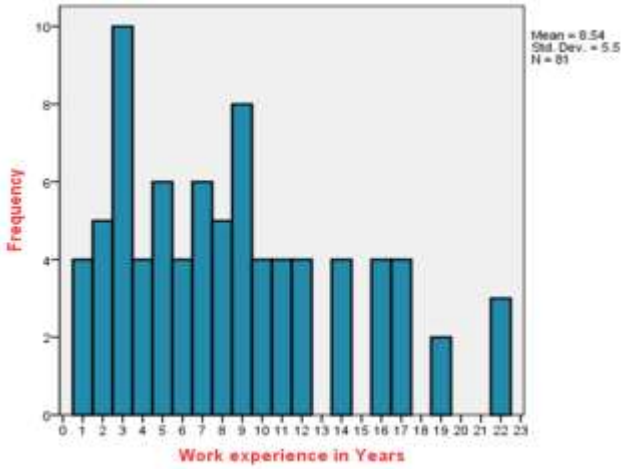


Fig 4.1.4: Work Experience of Respondents

Fig 4.1.4 depicts the work experience of the respondents. The chart indicates that the average of work experience of respondents is 8.54 while majority (i.e. 10) of respondents had 3 years of experience. Eight respondents were found to be 9 years experienced in their respective fields while very few who had 15 plus experience took part in the research study.

These states indicate that the respondents were mostly fresh and few were reasonably experienced and would have given better responses in background of their professional work experiences.

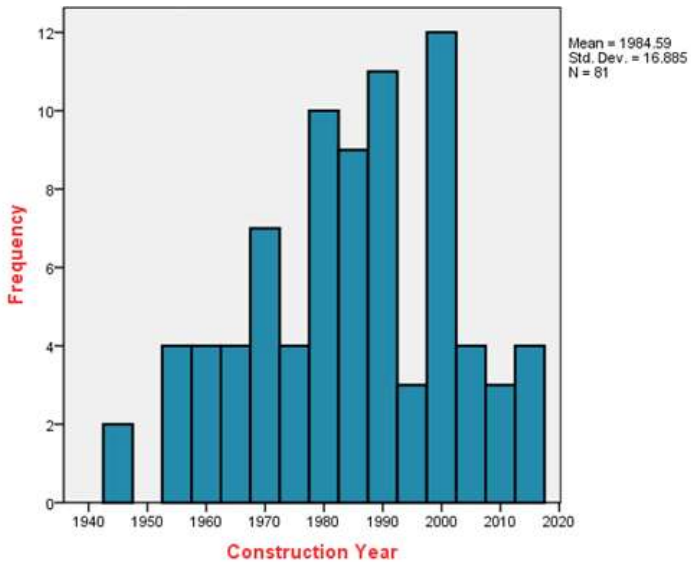


Fig 4.1.5: School Construction Year

Fig 4.1.5 states that 12 schools have been constructed in year 2000 which means that those schools, newly constructed can resist hydro metrological and geological hazards, presuming that they have built according to current safety standards & building codes. The average mean suggests that majority of schools have built in between 1980 and 1990 while schools built from 1940 to 1970 have turned old with passage of time and are exposed to many natural hazards.

1. ASSESSMENT AND PLANNING

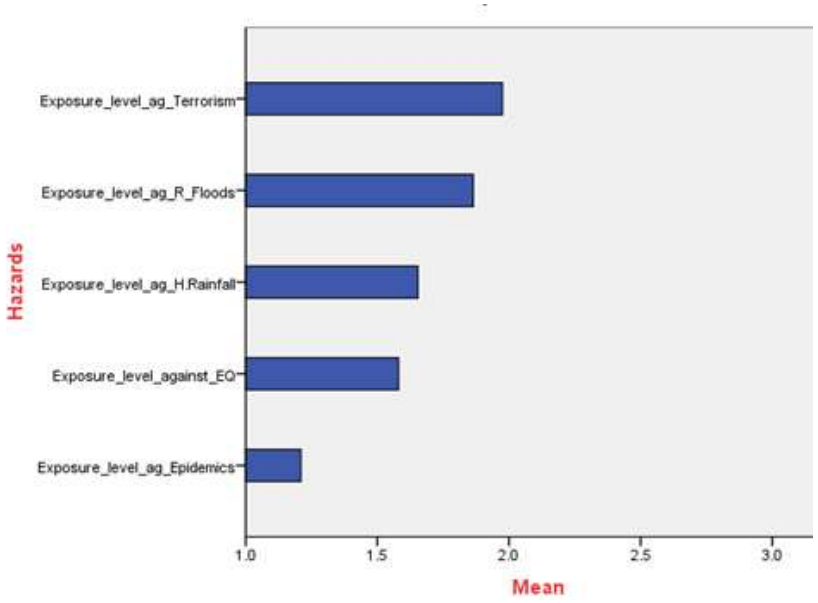


Fig 4.1.6: Mean of Hazard Exposure of the Schools

Fig 4.1.6 represents "MEAN" response of all the schools against different natural hazards. Y axis in the fig shows the type of hazards and X axis represents Mean values. The perceived response of the schools has been ranked on 3-point LS questionnaire. As per questionnaire of this research study, 1 represents the "Lowest" value, 2 is for "Average" and 3 depicts the "Highest" value. The mean values have been deducted from the collected data by using Descriptive Statistics (DS) on SPSS.

Recent work by Jacoby and Mattell has suggested that three-point Likert scales are good enough to study the averages across people or groups. Thus, two or three scale points are in general good enough to study averaging or mean of the group behavior and ensures reduced errors and does not lead to information loss.

Table 4.1: Total Mean of Hazard Exposure of Schools

Descriptive Statistics					
Hazards	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Exposure level against Terrorism	81	1	3	1.98	.806
Exposure level against Floods	81	1	3	1.86	.877
Exposure level against H. Rainfall	81	1	3	1.65	.710
Exposure level against EQ	81	1	3	1.58	.722
Exposure level against Epidemics	81	1	3	1.21	.410

The statistics of table 4.1 suggests that most schools are exposed to terrorism hazard with a mean value of 1.98. It shows that amongst all hazards, schools are mostly exposed to Terrorism, Riverine Floods and Heavy Rainfall with a mean value of 1.98, 1.86 and 1.65, respectively. Though Earthquake activity frequently occurs in the surroundings of Hindukush region but very few schools have expressed earthquake as a threating hazard with a mean value of 1.58, for their school buildings.

Table 4.1 indicates that if we rank all the hazards on Likert Scale (L.S) according to their values, we can state that the exposure of all the schools against Floods, Rainfall and to Terrorism is "Average" because the values 1.98, 1.86 and 1.65 are lying close to mean value "2" while the value for Earthquake (EQ) is 1.52 which is close to 1, indicating the schools have "Low" exposure against EQ. The least exposure was noticed against epidemics with 1.21 value mean.

It means that if we compare schools against natural and man-made hazards, we come to know that schools are comparatively more exposed to man-made comparative than to natural hazards.

Table 4.2: Vulnerability Mean of the Schools

Descriptive Statistics					
Vulnerability	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Vulnerability level against Terrorism	81	1	3	2.41	.685
Vulnerability level against H. Rainfall	81	1	3	2.02	.547
Vulnerability level against R. Floods	81	1	3	1.95	.835
Vulnerability level against EQ	81	1	3	1.74	.703
Vulnerability level against Epidemics	81	1	3	1.35	.616

The table 4.1.2 represents the vulnerability levels of the schools against different hazards. Vulnerability is "the conditions determined by physical and environmental factors or processes which increase the susceptibility of assets or systems to the impacts of hazards.

The table shows that most schools are vulnerable against terrorism hazard with a mean value of 2.41. It shows that amongst all hazards, schools are most vulnerable to Terrorism, Heavy Rainfall and Riverine Floods with a mean value of 2.41, 2.02 and 1.95, respectively. For earthquake and epidemics, the vulnerability mean value is recorded the most least i.e., 1.74 and 1.35, respectively.

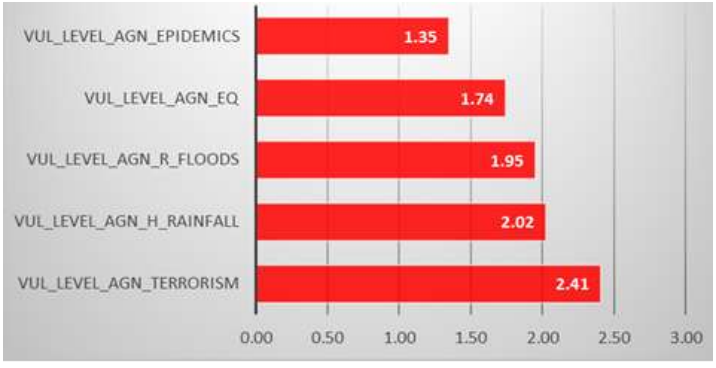


Fig 4.1.7: Mean of Vulnerability of Schools

The mean value for Terrorism is exceeding 2.4 and lying close to the value of 3 on LS which indicates "High" vulnerability for the schools. Likewise, the values mean for earthquakes, heavy rainfalls and floods are lying near "2" and are ranked as "Average" on L.S.

As per Disaster Risk formula which is Risk is directly proportional to the Vulnerability and Exposure, higher the exposure and vulnerability, higher the disaster risk. By observing the Fig 4.1.6 and Fig 4.1.7, it can be concluded that with maximum mean values of hazard exposure (Terrorism=1.98) and "High" Vulnerability (Terrorism=2.41), schools have higher disaster risks to Terrorism while the disaster risk of the schools against rainfall and floods is considered "Average" on LS because their exposure (Flood=1.86, Rain=1.65) and vulnerability (Rain=2.02, Floods=1.95) mean values in table 1 and 2 are either 2 or close to 2 which indicates Average on LS.

In *Mardan.e. Khass* UC, four government schools are located at a single station having more than three thousand strengths collectively. Such great number of students at these schools with inadequate security facilities has enhanced their exposure against terrorist attack. The perennial *Kalpani* river which flows in the heart of Mardan city has escalated the flood hazard exposure of those schools due to their location on the bank of *Kalpani* river. The seasonal Monsoon spells have great impact on the old structured school buildings. The seasonal and severe rainfall events is likely to exacerbate the vulnerability of these schools and have been ranked Average on the L.S.

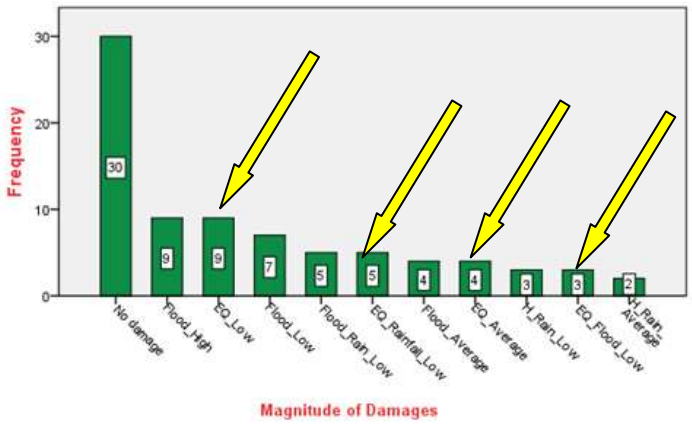


Fig 4.1.8: Frequency and Magnitudes of the Structural Damages to Schools

The above graph shows the frequency wise impact of different types of hazards on schools with its different magnitudes. Y axis shows frequency while on X axis different hazards of different magnitudes are shown in fig 8. It shows that 37% of the total schools responded to have not received any structural damage due to natural hazards so far but those who have been damaged mostly are due to floods and earthquake hazards.

One worth noticing point here is that most schools responded that they have least exposure and vulnerability against earthquake hazard in the fig 4.6 & 4.7 "hazard exposure" and "vulnerability" charts but with such least exposure and vulnerability, 28% of schools have been damaged and affected by earthquake hazard, highlighted in the fig above. Flood has alone and jointly damaged & affected 34% schools which indicates that most schools are prone against flood hazard while 30 amongst 81 schools have responded "no damaged", are mostly newly constructed school buildings where to some extent safety standards have been applied.

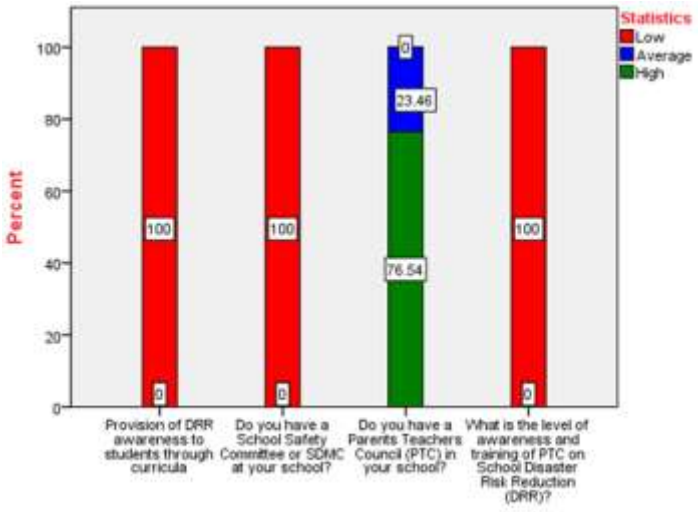


Fig 4.1.9: DRR Awareness for Students and School Committees

The above chart depicts the gap within the schools, regarding Disaster Risk Reduction (DRR) awareness. It states that 100% of the schools' respondents replied, they do not have access to the DRR awareness through curricula. Education sector does not have a centralized textbook-driven integration of DRR into formal school curricula. 76.54% of the schools responded that they have highly functional Parents Teachers Councils (PTC) while in the rest, 23.46% PTCs exists only in

the documents and were found not functional. The role of PTC is very important in School DRR activities but 100% of the PTCs were found nor to be trained and aware on DRR. It is in the Disaster Policy of Pakistan that awareness regarding disasters and its prevention should be integrated in the school curricula for a wider understanding of disasters and its impacts. There should be school safety committees in the schools for assessment, planning, implementation and monitoring of all disaster relevant activities. Unfortunately, committees exist but they need to be trained and educated so that they play their role in risk reduction at their respect schools.

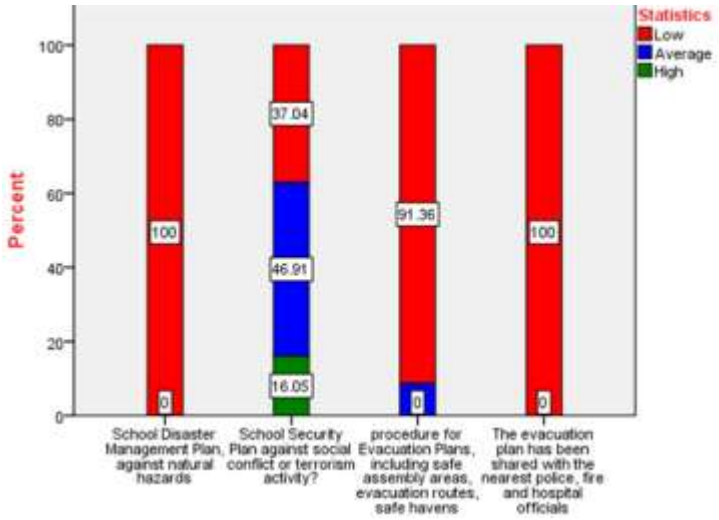


Fig 4.1.10: Assessment of School Safety, Security and Evacuation Plans

In the above graph, comparison has been made between the natural and man-made disaster plans of the schools. The statistics gained in fig 10 represents that 100% of the schools confessed, they lack natural disaster plans while no procedures and evacuation plan exists in the documents, for in time evacuation from the site of emergency/disaster. About 91% schools responded to have no secure places and exit routes which have been clearly marked, shows that severe DRR gap exists on ground against the DRR policy paper. On the contrary, 46.91% schools responded to have security plans only as a document while 16.05% schools agreed that their security plan exists (*theoretically, no paper work),* personnel have been trained, and resources are in place to carry out the plan while the rest 37.04% schools responded in negative to have a security plan against any external terrorist intrusion.

It is evident that plans against security risks exists somehow at satisfactory level while safety plans against natural disaster need more attention. The difference between the two plans is for the reason that in its aftermath of APS terror attack National Action Plan (NAP) made it obligatory for the district administrators to have a check on schools' security and impose fine on those schools who do not follow the security measures. Other worth noticing factor was the support from the provincial and departmental support. The education department provided security funds for their security measures which included CCTV cameras, metal detectors, small weapons, barricades, fencing, walk through gates (at some schools).

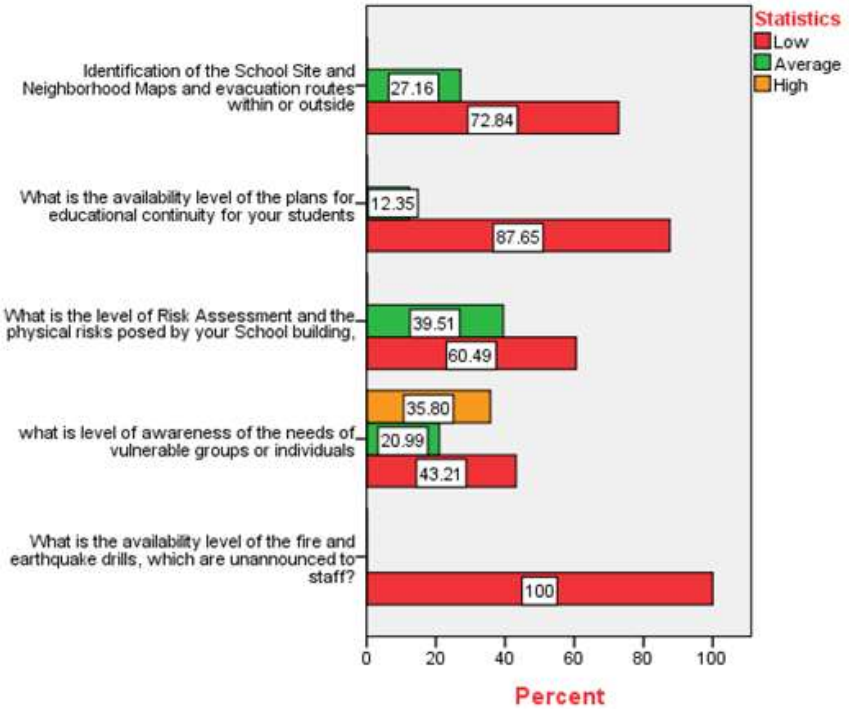


Fig 4.1.11: Gaps in the Assessment and Planning of Schools

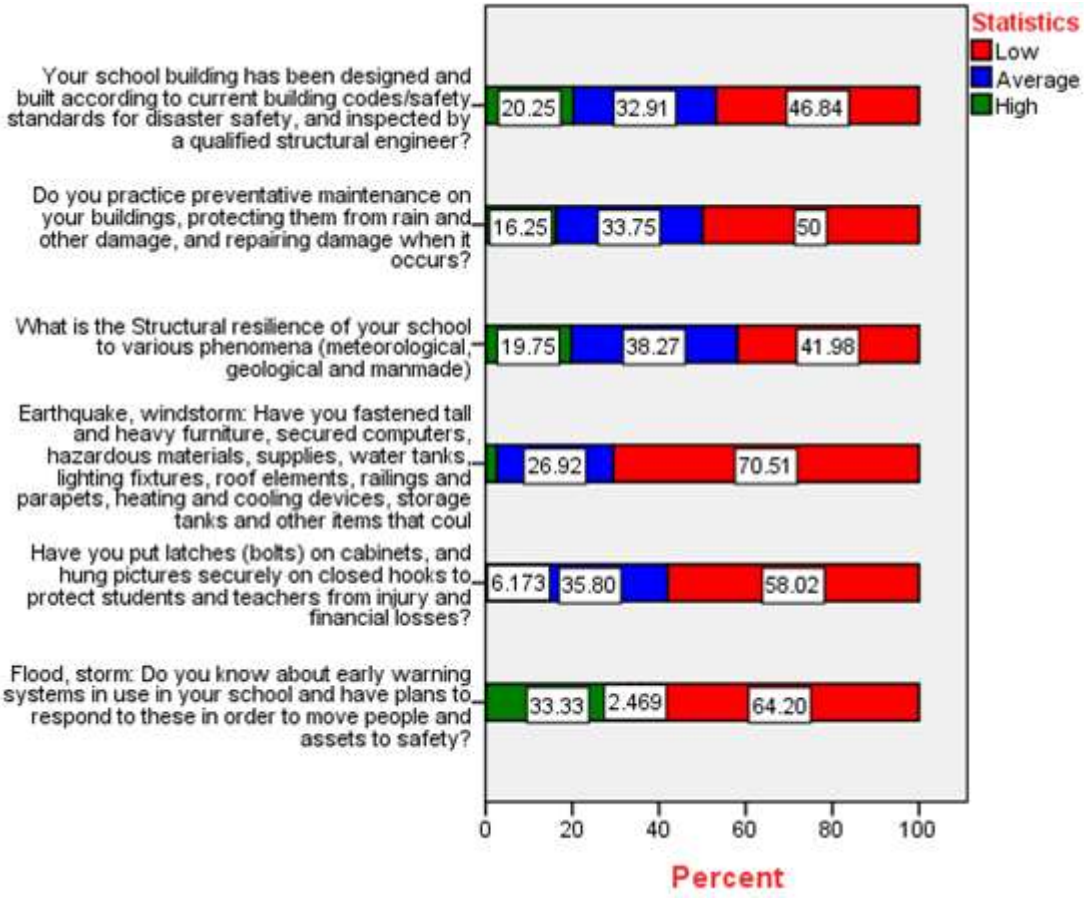
Planning at school administration level has been a weak link against disasters, during preparedness stage. Assessment and Planning situation of the schools is evaluated in the above chart which draws the overall picture of DRR at school level. School site and neighborhood mapping is vital for safe evacuation. As per above chart, 72.84 % schools have not been able to identify and draw their school and neighborhood maps where they could timely evacuate their students while 27.16% of the respondents replied that they have not only identified such places

where safe evacuation can be made but their routes have been also properly marked for the students. On the contrary, no such marked routes were noticed during school visits.

Fire and earthquake drills help prepare students & teachers to respond quickly, calmly, and safely. Such unannounced fire and earthquake drills have been ignored by 100% of the schools due to non-availability of proper planning. More than 87% of the schools do not have plans for the educational continuity during post disaster situation to cope with the educational crises created by the allotment of schools as relief camps while the rest 12.35 % schools responded that they usually continue their classes in playground of the schools or at nearby mosque but do not compromise on students' future. Regarding risk assessment (R.A) question, 60% respondents of the schools admitted that most of the teachers do not know what is RA and how to carry it out while 40% respondents answered that they know what are their risks in the school premises and have already identified them but are not in documented form. Awareness of the needs of vulnerable individual or groups at schools received different responses i.e. 35% reported high level of awareness of the needs of vulnerable who also try to address these needs, 43% were found unaware of these needs while 20% responded that they are aware but unable to address their problems.

2. Physical and Environmental Protection

Fig 4.12:



Structural Safety of School Buildings

The analysis of fig 4.1.12 shows that almost against every variable, the DRR gap reaches 50% or in some case exceeds 70%, clearly highlighting the miserable structural safety situation of the schools. Near 50% of the schools replied that their schools have not been built and designed on current safety standards. Safety standards were partially applied in 32% while fully in 20% of the schools. Respondents of the 50% schools replied that they do not have special funds for preventive maintenance of the school buildings while 16% responded to have full financial support from the department to have retrofitting and maintenance work in the schools. 33% claim that they do have budget but it is not utilized in structural mitigation. About 41% of the schools replied that their buildings are old and bad condition lacking resilience while 38% have

old but not cracked buildings which can sustain the stress to some extents. About 20% respondents claimed to have a resilient building which can sustain any natural phenomena.

Around 70% and 58% of the schools replied against earthquakes and windstorms repeatedly, that they do not have fastened heavy furniture's, computers and haven't put latches on cabinets & hung pictures securely. Just 4% of the schools have fully fastened all the hazardous material along with tall & heavy furniture's and computers. As far as latches on cabinets and to secure hung pictures, 6% schools had fully secured the hung pictures and fully applied latches on cabinets while in 35% schools pictures were fully secured but there were no latches on cabinets for students & staff protection.

Early warning system (EWS) use in schools against floods: 60% schools stated that their teachers & students both do not know and are not trained on EWS while 33.3% responded in "Yes" and stated they know and have plans to respond as well.

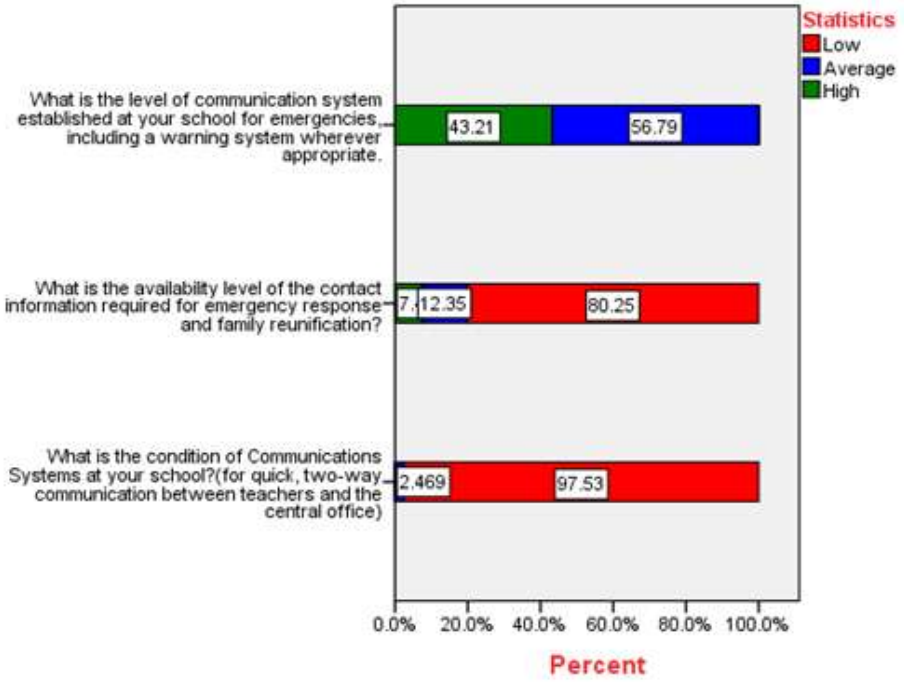


Fig 4.1.13: Condition of the Communication System for Emergency

Around 98% schools stated that they have no quick two-way communication system (inter com system) for teachers and central office in time of emergencies rather they have manually handled

communication system for emergencies alert within the school for their staff. For contacting law enforcement agencies during emergencies and family reunification, 80% schools replied that they do not have list of the contact numbers of important departments, displayed within school premises while, 12% responded that contact numbers list exists within schools but have not been displayed.

The level of communication established at schools is smart phone based. 43% schools have been given smart phone having an app installed, named "SOS System" which connects the school with different emergency response departments and hospitals for prompt emergency response. Besides, these schools rely on one way communication and have installed internal loud speakers located at different position at schools for mass public announcement. Around 57% of schools stated that they have SOS system but there is no internal electronic communication system which could create trouble in time of emergencies.

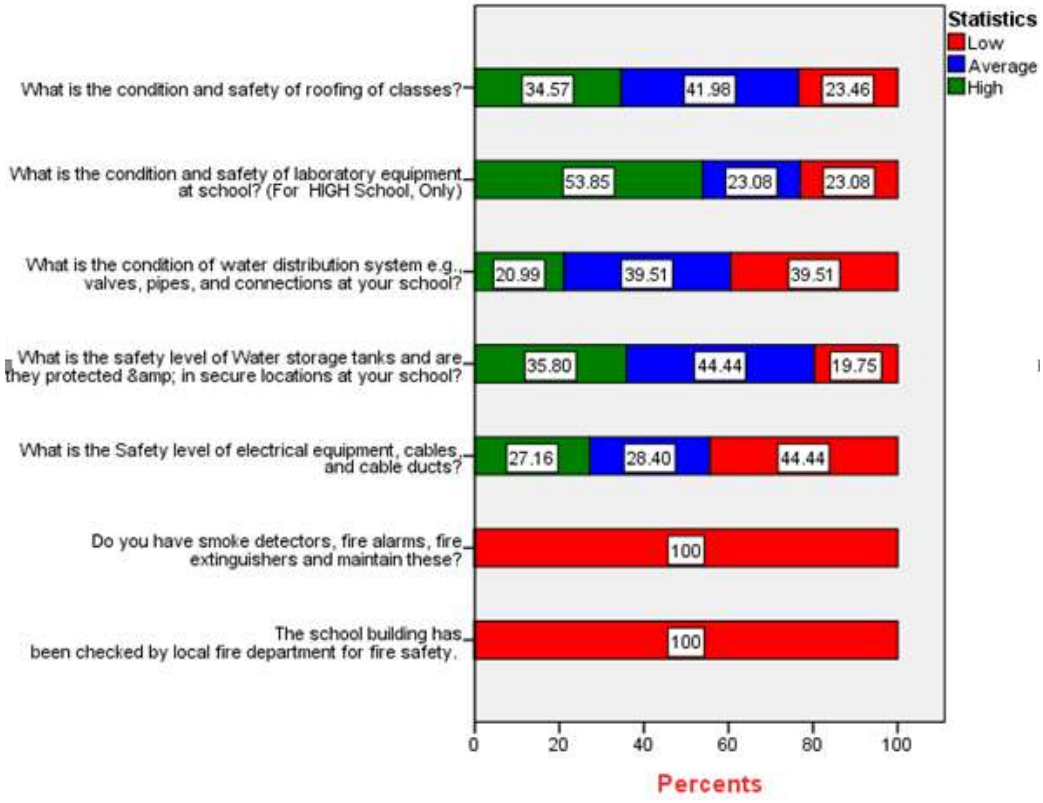


Fig 4.1.14: Safety and Condition of the Non-Structural Elements

The above chart states that 100% of the schools do not have fire alarms, extinguishers and smoke detectors while none of the school has been checked by fire department (rescue 1122) for fire safety. At schools usually, fire event occurs in laboratories or due to short circuits and can risk life of number of students. 44% respondents highlighted the poor and unsafe conditions of electric equipment and cables. In 39% of the schools, condition of the water distribution system was found miserable and in poor condition while about 20% reported that water tank of their schools is not protected, secure and in good condition. Safety of the laboratory chemicals in most of the schools was not ensured and were in bad condition. Safety precautions and procedures were not visibly posted in labs with chemicals in 23% of the High schools.

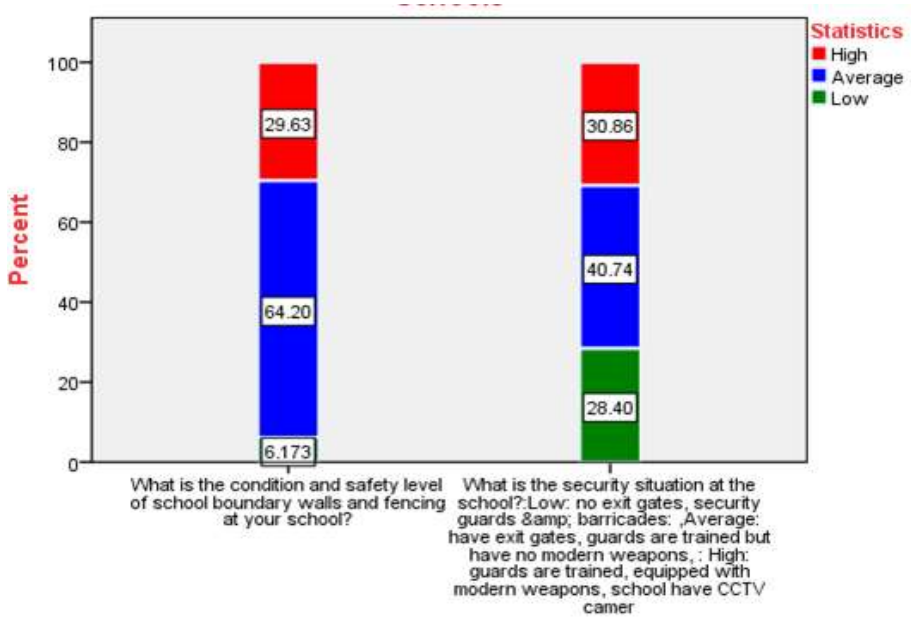


Fig 4.1.15: Condition & Safety of Boundary walls and Security Situation

As far as the physical protection of the schools is concerned about 30% of the schools stated to have no boundary walls and fences around their buildings leaving the children exposed to rapid shooter attack while 30% respondents regarding their security situation replied that they have no exit gate, barriers or barricades and security guards at the gates. Schools guards are usually a gardener or peon who has been given an outdated gun with no training. 64% schools within the city stated to have high boundary walls but with no fencing while schools with 6% have well heightened walls with proper fencing. Around 28% schools were found to be well secured in terms of CCTV cameras, exit gates for safe evacuation from the building and well trained and equipped security guards.

3. Response Capacity: Supplies and Skills

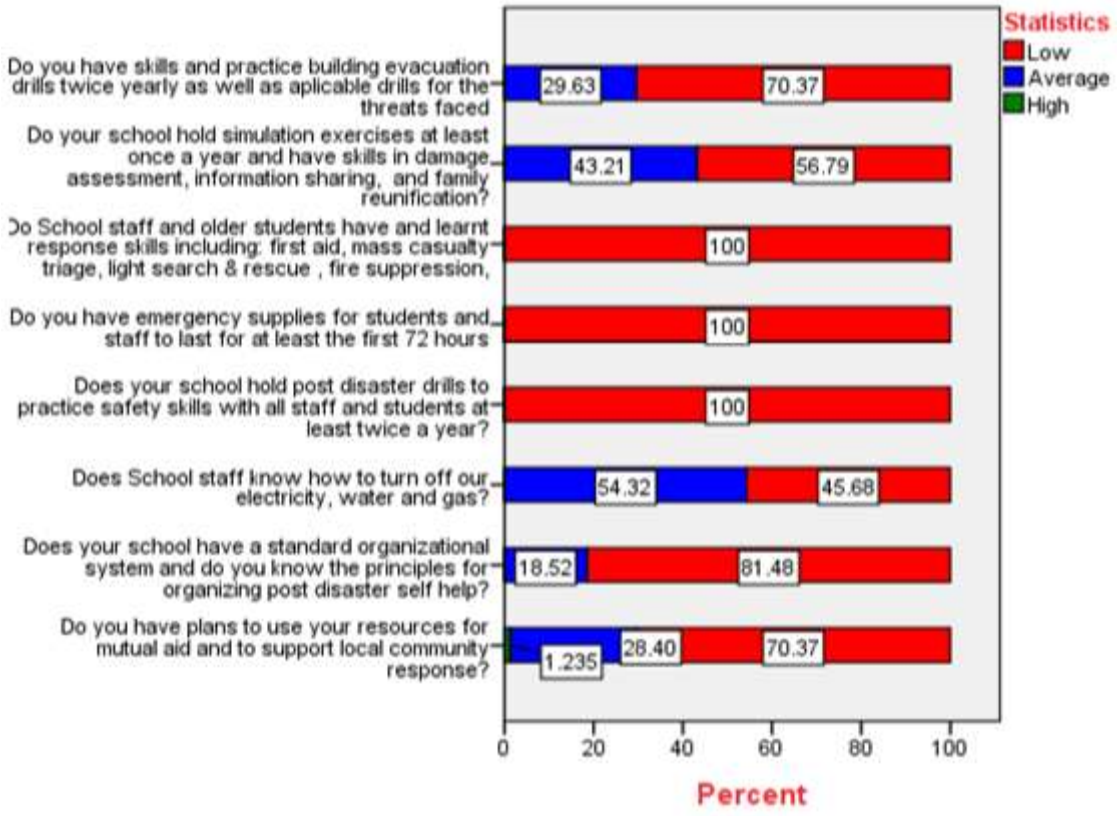


Fig 4.1.16: Gaps in Response Capacity

The overall response capacity, supplies and skills at school level is alarmingly weak and needs attention at emergency level to be strengthened. Fig 4.16 elaborates that 100% of the schools' sample, mostly do not know the response skills needed for affective response in time of emergencies. For example, fire suppression, mass causality triage, first aid (certified) and light search & rescue skills. Besides, 100% schools have not been found to hold post disaster drills to practice safety skills to teach students and staff how to respond to the complications of an actual disaster. Emergency supplies for at least 72 hours *(including at least 12 liters of water per person, food, first aid supplies, emergency power, emergency lighting, shelter and sanitation supplies)* for the anticipated disasters was 100% unavailable at any of the schools.

More than 70% schools were lacking to have evacuation skill and to practice them. 29.63% those schools who claimed to know evacuation, were totally reactional and traditional one while

building evacuation drills practice was not followed and popular in the schools. Administration had left the students on the mercy fate. Above 80% of the schools do not know the principles for organizing post disaster self-help. Majority of the schools, nearly 70% replied that they don't have plans of using school resources for mutual aid while 28% had plans to support the local community response by using school resources. Rarely, 1.235% already used their school resources in every emergency if it occurred, to support community responses. These schools supported the flood 2007, 2010 and Swat IDPs during militant operations.

4.2.1 General Information About Health Facility

The hospitals have been compared on the standards of Pan American Health Organization (PAHO) and World Health Organization (WHO). Hospital Safety Index (check list) is a tool developed by the Pan American Health Organization and a group of Caribbean and Latin American experts, which is extensively being used by health authorities to gauge the overall level of safety of a hospital or health facility in emergency situations (PAHO, 2017)

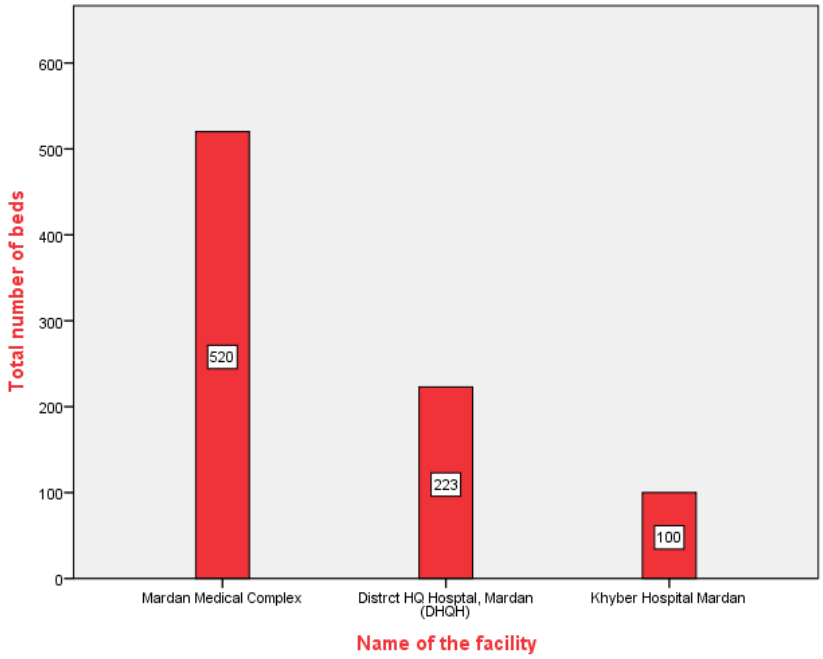


Fig 4.2.1: Name of Hospitals and Number of Beds

As mentioned in fig 4.2.1, names of the facilities have been shown on X- axis and number of beds on Y- axis. Three health facilities were selected within Mardan city for the study of hospitals to find out the DRR gaps. Two government while one private hospital was selected for the research study. Mardan Medical Complex (MMC) and District Headquarter Hospital (DHQ) Mardan are public while Khyber Hospital Mardan (KHM) is a private sector facility. MMC is a 520-bed unit and a teaching hospital which serves a population of 2.3 million approximately including many from the northern districts. DHQH is a secondary type facility with a 223- bed unit and a second big hospital with 21 departments (in documents) in the district while third one whose bed strength is 100 is a primary health facility.

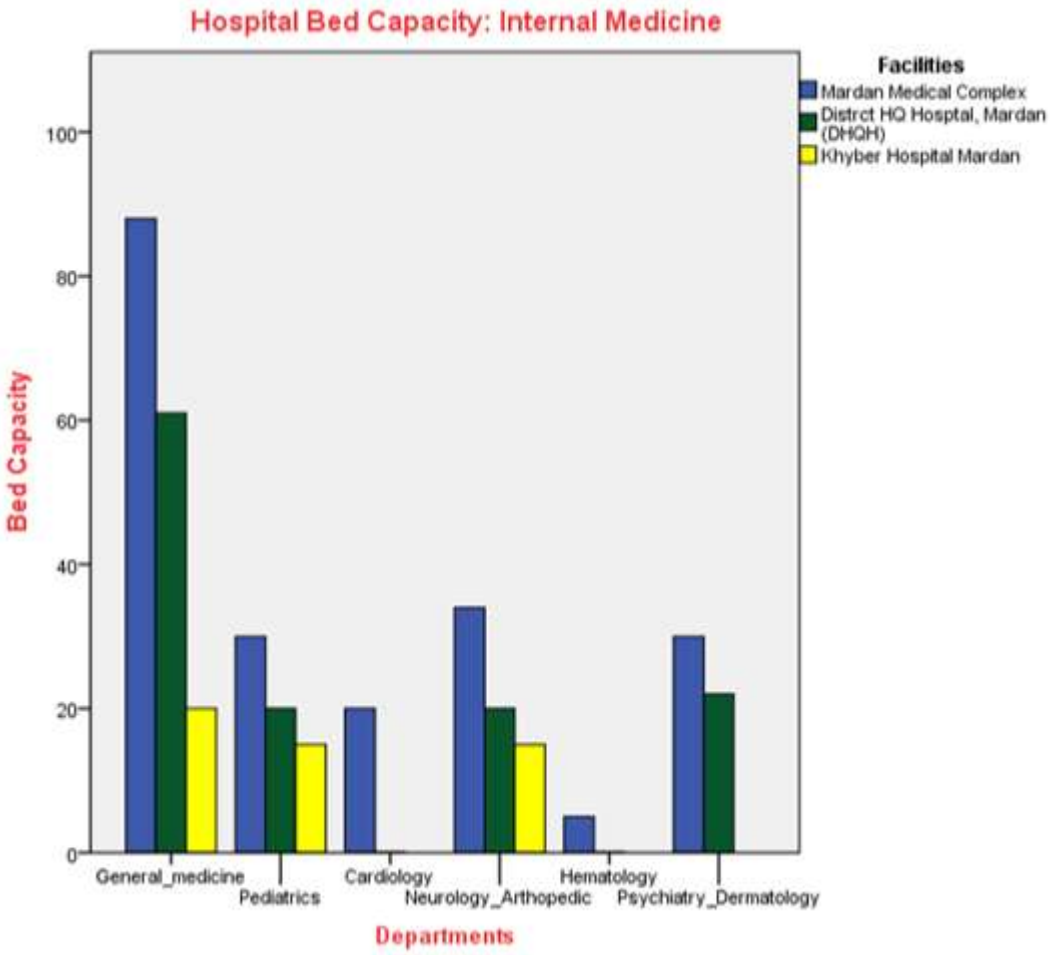


Fig 4.2.2: Hospital Bed Capacity: Internal Medicine

The fig 4.2.2 is self-explanatory which indicates the number of bed capacity in medicines within all the three facilities. X- axis have names of the different departments of Internal Medicine while bed capacity is shown on Y -axis. Orthopedic services in all the facilities need to be extended because in earthquakes mostly fractured bones and limb fractures victims are brought while in suicide blast usually traumatic amputation occurs as a primary blast injury while bed capacity for orthopedic patients in all the hospitals is below 40. During natural and man-made disasters most, people suffer head trauma and spine injuries which is treated by neurologists while "Orthopedic & Neurology" collectively shares below 40 beds at MMC. The DHQ has 20 beds for orthopedic but there are no Neurology services available at DHQ while KHM has 15 beds for orthopedic services only.

Hematology serve as an important department during extreme emergencies while there are below 10 beds i.e., only in MMC while the other 2 hospitals lack this department. For superficial bruises or emotional shock MMC has 30 while DHQ has 22 beds which is not sufficient for even a small type of emergency.

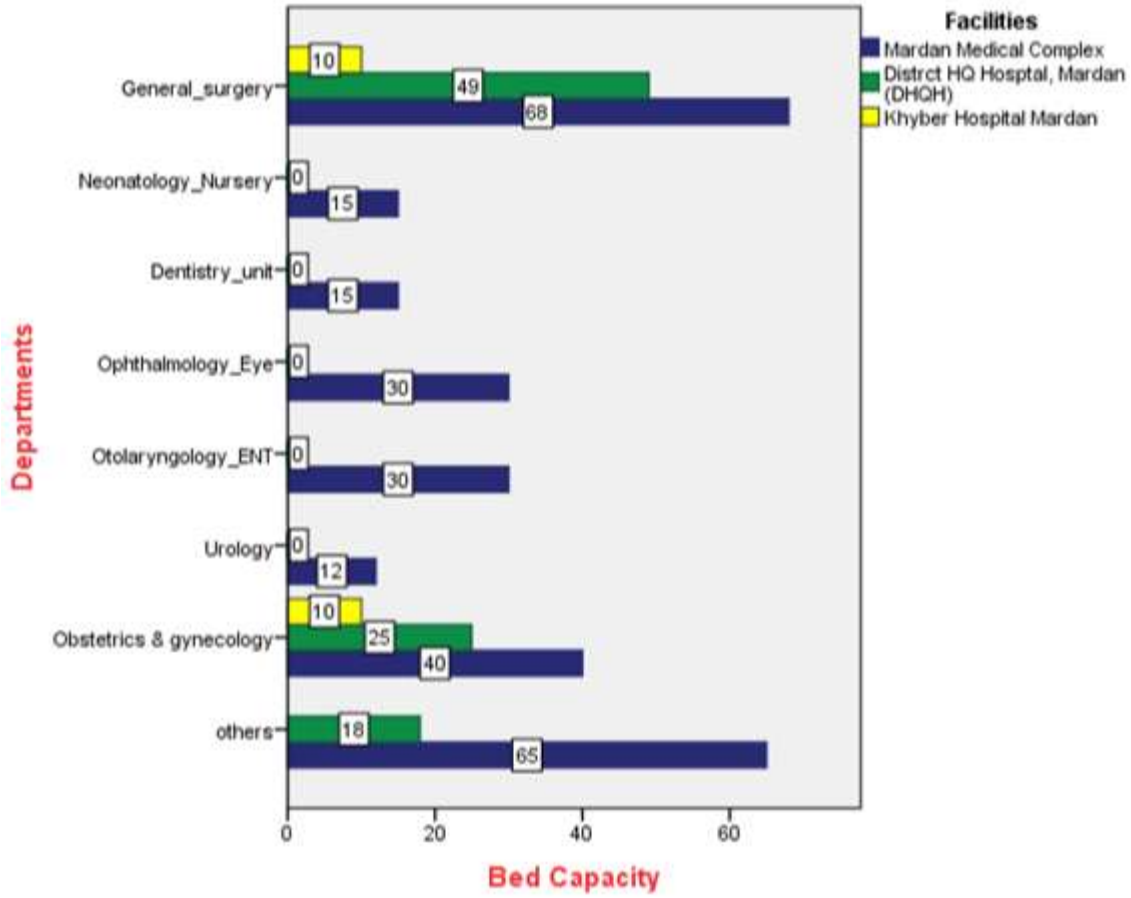


Fig 4.2.3: Hospital Bed Capacity: Surgery

Fig 4.2.3 elaborates the bed capacity of hospitals for surgical services. Most of the victims of natural disasters and suicide explosions undergo or require emergency surgery. In earthquakes, mostly renal failure and soft tissues injury cases are brought to hospitals which need specialized renal care including dialysis while the number of beds in Urology department is very limited. MMC has only 12 beds while DHQ has no department for treating such patients. In bomb blasts victims usually sustain penetrating rectal injury and multiple shrapnel injuries. Blunt trauma is more commonly a multisite injury sustained in explosions in which the multitude of heavy

particles causes damage to a large surface area of the victim. For surgical injuries the capacity at MMC is 68, 49 at DHQ and just 10 in KH, which hardly can be enough for routine emergencies.

Tympanic membrane perforation (ear drum rupture) and ocular trauma or eye injuries are most common in bomb blasts whereas the space capacities against such injuries is not satisfactory. Specially DHQ does not have ENT and Ophthalmology department while KH being a small facility does not entertain victims related to ENT. Burn casualties are common during forest fires, hit by thunder light and terrorist blast activities. Currently there is no Burn center, plastic surgery, and Neurosurgery available at these facilities. Others shown in the chart represents private rooms, CCU, Casualty and Day care etc., which could be utilized to adjust the disaster victims' influx during disasters.

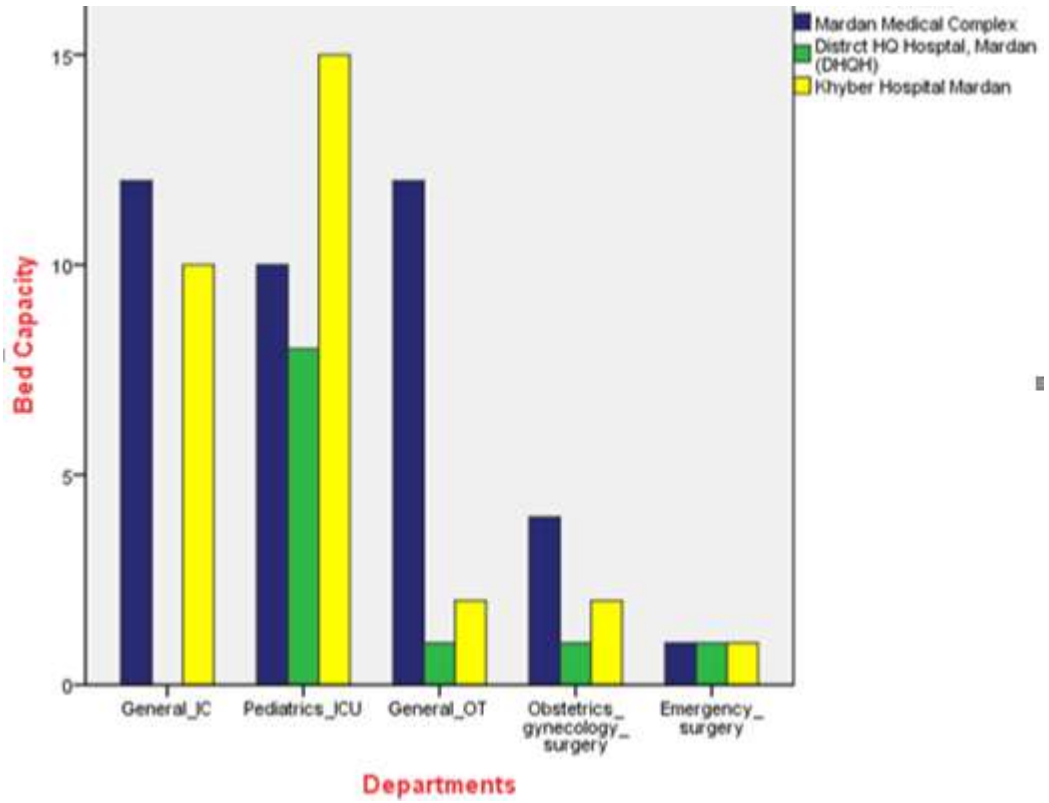


Fig 4.2.4: Hospital Capacity: ICU & Type of Operation Theaters

Fig 4.2.4 depicts the hospital services of the Intensive Care Units (ICU) and different types of available Operation Theaters (OT) needed for dealing critical patients. All hospitals have just 1 Emergency Surgery (ES) irrespective of the building capacity or physical space. These surgery

units accommodate not more than 3 beds in routine situation and cannot efficiently handle complex emergencies or natural disasters like Balakot earthquake. Patients usually get treatment outside the surgery unit in main gallery hall because of the limited available space. The influx of disaster victims could be overwhelming and diminish the effectiveness of hospitals in dealing with casualties.

General OT with 1 and 2 beds in DHQ and KH indicates the miserable situation and raise many questions while at MMC the OT has 12 beds for dealing complex and natural disasters. General IC capacities for all the two hospitals is below 15 while DHQ has no IC operating nowadays due to the construction running in the premises.

Physical space is an important consideration especially in blasts accidents or for victims of a large-scale disaster. For additional spaces or encountering surge capacity during complex and mass casualty emergencies, MMC in their DRM Plan has designated Cardiology Emergency Ward for patients requiring monitors while for non-monitored patients Accidents & Emergency Department (A&ED) has been designated. Besides, MMC administration usually utilizes the ENT wards, to reinforce their surge capacity where the flow in routine is usually low and they have enough space there.

4.2.2 Elements Related to The Geographic Locations of Health Facility

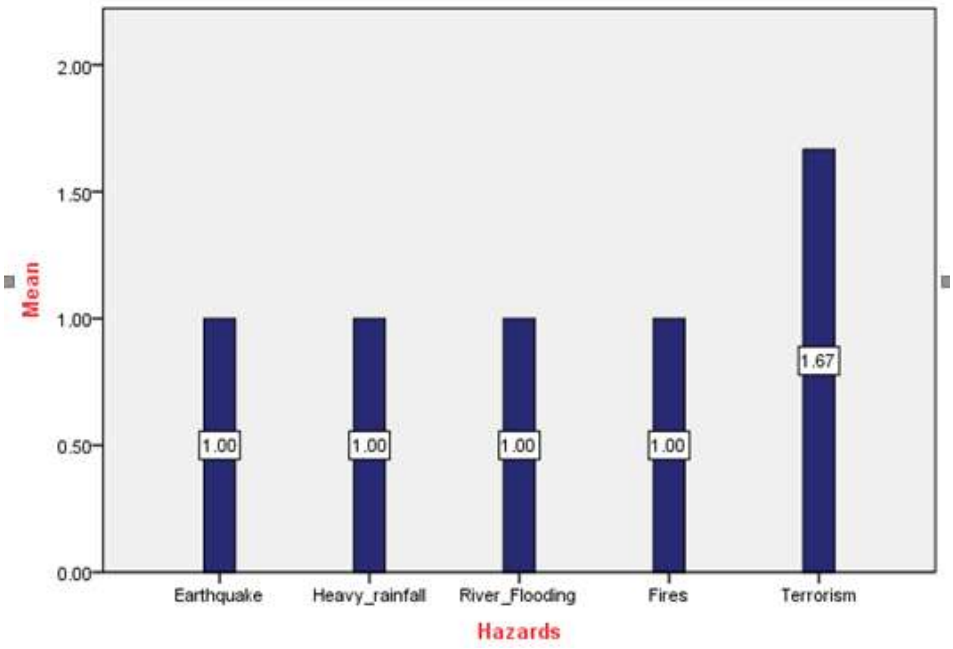


Fig 4.2.5: MEAN of the Hazard Exposure of Health Facilities

In fig 4.2.5, the extent of exposure of health facilities against different natural and man-mad hazards has been shown. Mean is shown on Y axis while hazards are given on X axis. As per PAHO hospital safety index, the exposure magnitude has been described into LOW, AVERAGE and HIGH. Three-point Liker Scale (LS) has been used in the questionnaire in which lowest value is 1 and the highest is 3.

The mean values of the hazards have been attained by using Descriptive Statistics in SPSS. Fig 5 indicates that with a mean value of 1, all the three hospitals i.e., MMC, DHQ & KH have "Low" exposure against earthquake, heavy rainfall, river flooding, fires while with a mean value of 1.67 at LS, Terrorism has been ranked "Average" because of its value which is close to "2".

4.2.3 Elements Related to The Structural Safety of The Building

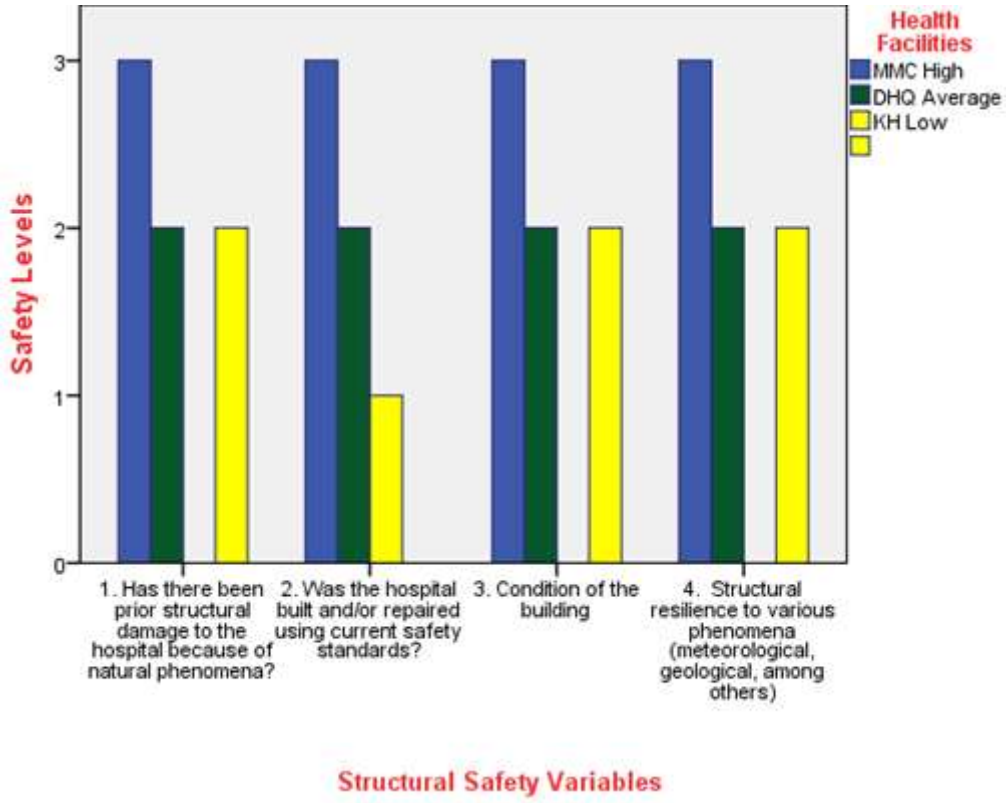


Fig 4.2.6: Elements of the Structural Safety of Hospitals

As mentioned in Fig 4.2.6, three values are shown on Y axis which shows the safety level of the facilities regarding structural safety variables given on X axis. 1 is for Low, 2 for Average and 3 for High level of safety regarding structural element of the hospitals. The analysis is based on 3-point LS as per the standard of PAHO questionnaire.

The chart clearly depicts that safety level values of MMC is 3 for every structural variable given on X axis which means that the safety level is "High" by describing 3 on Y axis. MMC had not received any structural damage in the recent past, and is built using current safety standards, having good condition of the building and ensures structural resilience to various natural phenomena while DHQ and KH has an "Average" safety level against all variables except in the second variable in which KH admits that the hospital is not built according to the current safety standards by securing safety value 1 and claims LOW level safety against it.

Focal person of the DHQ informed that earthquake 2016 had caused a minor crack inside the causality Block of the hospital. KH also reported minor ceiling crack while MMC left the box blank where no natural phenomena had occurred and caused a structural damage. Focal person of MMC told that MMC building has been designed and built according to the safety standards and building codes of Pakistan, by National Engineering Services Pakistan (Pvt.) Limited (NESPAK). Condition of the building and structural resilience of DHQ and KH was ranked "Average" on the Likert scale.

4.2.4. Elements Related to Non-Structural Safety

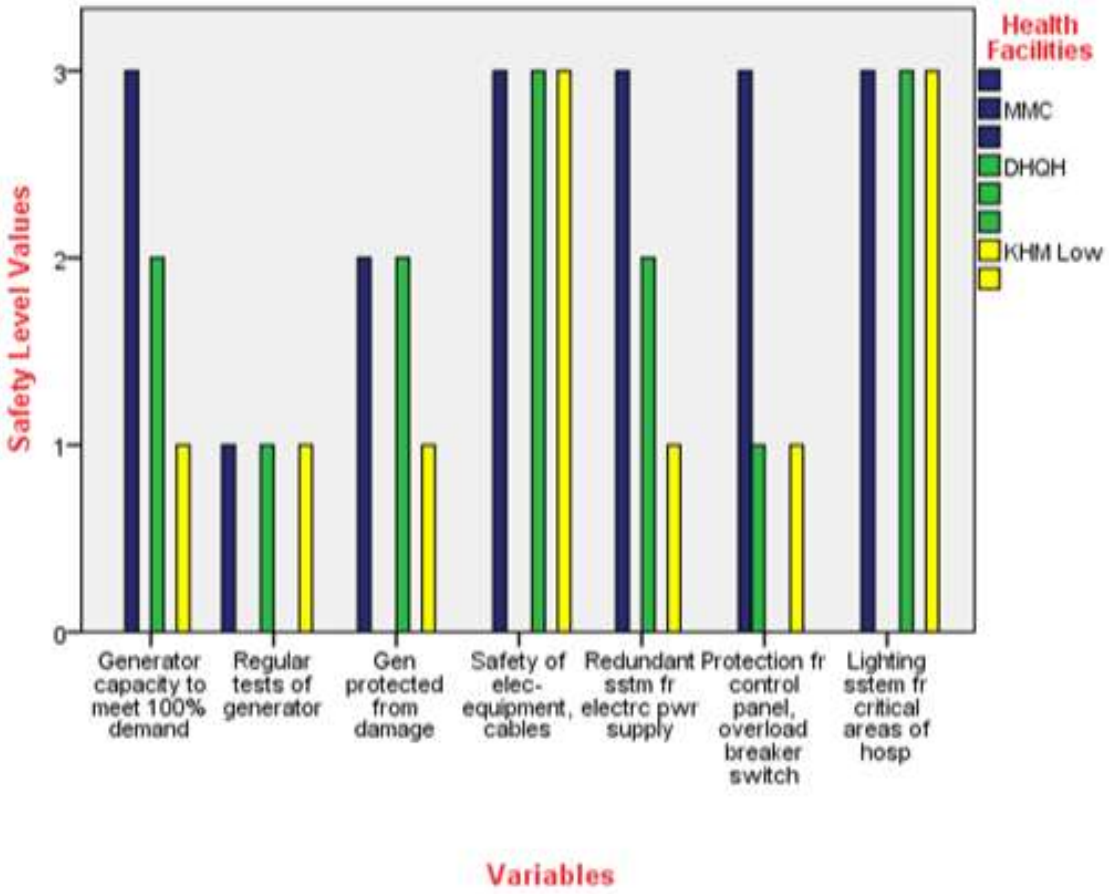


Fig 4.2.7: Critical Systems: Electrical System

Fig 4.2.7 represents the gaps in the non-structural elements of the electrical system of hospital. Value “1” at Y axis, for the generator capacity and regular performance tests signifies the Low safety level of electrical system of all the three hospitals. Low safety level shows that generators of these hospitals cover their demands but not 100% (MMC=80%, DHQ=70, KH=80%) whereas their generators start manually which takes at least 5 to 8 minutes. As per the standard of hospital safety index, for “High” safety level the generators must start automatically in less than 10 seconds and should cover 100% demand while their generators cannot support to run Computed Tomography (CT) scan machine and hinders the services during shutdown.

As far as the regular performance tests are concerned, MMC along with DHQ & KH carry out their generator performance tests once in a year whereas the tests should be conducted at least monthly for ensuring best performance during blackout or continuous load shedding. That is why all the 3 hospitals have ranked “Low level safety” for their performance test. Average level safety is ranked for generators protection by MMC and DHQ which signifies that generators are partially protected from natural phenomena. Among 3 generators of the MMC 2 are grounded in open air while one in a closed room where fuel for generators is also stored and can be dangerous. Redundant system for local electric power supply is on Average level with safety value “2” for MMC and DHQ which means the partial availability of the redundant system at the hospitals. Safety level of protection for control panel, overload breaker switches and cables is highly ensured at MMC but poorly managed at DHQ and KH.

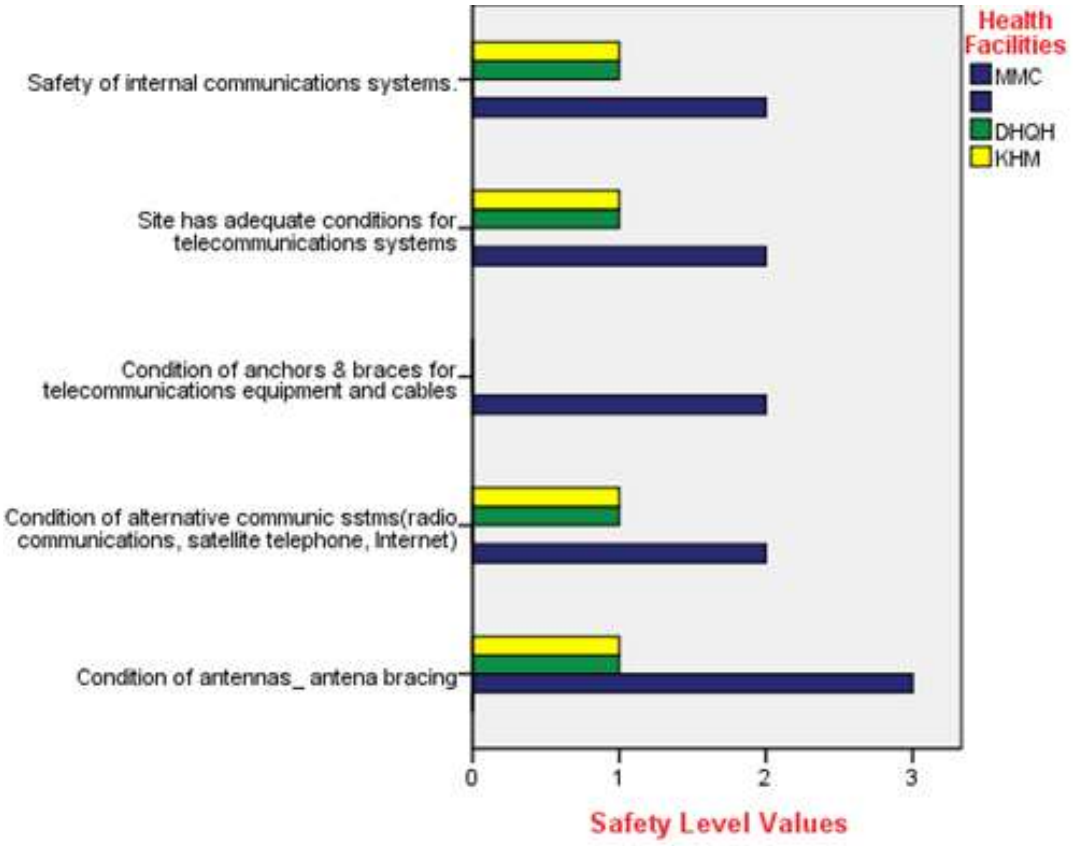


Fig 4.2.8: Critical Systems: Telecommunication System

In Fig 4.2.8, variables are shown on Y axis while safety level values on X axis. This above chart depicts the safety level of the Communication Systems (CS) available at the hospitals. The internal communication system which includes loudspeakers, public address system, speaker systems, etc., does not exist at DHQ and KH and have been ranked at Low safety level in case of rapid shooter intrusion in these two hospitals while MMC has been ranked at Average level due to their claim that they have a satisfactory level of internal CS only at OPD not at certain departments or throughout the hospitals. Better CS are proved helpful both in disasters, complex emergencies and terrorist activity. The condition and safety of antennas for CS is good with maximum level of safety level at MMC but the other two facilities do not have CS services and have been ranked at the low level of safety. The alternative CS does not exist at KH and DHQ wherein they have a traditional telephonic system for communication. At MMC besides, an exchange for internal CS in addition National Telecom Corporation (NTC) had allotted MMC with specific landline numbers but other modern means of CS i.e., radio communications, satellite telephone, does not exist.

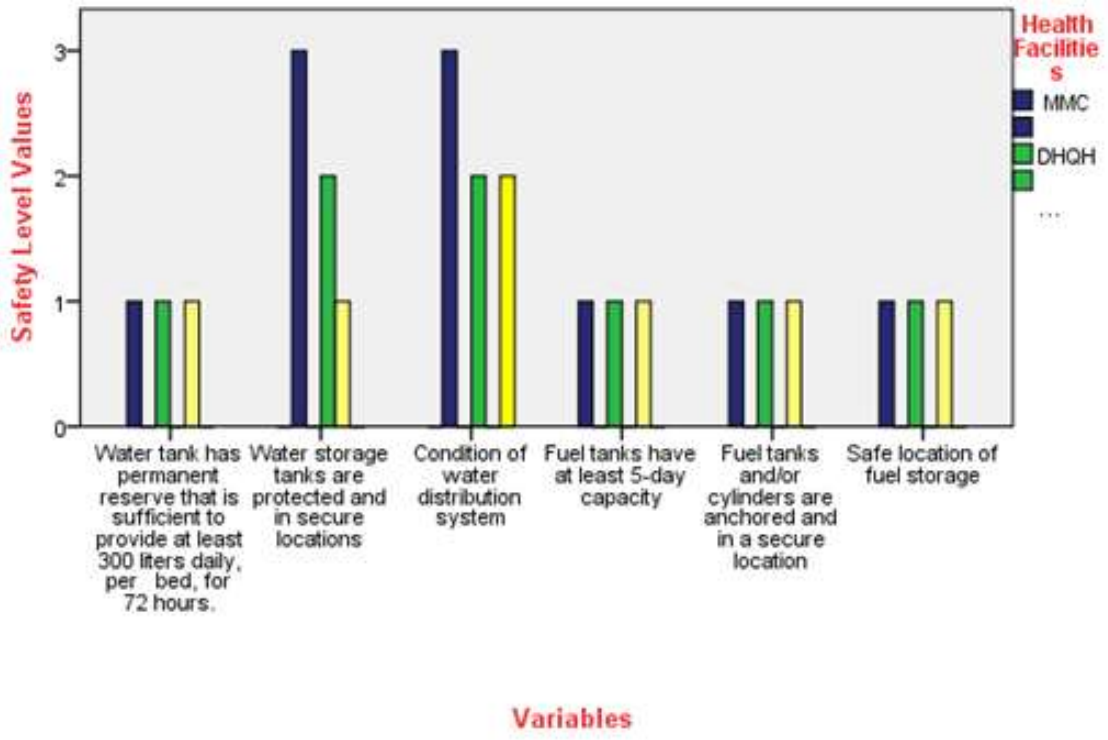


Fig 4.2.9: Critical Systems: Water and Fuel Tanks Safety Level

The above chart shows conditions & safety level of the most critical facilities i.e., water and fuel tanks. MMC has two water tanks above the ground. One tank is of 35,000 gallons while the other is of 45,000 gallons. Collectively MMC has 80,000 gallons for 512 beds per day use which is quite enough against its standard use of 60,865 gallons per day. DHQ has two above land water tanks having one of 15,000 gallons and other tank is 30,000 gallons which collectively makes 45,000 gallons against its daily use of 26,000 gallons. KH has only tank one tank which is 10,000 gallons and its daily use is 11,887 gallons.

Water supply interruption can be caused by several types of events such as natural disaster, a failure of the community water system, construction damage or even an act of terrorism. In this case, all the 3 facilities do not have any extra storage facilities for storing water for 3 days to maintain daily operations and patient care services. All the three facilities have ranked "low level" of fulfilling water need, in the above fig, due to failure of community services during natural disaster events, which means that their water tanks have water sufficiency only for 24 hours instead of 72 hours contrary to the standards of hospital safety index.

MMC and DHQ were given average level safety and “high level safety” to the water tank protection and its secure location, respectively. It means that MMC has low possibility of functional failure while DHQ reported that its failure would not cause collapse of tanks. KH ranked “Low safety level” which signifies that water tank is susceptible to structural failures.

Conditions of the water distribution is good between 60 to 80% in good conditions for DHQ and KH and as per the PAHO standard, their safety has been ranked at average level while for MMC the distributions are above 80% in good conditions and have been ranked high.

MMC has 700 to 900 liters of fuel reserves for the generators while DHQ has 200 liters reserves which are not enough even for a day. 28 liters of fuel can run a hospital generator of 200kv for one hour at DHQ while 200 liters can run this generator for 7 hours continuously which signifies that this fuel cannot support the hospital services not even for a day. MMC has 900 liters which is enough only for 32 hours.

Against fuel tanks capacity variables, all the 3 facilities have marked “low level” of capacity which signifies that fuel storage is not secured and has less than 3-day fuel capacity as per the standards. For intense emergency the hospitals must have secured storage i.e. minimum for 5 days. Fuel tanks are not anchored and located in secure location. At MMC, the fuel tanks were placed in a store room where medical gas cylinders and fuel tanks along with stationery writing pads were located under the one roof and there was a risk of failure. Same situation was seen in DHQ and KH.

The table below illustrates the utilization of water per person per day within all the three hospitals while as per standard of the HSI, how much gallons will be required for 72 hours or 3 days for the whole hospitals are also given below.

Table 4.3: Water Supply Need of the Hospitals

I US gallon = 3.78 liters
Water use per BED per Day (450 liters = 118 gallons)
For One Day:
Water use of MMC per Day (512*450) = 230,400 lit = 60,865 gallons)
Water use of DHQ per Day (223*450) = 100,350 lit = 26,509 gallons
Water use of KH per Day (100*450) = 45,000 lit = 11,887 gallons
For 72 Hours or 3 Days
Water use of MMC for 72 hours 691,200 lit = 182595 gallons
Water use of DHQ for 72 hours 301,050 lit = 79,528 gallons
Water use of KH for 72 hours 135,000 lit = 35,663 gallons

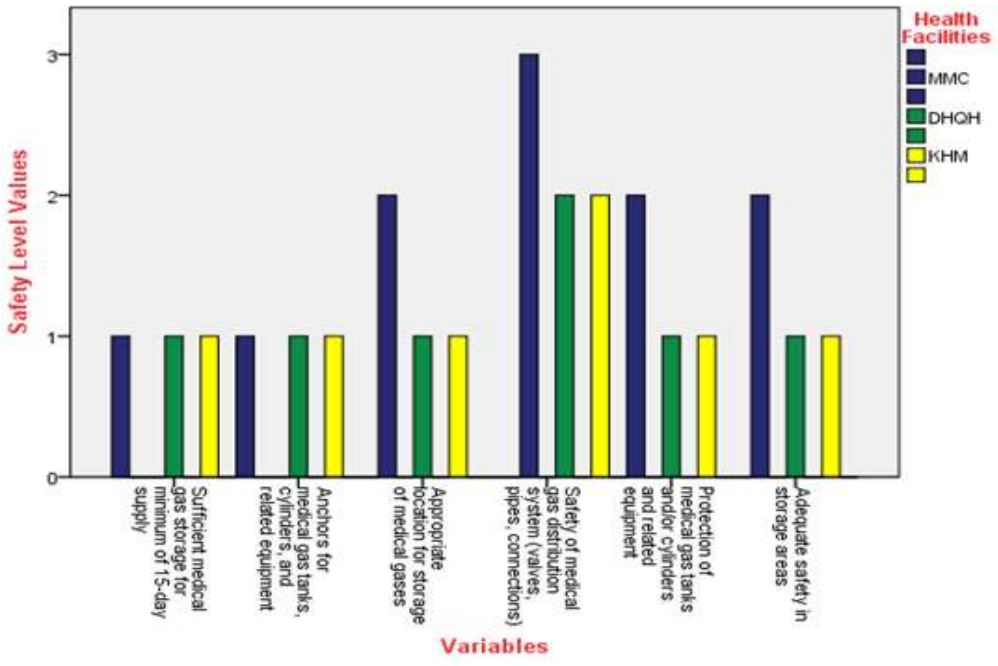


Fig 4.2.10: Critical Systems: Medical Gasses (O2, N2, etc.)

Medical Gas (MG) storage is not sufficient in hospitals as shown in fig 10. MMC has a total of 100 cylinders while at storage room they keep 35 medical gas cylinders. Use of oxygen cylinders in ICUs and other department is 20 while 20 nitrogen cylinders are used weekly in orthopedic and OT etc. MMC has a contract with MG suppliers' contractors who provide them refilled cylinders every second day and the services continues but for critical emergencies they do not have enough storage of the MG for at least 10 days which is minimum requirement for MG emergency supply plan. For the minimum standard MMC must have at least 200 gas cylinders in the store room for critical disasters while DHQ has total 70 medical gas cylinders which rotates for filling and refilling every second day while their daily use is 12-15 cylinders and for 10 days they will require minimum 150 cylinders. Gas cylinders were not anchored in any of the department of hospital. Safety of medical cylinders in storage areas is compromised by the presence of the fuel tanks hazards and in some cases storage is not accessible. Distribution lines and system for medical gases circulation was comparatively good. Between 60 to 80% system was in good running condition.

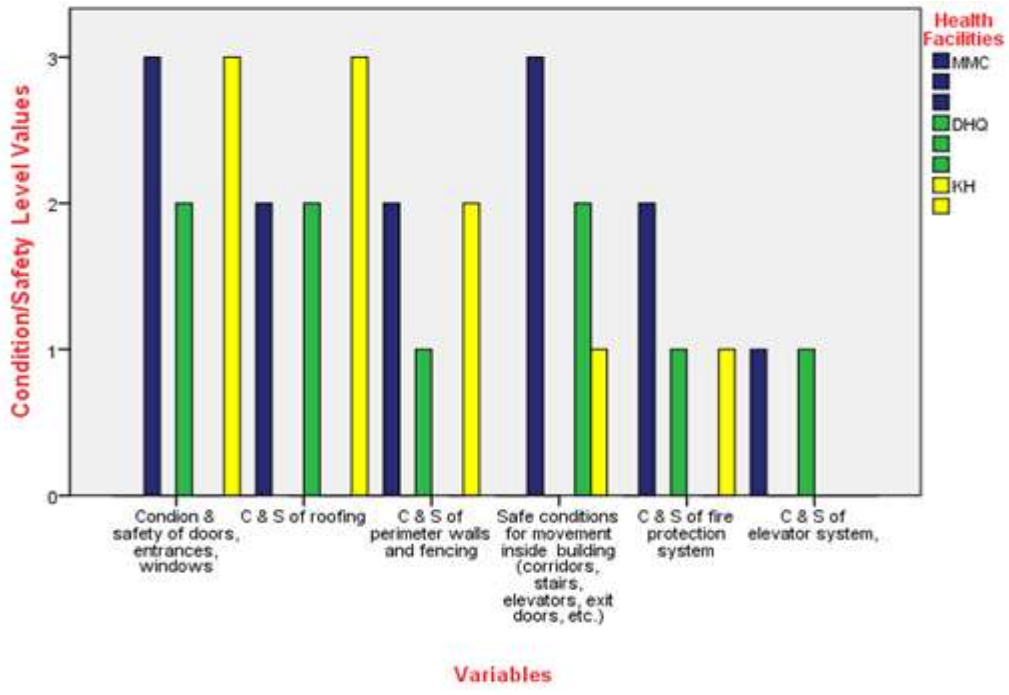


Fig 4.2.11: Non-Structural Safety: Architectural Elements

Architectural elements of the hospitals include, doors, entrances, windows, roofing, boundary walls and corridors etc. KH and MMC have been given high safety and good condition value in the chart which signifies condition of doors, windows and entrances while DHQ was marked "Average" which means if these are subjected to damage they would not impede hospital function. Condition of roofing in DHQ and MMC is averagely good but in some departments, there was a roof seepage problem. Perimeter walls and fencing of DHQ is marked "Low" due to its low height i.e., 6 to 8 feet and without fencing. MMC and KH have relatively high boundary walls but again with no fencing. At MMC the boundary wall has a short height of 6 feet without fencing near doctors' colony and near Nurse hostel which could create security problems or intrusion of terrorist.

MMC has relatively good fire protection system and every department has smoke detectors & alarms but they have not been tested so far. The alarm system batteries need to recharge every three months. In few cases the smoke detectors connection has been discounted because sometimes smoke from cigarette or kettle would activate the alarm. Fire extinguishers are available but most of them need to be refilled because more than 60% extinguishers were empty. The elevators in both MMC and DHQ were not functional while KH did not have an elevator.

4.2.5. Safety Based on Functional Capacity of Hospital

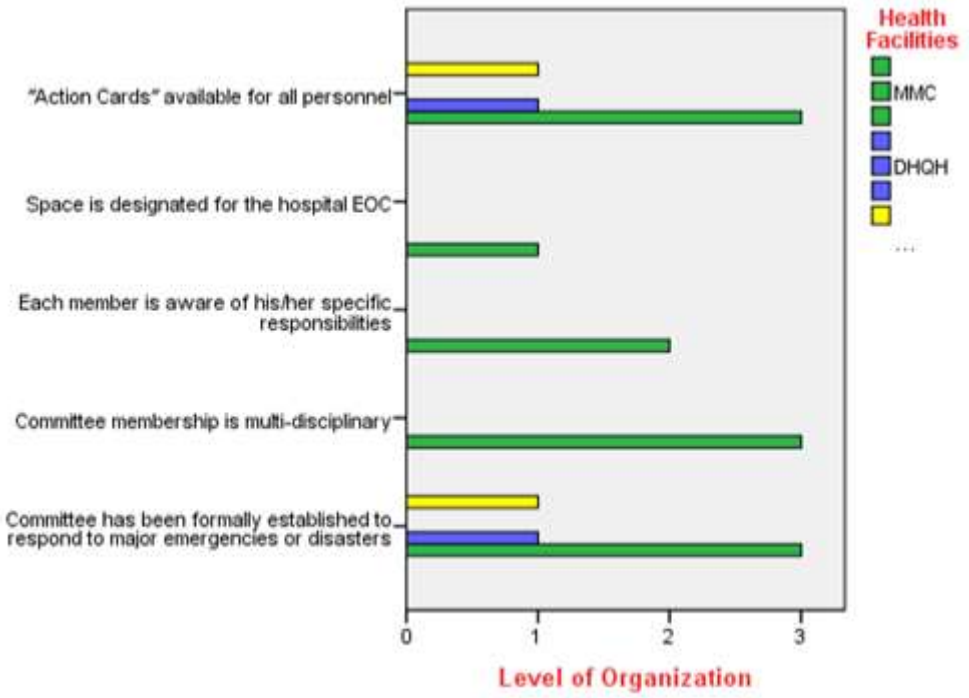


Fig 4.2.12: Hospital Disaster Committee and Emergency Operation Centre

The Fig 4.2.12, clearly shows that it is only MMC hospital where disaster committee has been formally established which in timely responds to major emergencies and disasters. For variable 1st and 2nd on the x-axis, MMC has marked high level of organization of the disaster committee and having multi-disciplinary membership. All the committee members have been assigned specific and situation related tasks, mentioned in the MMC Disaster Management Plan (DMP).

On the contrary, DHQ and KH were marked "Low" which represent low level of organization and states that they do not have a formal committee established for encountering disasters and major emergencies.

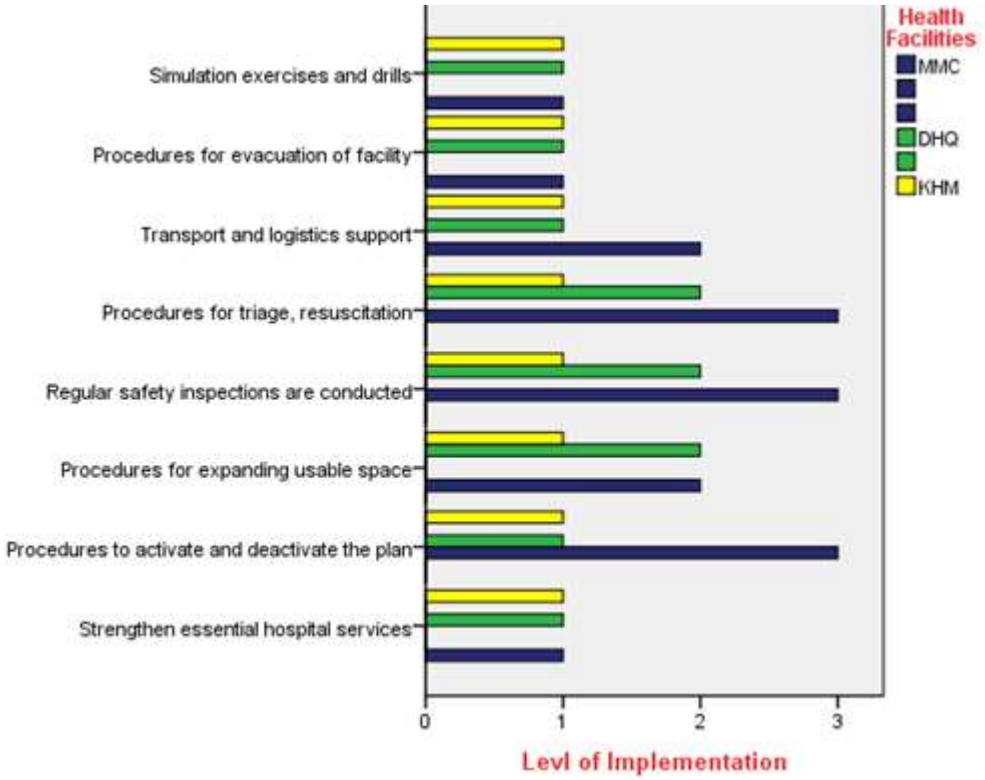


Fig 4.2.13: Operational Plan for Internal or External Disasters

Fig 4.2.13 represents operational plans for internal or external disasters. Basically, there are two types of disaster exercises for hospitals i.e., discussion-based exercises, and operations-based exercises. Discussion-based exercises include seminars, workshops, tabletop exercises (TTX) etc., which typically focus on strategic, policy-oriented issues while operations based exercises incline to focus more on response-related issues which includes drills, functional exercises (FEs), and Full Scale Exercises (FSEs).

According to the chart, no hospital among the three has a trend of carrying out regular disaster exercises and drills and was marked mean value "1" on the x-axis which means "Low" level of implementation of operational plans. Likewise, there are no procedures available in any of the hospital regarding evacuation of facilities in case of the fire or natural disasters.

MMC ambulance transport service has enough ambulances but are not satisfying the needs of the current population depending on this facility while private ambulances are stationed outside the MMC which provides facilitation in time of emergency. Usually, the ambulances have no first

aid or emergency service providing material in the ambulances and are used just to carry patients from the site of emergency to the hospital. Overall there is no coordination and a contingency transportation strategy of hospitals with transportation services to ensure continuous patient transferal while logistic & supply management department has already stockpiled the essential supplies and pharmaceuticals in accordance with national guidelines.

Two Disaster Cabinets have been established at the MMC, one at the Accidents & Emergency department (A&ED) and second at the EMS Room. Disaster Cabinets is to be opened for all disasters and it contains a list of responsibilities of the concerned departments and personnel's but they have not been drilled or practiced and are left just for emergency.

Procedures for triage rehearsed at DHQ & MMC are satisfactory and have been ranked "Average" and "High" on the scale of level of implementation. MMC procedures for external disasters or mass casualty emergency has designated Triage Vests for the Ambulance Triage Officers (ATO) and only three Vests have been designated for ATOs while Triage Officer and Triage Nurse have been assigned for these services.

Regular safety inspections are at "Low" scale at KH while at DHQ & MMC the inspections are carried out on regular basis especially at MMC, the Monitoring officer daily visits all the departments and report to the hospital director. Procedures for expanding useable spaces are marked "Average" and have been given mean value "2". To encounter surge capacity during mass casualty emergencies, MMC has already designated Cardiology Emergency Ward and Accidents & Emergency Department (A&ED) where the number of beds for patients have not been mentioned in DMP of MMC while at DHQ they have assigned medical wards where the space is available only or few patients.

Procedures for activation of the DRM plan does not exist at DHQ and KH because they do not have written procedures for activation and deactivation while they get information from the DC office when any mass casualty event occur. On the contrary, it is the responsibility of Incident Command Centre to activate and deactivate the emergency.

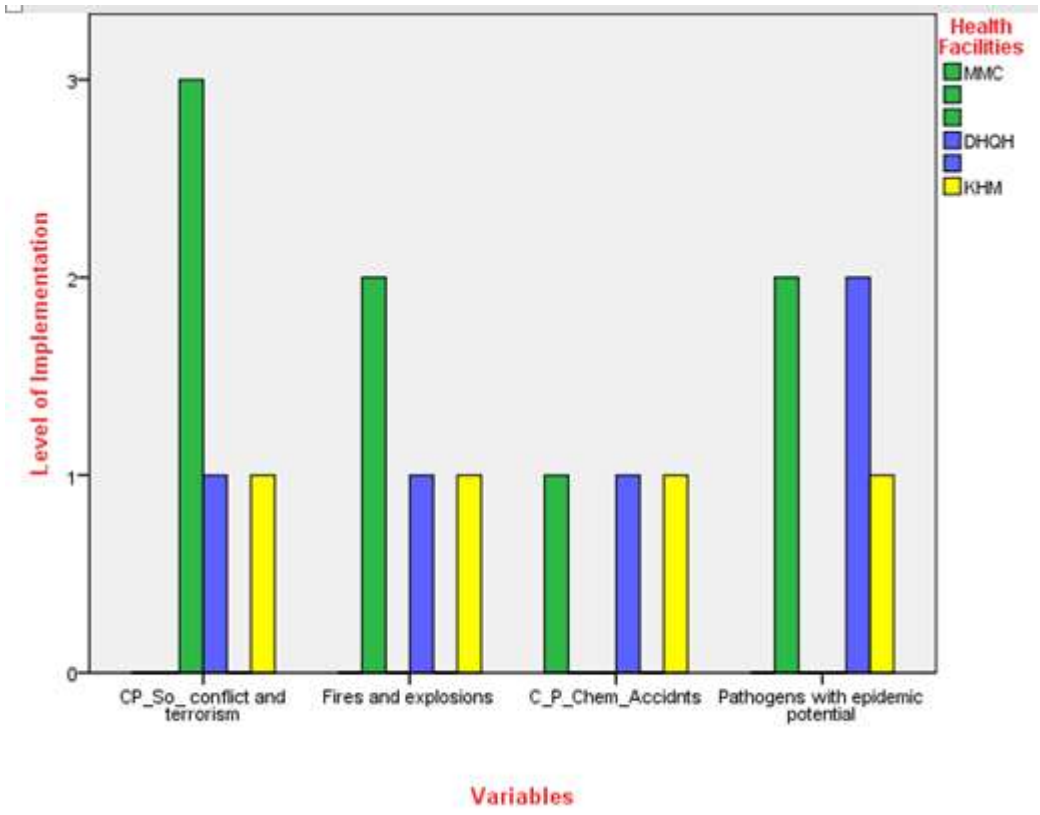


Fig 4.2.14: Contingency Plan for Medical Treatments in Disasters

Contingency plans (CP) are response plans prepares the organizations or communities to respond well to a disaster event and its potential impacts. MMC has formulated and drafted their procedures for medical treatments in disasters like terrorism or bomb blast while DHQ and KH do not have such contingency plans and mostly refer patients to MMC or Peshawar for prompt medical services. That's why CP for conflict and terrorism have been marked "LOW" by DHQ and KH.

For fires and explosions: MMC has no CP for internal explosions if such event take place inside the hospital while for fires inside the hospital, it has well-established resources for prompt response. Fire alarm bells, fire extinguishers and smoke detectors have already been located at different departments but they have not been tested even for a single time. For external explosions, MMC has well-coordinated emergency management plan in document which has already been shared with the district authorities. But for dealing with fire events, MMC has no

burn unit and mostly patients are referred to Lady Reading Hospital (LRH) and Khyber Teaching Hospital (KTH). The graph is showing "Average" level of implementation in this regard while the other two facilities do not have such plans for fires and explosions. For encountering chemical accidents, no facility has a decontamination facility instead MMC has just mentioned in its DMP that concerned department capable of decontamination will be notified if chemical event occurs. Besides, list of such departments has not been given in the plan. Against endemic diseases MMC and KH has response and awareness centers.

Chapter 05

ISSUES REGARDING MAINSTREAMING DRR INTO SCHOOLS AND HOSPITALS

5.1.1 Policy Issues:

Risk knowledge at the government level regarding Critical Infrastructures (CIs) i.e., schools and hospitals safety and security is very low. There is also a big gap in the implementation of risk awareness and knowledge at schools and hospitals from the concerned departments. Research data of the school's states that 100% of the schools' Parents Teachers Councils (PTCs) at district Mardan have no knowledge of the School Disaster Risk Reduction (SDRR). The PTC which is implementing body at school level even does not know that what kind of interventions could be taken for safety & security of the school, staff and students against natural and man-made disasters.

Education department and schools do not provide significant local disaster risk awareness and reduction activity at all age levels, through the formal curriculum. According to the study, 100% of the schools do not have text books or chapters related to natural disaster and its awareness. The KP text book has already been approached by different national and internal organizations for mainstreaming DRR into formal curriculum but there is no progress made in this regard.

Education and Health departments along with the concerned provincial department i.e., PDMA and other organizations have not conducted the risk assessment of CIs at a wide range to cover the gap. Rather only a small number of risk assessments have been undertaken covering limited territory and hazards while at hospital level there is a huge gap. The research study represents that more than 60% of the school teachers do not even know what is risk assessment.

- There are no maps of the vulnerable schools and hospitals, as per our research data more than 72% do not have maps of their schools for evacuation purposes. Likewise, the education

department do not have their vulnerable school database due to limited knowledge about DRR and other financial factors.

- There is low understanding of the key hazards and underlying causes both at the departmental level as well as at schools and hospitals. Knowledge about hazards and their causes can mitigate the disaster impacts. During the research study most of the time was spent in explanation of the disaster terminologies and disaster risks posed to their facilities. Similarly, the health and education departments do not have their Risk Atlases or databases which help to establish a clear picture of the vulnerable and safe schools and hospitals.

5.1.2 Developmental Issues:

Risk consciousness in overall development is at pre-mature stage. Mainstreaming DRR in developmental projects has always been a big challenge whether they are educational or health sectoral programmes, plans or projects, or the application of building codes for construction or land-use and zoning for settlement planning. At all levels, DRR is not effectively mainstreamed in health and education sectors.

- Most of the school structures do not have integrated building codes at time of the construction. This statement is substantiated by our research study which states that nearly 50% of the school buildings are lacking current safety standards and had been constructed by the local masons having no knowledge of building codes while 41% schools reported that their buildings are lacking resilience due to the old age and sub-standard material used in construction.

- Proper land use planning and zoning for schools has been a serious problem. Most old and few newly constructed schools have built on "*KALPANI"* River bank which poses a great threat of seasonal floods. As per our collected data of the schools, 17 primary schools which is 30% of the total primary schools of the sample were reported to be highly exposed against floods as they were located near bank of the river. Likewise, 6 Middle schools and 3 Highs of the total sample which makes 50% and 23.1%, respectively were also described as the most exposed against floods due to their locations near river. Issues related to proper land zoning has been underestimated which if not addressed by the Urban planning department is likely to have great

future consequences in terms of disaster loses. Flood 2007 especially, and 2010 have already caused great damage to the exposed schools.

Table 5.1: Exposure Levels of Schools Against Natural Hazards

Hazards	School Type								
	Primary			Middle			High		
	Low	Average	High	Low	Average	High	Low	Average	High
Exposure level against Floods	26	13	17	5	1	6	6	4	3
	46.4%	23.2%	**30.4%**	41.7%	8.3%	50.0%	46.2%	30.8%	23.1%

5.1.3 Insufficient DRR Capacity

DRR Capacity at different sectoral level is not up to the mark including education and health sectors. The capacity of both these departments within the context of preparedness, prevention and mitigation is overall very low. The same gap has been found on the ground at schools and hospitals. The preparedness and response capacities at schools and hospitals have been at very low level. The statistics from this research states that 100% of the school samples do not have proper plans against natural hazards as well as no evacuation plans and schools are not trained and educated on fire & earthquake drills.

Response capacity which includes first aid, mass casualty triage, light search and rescue, fire suppression, emergency power operation, student release procedures, shelter, nutrition, and sanitation skills need emergency attention at school level. The school data states that 100% schools do not have the above-mentioned response skills while very few individuals in very limited schools just know first aid skills.

Preparedness capacity related to simulation and drill exercises which includes discussion-based exercises, and operations-based exercises is unexpectedly low at hospital level. The procedures for hospital evacuation are not available and defined yet.

5.1.4 Ineffective Early Warning System (EWS):

Early warning system is an important component of the Disaster Risk Reduction (DRR). Effective multi-hazard EWS results in the reduction of human suffering and property damage from all future natural disasters. There two main reasons for not having a well-established and coordinated EWS especially for floods and heavy rainfalls. One, the Provincial Meteorological department is not equipped with the modern technology to detect and forecast accurately. Secondly, there is a huge gap in the dissemination of warnings to the end user or vulnerable communities. Hence, it is the communication system which is a key component in the dissemination of warnings to the main stakeholders to have better response plans is seriously lacking.

There is ignorance of the significance of EWS on the part of education and health departments which is reflected in the research study. About 60% schools reported that their teachers and students both do not know about the signs used for early warning system at their schools against floods and heavy rainfalls which means that they are not trained or educated on EWS signs so that they move the students and assets in time to a safer place.

5.1.5 Ignorance of the Significance of DRR at Schools and Hospitals:

The ignorance and unawareness regarding DRR at departmental and community level is one of the main hurdles which create gap in the implementation issues of DRR at schools and hospitals. Both health and education departments do not have their sectoral DRR plans which could be implemented downstream in their sectors. Balakot earthquake is one instance, where more than 17,000 school children died and buried under the school buildings. Analysis revealed that a greater number of victims could have been safeguarded if students and teachers were equipped with adequate skills, training and properly educated on DRR. Both schools and hospitals have a great risk of human loses but if they are kept ignorant of their disaster risks and not educated & trained on DRR, they are likely to suffer colossal damage in terms of human and property loses.

According to the research statistics, there is no provision of DRR awareness to the students through formal curricula. The status of institutionalization of DRR education in Pakistan is seriously lacking at all levels. 100% of the schools reported that DRR education is not a priority at the government level and educational institutions in the country are not giving due consideration to DRR education. Besides, the research data from the sample states that 100% schools including their PTCs have "LOW" awareness level of the DRR which means that they are not aware of the assessment & planning, mitigation, fire safety etc.

5.1.6 Lack of Preventive Maintenance or Retrofitting

According to the UNISDR, Retrofitting is reinforcement or upgrading of existing structures to become more resistant and resilient to the damaging effects of hazards. The high level of deterioration which is found in most school buildings due to lack of preventative maintenance has endangered and exposed them to the future disasters. The schools' administration usually does not utilize the PTC fund for retrofitting purpose. The main reason stated was that PTC fund is limited and can be used for minor activities like white wash and electric works etc., while retrofitting needs a special developmental fund in which maintenance activities could be carried out. Research data represents that 42% of the schools have "Low" structural resilience to the natural phenomena i.e., floods, heavy rainfalls and earthquakes. Those high schools which receive a handsome amount of PTC fund could not manage to invest in retrofitting because of the lack of awareness and interest in DRR. No visits have also been recorded from the structural engineers by the facilitation of District Education Officer (DEO) for the assessment of vulnerable as well as intact school facilities.

5.1.7 Funds Availability for DRR

During the last five years, the provincial government has consistently allocated budgets much higher than the previous governments by allocating amounts between 24% to 28% of the budget for education sector. Previously, the budget allocated for education sector was Rs. 84.629 billion which increased to Rs. 168.085 billion, an increase of about 61%. This increase in education budget is specifically for improving school services but there is no fund allocated specifically for DRR structural and non-structural measures. Neither it is shown that what percent of this big

amount will be spend on school based DRR activities. Though it is elaborated in the report of "*Alif Alaan"* organization, titled: "2013-2018 Five Years of Education Reforms in Khyber Pakhtunkhwa. Wins, Losses and challenges for 2018-2023". "Alif Alaan" is a campaign that aims to make education a top priority for all citizens of Pakistan. It states that education sector has improved school infrastructure and under conditional grants the missing facilities which includes additional classrooms, boundary walls, group latrines, water supplies, electrification and solar panels have improved. But there is no DRR fund allocated for floods & seismic retrofitting, fire safety at schools, risk assessments, multi hazard mapping of the school etc. The research data suggests that 100% of the schools are lacking fire safety equipment's e.g., smoke detectors, fire extinguishers and fire alarms especially at high schools which are prone to fire risks due to presence of different chemicals for different lab experiments/practical.

5.1.8 School and Hospital Based DRR Verses Other Competing Needs

The policymakers of DRM are facing problems in obtaining political and economic commitment to other needs and priorities of the society. Though, the policymakers know the importance of investment in DRR at school and hospital levels but other needs like poverty reduction, economic growth, social welfare, energy and extremism needs greater attention and funds. Due to lack of budget, policy workers must prioritize on basic needs, neglecting the allocation of funds for mainstreaming DRR into CIs.

5.1.9 Excessive Burden of Work on Schools and Hospitals

Schools and hospitals follow a very busy schedule of routine responsibilities. Most of the teachers and especially the administration reported that there is hardly any time to engage students and teachers in co-curricular activities, how could they carry out all the trainings, assessments and implementation activities related to DRR or any other interventions. They must follow a strict work plans of the education department. Likewise, the same problem is associated with the health facilities. The administration and staff both hardly fulfil their routine duty schedule. The routine minor emergencies keep them busy while administration is mostly found busy in day to day administration issues.

Proposed Guidelines

5.2.1 Raising Awareness:

The awareness of schools and hospitals about their hazards, disaster risks, vulnerabilities and capacities need to be raised by the concerned department. PDMA along with education and health department should organized school and hospital based DRR workshops, seminars and trainings so that they get aware of these terms. Key stakeholders and decision-makers capacity on DRR must also be promoted and strengthen.

5.2.2 Risk Assessments:

District level risk assessments of schools and hospitals should be carried out in the presence of external and internal DRR and assessment experts. Teachers, PTCs members, administrators and doctors should also be trained on how to conduct risk assessment of their schools and hospitals as well.

5.2.3 Multi-Hazard Vulnerability Atlas and Index:

There is a need to establish a province-wide multi-hazard vulnerability Atlas and Index for schools and hospitals. These atlases and indexes should be produced by highly qualified experts of their fields. GIS experts from the PDMA and other external agencies should be a part of this task. Schools and hospitals should play a role of facilitators in this practice so that experts in their facilitation presents the actual pictures of the prone and exposed schools and hospitals.

5.2.4 Mainstreaming DRR into the Formal Curricula:

DRR must be imbedded into the formal curricula of the schools. Memorandum of Interest (MoU) must be signed with Provincial Text book Board and meetings should be held on this matter by the PDMA with educational experts and Text book board administrators. They should be mobilized and motivated on the importance of disaster relevant subjects and lessons for the schools in their text books.

5.2.5 Preparedness and Response Plans:

Education and health departments in facilitation of PDMA must formulate preparedness and response plans for their departments. It is in the National DRR policy 2013 that each department must have their preparedness and response plans and which must be updated accordingly. They should spare some budget for this activity and must hired Disaster Management qualified personnel to look after and supervise the disaster relevant activities in their respective departments.

5.2.6 Hazard Resilient Construction:

Schools and hospitals should promote hazard resilient construction of the new schools/hospitals and should support retrofitting for old ones. It is costly to construct new resilient infrastructures so maintenance and retrofitting can not only save the budget and ensures resiliency. Structural and architectural engineers' services can be hired for this purpose.

5.2.7 Strengthening multi-hazard Early Warning Systems (EWS)

The capacity of the met department need to be strengthen in terms to provide them modern radar technology. There is a need to strengthen the dissemination and coordination mechanism among the response departments, schools, hospitals and local community.

Chapter 06

CONCLUSION

The primary research reveals that there is an eminent gap in the policy implementation and mainstreaming of DRR into CI i.e., schools and hospitals. The research concludes that a comprehensive policy work has been done so far in the form of NDRM Framework 2007, NDMA Act 2010, ND Response Plan 2010, NDM Plan 2012, DRR Policy 2013 and guidelines have been set for mainstreaming DRR into health and education sector by UNDP, NDMA Pakistan. This paper work done, highlights the importance and inclusion of DRR into schools and hospitals but on ground, the situation and implementation of the policy is not satisfactory. Following points have been deduced from the research study, given below:

1. The research statistics shows that there is no risk assessment done on the part of schools and hospitals at district Mardan which are the foundation base for DRR plans against natural disasters, while against terrorism, progress has been shown on the ground in terms of risk assessment and planning. There is no identification and inventory available with either education or health departments of the vulnerable educational and health institutions and infrastructure in hazard prone areas. Besides, the skilled resource and experts are not available to carry out the risk assessments based on scientific knowledge. Though, according to the DRR policy of Pakistan the vulnerability of various infrastructure systems and services needs to be assessed against multiple priority hazards. Schools, colleges, hospitals and health facilities in the prone areas need to be assessed and its risk level be evaluated and measured by using different risk assessment tools.

2. In terms of disaster planning, the schools have better plans and implementation of the precautionary measures against man-made hazards i.e., terrorism and school security has been ensured to some extent by the presence of CCTV cameras, security guards, SOS mobile application, heighted boundary walls and fencing etc. These measures took place because of the National Actin Plan (NAP) implementation after which the district administration bound education department to implement and follow school security precautionary measures. However, in case of hospitals the security measures are not well implemented and established. On the contrary, the disaster plans against natural hazards

in schools do not exist while hospitals have better resilient structures against natural hazards.

3. Hospitals and schools lack preparedness and contingency plans to encounter large scale disasters. The research study depicts that disaster planning for external disaster is satisfactory to some extent at MMC and DHQ Hospitals, but for internal disasters they lack the contingency and preparedness plans. While at schools, both contingency and preparedness plans are missing due to low level of risk knowledge. It is worth mentioning that these facilities have been bound by the NDRM Framework 2007 which suggests "to prepare disaster risk management and emergency plans for each level of health care facilities and schools.

4. Nonetheless, efforts are on its way to mainstream DRR into the school curricula but so far, no fruitful results have been achieved. The intervention 5 of the NDMP 2012 and the priority 5 of the NDRMF 2010 suggests "Promotion of training, education and awareness" in relation to disaster management but so far DRR is not mainstreamed into the formal and informal curricula at national and provincial level while this priority has been part of our policy but the implementation gap still exists.

5. The awareness about DRR and its inclusion in the CIs is very limited both at schools and hospitals. The staff and administration of hospitals and schools do not know what is DRR and how can it be mainstreamed. PTCs, an implementing body of school, had no capacity and awareness regarding school safety and DRR while at hospital level, Disaster Committees were not existing with the exception of MMC.

6. The scarce resources and funds are restricting health and education sectors to initiate structural mitigation projects and are limiting them to mainstream DRR in the CIs. Implementation actions e.g. retrofitting, renovation, rebuilding etc., to reduce the vulnerability of built infrastructure in hazard prone areas are ignored and lack attention by both sectors. Besides, the risk perception is not yet well developed at sectoral level. However, the recent government has allocated amounts as high as 24% to 28% of the budget for education sector but no fund was allocated specifically for DRR structural measures against natural hazards at schools.

7. Communication or warning system used for immediate help from the law enforcement agencies is good at schools' comparative to hospitals while internal communication warning system is poor at both facilities. Schools have SOS application mobiles to press a red button in case of emergency while hospitals do not have such facility or app available. In case of other natural disasters and security breech or intrusion of terrorists into schools and hospitals, the two-way internal communication system (intercom facility) is not available to aware the public, staff and students and cover themselves in secure places especially in schools. Secure places also do not exist at schools.

8. Schools with big strength of students and constructed earlier or with old infrastructure were found more vulnerable to terrorism activity and natural hazards. Most primary schools were reported to be more vulnerable against naturals hazards while High schools were found exposed and vulnerable to man-made hazards.
9. Fire safety equipment was not present at the schools especially in the science labs at High schools. In the case of hospitals, the fire extinguishers in most of the cases were not charged and empty cylinders were hung for display. The smoke detectors in some departments of the hospital were present but there was not surety whether their batteries were charged or not.

10. The overall response capacity and skills at school level is alarmingly weak. Most schools do not know the response skills needed for affective response in time of emergencies for example fire suppression, mass casualty triage, first aid (certified) and light search & rescue skills. They do not hold post disaster drills to practice safety skills because teachers and administration themselves are not trained on it.

11. Emergency supplies for at least 72 hours (at least 12 liters of water per person, food, first aid supplies, emergency power, emergency lighting, shelter and sanitation supplies) for the anticipated disasters are not available at any of the school.

12. MMC DMP is a document in which roles have been assigned to different individuals and departments heads but this document is rarely practiced and drilled by the authority and staff. Most of the staff does not know about this document. Secondly, the focus of this document is to tackle and respond to the mass casualties of emergencies which occur

outside of the hospital while regarding natural disasters i.e., earthquake and fire events which could damage and affect the hospital itself or its functional services, there has been no planning set against it.

RECOMMENDATIONS

1. The Government of Pakistan, NDMA and UNDP must address the policy implementation issues regarding mainstreaming DRR into CI on emergency basis and must build risk knowledge, raise capacity on School & Hospital Based DRR and strengthen EWS for preparedness.

2. To overcome the financial constraint, the Government of Khyber Pakhtunkhwa and PDMA, KP must build strong Public Private Partnerships for investment in DRR and ensure to initiate immediate projects regarding structural mitigation measures and retrofitting of the vulnerable schools and health facilities. Proper land use planning with the inclusion of safety building codes in the construction and rehabilitation of new and old educational & health facilities must be ensured.

3. Proper risk assessment of the vulnerable schools and hospitals in hazard prone areas must be carried out by risk assessment specialist with standardized tools under the supervision of PDMA, KP, Education and Health departments. Government must ensure the formulation of realistic disaster management plans to make schools & hospitals resilient against natural and man-made hazards.

4. Develop curriculum based on DRR for all schools and ensure its inclusion not only in informal but formal education.

5. Disaster Management qualified personnel must be hired to look after the disaster relevant activities in health and education departments.

6. Further studies will be carried out to evaluate the remaining gaps.

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The Plan of Action for Safe School and Educational Buildings in Khyber Pakhtunkhwa "School Safety Action Plan" NDMA, PDMA KP, UNESCO, 2012

Annex A
SCHOOL SAFETY & SECURITY QUESTIONNAIRE

Background Information

Please answer the following questions that describe your building.

1	**School Name**		
2	**Address of School**		
3	**School Type**		
	Primary	Middle	High
4	**Number of Students in School**		
5	**Number of Teachers in School**		
6	**When was your school building constructed?**		
7	**What is your position in the School?**		
	Administrator	Principal	Teacher
8	**How many years have you worked in the School?**		
9	**Contact number and email of the respondent/School**		

1. Assessment and Planning

Please answer the following questions that describe the suitable answer.

1	**What is the level of exposure of your school to the below given hazards?**			
	Earthquake	Low	Average	High
	Heavy rainfall			
	River Flooding			
	Epidemics			
	Terrorism			
2	**What is the level of vulnerability of your school to the below given hazards?**			
	Earthquake	Low	Average	High
	Heavy rainfall			
	River Flooding			
	Epidemics			
	Terrorism			
3	**Has there been prior structural damage to your school because of natural phenomena or terrorism? Also, mention name of the phenomena.** *If such an event has not occurred, leave boxes blank.* ***Low= 20%, Average=30 to 50%, High= Above 50%***			
	Low	Average	High	
4	**We provide significant practical local disaster risk awareness and reduction activity at all age le vels, through the formal curriculum.**			
	Low	Average	High	
5	**Do you have a School Safety Committee (SSC) or School Disaster Management Committee (SDMC) at your school?** *Low = Committee does not exist; Average = Committee exists but is not functioning; High = Committee exists and is functioning.*			
	Low	Average	High	

6	**Do you have a Parents Teachers Council (PTC) in your school?**		
	Low	Average	High
7	**What is the level of awareness and training of PTC on School Disaster Risk Reduction (DRR)?** *For example, Assessment & Planning • Response Skills • Non-structural mitigation • Fire safety etc.*		
	Low	Average	High
8	**What is the level of identification of the School Site and Neighborhood Maps and evacuation routes within or outside the schools?** *Low= maps and roots have not been drawn and identified, Average= have been identified and marked, High= have been identified, marked and tested during drills*		
	Low	Average	High

9	**What is the level of the School Disaster Management Plan, against natural hazards for your school?** *Low = Plan does not exist; Average = Plan exists only as a document; High = Plan exists, personnel have been trained, and resources are in place to carry out the plan.*		
	Low	Average	High
10	**What is the level of School Security Plan against social conflict or terrorism activity for your school?**		
	Low	Average	High
11	**What is the procedure for Evacuation Plans, including safe assembly areas, evacuation routes, safe havens in your school?** *Low = No Safe Heavens, exit routes are not clearly marked and many are blocked; Average = Some exit routes are marked and most are clear of obstacles; High = All exit routes are clearly marked and yes safe heavens exists.*		
	Low	Average	High
12	**The evacuation plan has been shared with the nearest police, fire and hospital officials and established communication and understanding in advance of emergency situations.** *Low= plans don't exist in document, Average= plans exit and have been shared, high= Plans have been shared, practiced annually and communication established*		
	Low	Average	High
13	**What is the level of awareness of the needs of vulnerable groups or individuals such as young children, students with disabilities as well as the concerns of staff, students, parents and community.**		
	Low	Average	High
14	**What is the level of the risk assessment and the physical risks posed by your School building, non-structural elements *(electricity, communication & water supply system etc.)* and identification of the hazards *(floods, earthquakes, terrorism etc.)* in your neighborhood.** Low=teachers know R.A but don't know how to conduct, Average= knows R.A and have identified their risks, High= teachers have produced disaster plans based on their R.A		
	Low	Average	High
15	**What is the level of communication system established at your school for emergencies, including a warning system wherever appropriate.**		
	Low	Average	High

16	**What is the availability level of the contact information required for emergency response and family reunification?**		
	Low	Average	High
17	**What is the availability level of the plans for educational continuity for your students including alternate locations to continue classes, alternate schedules and methods of instruction as needed and secure back-up of educational records?**		
	Low	Average	High
18	**What is the availability level of the fire and earthquake drills, which are unannounced to staff?**		
	Low	Average	High

2. Physical and Environmental Protection

1	**Your school building has been designed and built according to current building codes/safety standards for disaster safety, and inspected by a qualified structural engineer?** *Low = Current safety standards not applied; Average = partially applied; High = fully applied.*		
	Low	Average	High
2	**Do you practice preventative maintenance on your buildings, protecting them from rain and other damage, and repairing damage when it occurs?**		
	Low	Average	High
3	**What is the Structural resilience of your school to various phenomena (meteorological, geological and manmade)**		
	Low	Average	High
4	**<u>Earthquake, windstorm</u>: Have you fastened tall and heavy furniture, secured computers, hazardous materials, supplies, water tanks, lighting fixtures, roof elements, railings and parapets, heating and cooling devices, storage tanks and other items that could kill, injure, or impair educational continuity?**		
	Low	Average	High
5	**Have you put latches (bolts) on cabinets, and hung pictures securely on closed hooks to protect students and teachers from injury and financial losses?**		
	Low	Average	High
6	**<u>Flood, storm</u>: Do you know about early warning systems in use in your school and have plans to respond to these in order to move people and assets to safety?** Low= Teachers and students are not trained in recognizing E.W signs, Average= Only teachers are trained on EW signs, High= both know EW signs and school have plans to respond		
	Low	Average	High
7	**The school building has been checked by local fire department for fire safety.**		
	Low	Average	High
8	**Do you have smoke detectors, fire alarms, fire extinguishers and maintain these?**		
	Low	Average	High
9	**What is the Safety level of electrical equipment, cables, and cable ducts?**		

	Low	Average	High
10	**What is the condition of Communications Systems at your school? (for quick, two-way communication between teachers and the central office)** Low= Inter come system doesn't exist, Average= system exits but not functional, high= exists and functional		
	Low	Average	High
11	**What is the safety level of Water storage tanks and are they protected & in secure locations at your school?**		
	Low	Average	High
12	**What is the condition of water distribution system e.g., valves, pipes, and connections at your school?**		
	Low	Average	High
13	**What is the condition and safety of laboratory equipment at school? (For High School, Only)**		
	Low	Average	High
14	**What is the condition and safety of roofing of classes?**		
	Low	Average	High
15	**What is the condition and safety of doors, windows and entrances of your school?**		
	Low	Average	High
16	**What is the condition and safety level of school boundary walls and fencing at your school?** Low= low heighted with no fences, Average= high boundary wall with no fencing, High= high with fencess		
	Low	Average	High
17	**What is the security situation at the school?** *Low: no exit gates, security guards & barricades: Average, have exit gates, guards are trained but have no modern weapons, High: guards are trained, equipped with modern weapons, school have CCTV cameras, safe heavens and SOS software mobile*		
	Low	Average	High

3. Response Capacity: Supplies and Skills

1	**Does your school hold post-disaster drills to practice safety skills with all staff and students at**

	least twice a year?		
	Low	Average	High
2	**Do your school hold simulation exercises at least once a year and have skills in damage assessment, information-sharing, light search and rescue, first aid, fire suppression and family reunification?** Low= No skills , Average= have few skills but don't hold S-exercises, High= have skills and hold S-E once a year		
	Low	Average	High
3	**Do you have skills and practice building evacuation drills twice yearly as well as applicable drills for the threats faced (*e.g. First aid skills for life safety, drop, cover, and hold for earthquakes, water safety and swimming skills for floods, shelter-in-place for violent threats*)?**		
	Low	Average	High
4	**Do you have practiced receiving updates on emergency situations, warning our community and informing the relevant authorities?** Low=No we don't receive E-updates, Average=yes but never practiced, High= yes receives updates & inform relevant authorities but never warn our community.		
	Low	Average	High
5	**Do you have emergency supplies for students and staff to last for at least the first 72 hours *(including at least 12 liters of water per person, food, first aid supplies, emergency power, emergency lighting, alternate communications, alternate transportation, shelter and sanitation supplies)* at your school?**		
	Low	Average	High
6	**Do School staff and older students have and learnt response skills including: first aid, mass casualty triage, light search and rescue, fire suppression, emergency power operation, student release procedures, shelter, nutrition, and sanitation skills?**		
	Low	Average	High
7	**Does School staff know how to turn off our electricity, water and gas?**		
	Low	Average	High
8	**Does your school have a standard organizational system and do you know the principles for organizing post-disaster self-help?**		
	Low	Average	High
9	**Do you have plans to use your resources for mutual aid and to support local community response?**		
	Low	Average	High

SAFE HOSPITALS CHECKLIST

1. Elements relating to the Geographic location of the health facility (mark with an X where applicable).

1.1 HAZARDS (THREATS)	Hazard Level				OBSERVATIONS
	No Hazard	Hazard level			
		Low	Average	High	
1.1.1 Geological Phenomena					
Earthquakes					
1.1.2 Hydro-Meteorological Phenomena					
Torrential rains					
River flooding					
1.1.3 Chemical And/or Technological Phenomena					
Fires					
1.1.4 Complex or Societal Phenomena					
Terrorism					

2 Elements related to the Structural Safety of the building

2.1 Prior Events Affecting Hospital Safety & Safety of The Structural System	Safety level			OBSERVATIONS
	Low	Average	High	
1. Has there been prior structural damage to the hospital because of natural phenomena? IF SUCH AN EVENT HAS NOT OCCURRED NEAR THE HOSPITAL, LEAVE BOXES BLANK.				
2. Was the hospital built and/or repaired using current safety standards?				

3. Condition of the building				
4. Structural resilience to various phenomena (meteorological, geological, among others)				

3. Elements related to Non-Structural Safety

Non-structural elements do not form part of the load-bearing system of the building. They include architectural components, equipment, and systems that are necessary for the operation of the building.

3.1 CRITICAL SYSTEMS	**Safety level**			**OBSERVATIONS**
	Low	Average	High	
3.1.1 Electrical System				
6. Generator has capacity to meet 100% of demand				
7. Regular tests of generator performance are carried out in critical areas *Low = Tested every 3 months or more; Average = Tested every 1 to 3 months; High = Tested at least monthly.*				
8. Generator protected from damage due to natural phenomena *Low = No; Average = Partially; High = Yes.*				
9. Safety of electrical equipment, cables, and cable ducts				
10. Redundant system for local electric power supply				
11. Protection for control panel, overload breaker switch, and cables				
12. Lighting system for critical areas of the hospital				
13. External electrical systems installed on hospital grounds				
3.1.2 Telecommunications System	**Safety level**			**OBSERVATIONS**
	Low	Average	High	
14. Condition of antennas and antenna bracing				
15. Condition of alternative communications systems For example, radio communications, satellite telephone, Internet, etc.				
16. Condition of anchors and braces for telecommunications equipment and cables Verify that radios, satellite telephone, video conferencing system, etc.) is anchored for increased security.				
17. Site has adequate conditions for telecommunications systems				

3.2 Office and Storeroom Furnishings and Equipment (Fixed and Movable) Including Computers, Printers, Etc.	Safety level			OBSERVATIONS
	Low	Average	High	
33. Anchors for shelving and safety of shelf contents				
35. Safety of computers and printers				
3.1.3 Water Supply System				
19. Water comes from a reliable and adequate source that is sufficient to provide at least 300 liters daily, per				
3.3 Medical and Laboratory Equipment and Supplies Used for Diagnosis and Treatment				
20. Water storage tanks are protected and in secure locations				
21. Condition of water distribution system				
3.1.4 Fuel Storage (Gas, Gasoline, Diesel)				
22. Fuel tanks have at least 5-day capacity				
23. Fuel tanks and/or cylinders are anchored and in a secure location				
24. Safe location of fuel storage				
25. Safety of the fuel distribution system (valves, hoses, and connections)				
3.1.5 Medical Gases (Oxygen, Nitrogen, Etc.)				
26. Sufficient medical gas storage for minimum of 15-day supply				
27. Anchors for medical gas tanks, cylinders, and related equipment				
28. Availability of alternative sources of medical gases				
29. Appropriate location for storage of medical gases				
30. Safety of medical gas distribution system (valves, pipes, connections)				
31. Protection of medical gas tanks and/or cylinders and related equipment				
32. Adequate safety in storage areas				

36. Medical equipment in operating theatres and recovery rooms Verify that lamps, equipment for anesthesia, and surgical tables are operational and that table or cart wheels are locked.				
37. Condition and safety of radiology & imaging equipment and laboratory equipment				
38. Condition and safety of medical equipment in emergency services unit, intensive or intermediate care unit, sterilization unit and for neonatal care & burn management				
3.4 Architectural Elements				
39. Condition and safety of doors, entrances, windows and shutters				
40. Condition and safety of roofing				
41. Condition and safety of perimeter walls and fencing				
42. Safe conditions for movement outside of building				
43. Safe conditions for movement inside the building (corridors, stairs, elevators, exit doors, etc.)				
44. Condition and safety of false or suspended ceilings IF THE HOSPITAL DOES NOT HAVE FALSE OR SUSPENDED CEILINGS, LEAVE BOXES BLANK.				
45. Condition and safety of internal and external lighting systems				
46. Condition and safety of fire protection system				
47. Condition and safety of elevator system IF THERE ARE NO ELEVATORS, LEAVE BOXES BLANK.				

4 Safety based on Functional Capacity of hospital

The level of preparedness of hospital staff for major emergencies and disasters as well as the level of implementation of the hospital disaster plan.

4.1 Organization of The Hospital Disaster Committee and The Emergency Operations Center. Assess the level of organization achieved by the Hospital Disaster Committee.	**Level of Organization**			**OBSERVATIONS**
	Low	Averag	High	
48. Committee has been formally established to respond to major emergencies or disasters *Low = Committee does not exist; Average = Committee exists but is not functioning; High = Committee exists and is functioning.*				
49. Committee membership is multi-disciplinary Verify that the positions on the Committee are occupied by personnel from diverse disciplines (for example, hospital director, chief of nursing, maintenance engineer, head of emergency services, medical director, chief of surgery, chief of laboratory and support services, among others).				
50. Each member is aware of his/her specific responsibilities				
51. Space is designated for the hospital Emergency Operations Centre (EOC) *Low = Nonexistent; Average = Space has been officially assigned; High = EOC exists and is functional.*				
52. The EOC is in a protected and safe location				
53. The EOC has a computer system and computers Verify that the EOC has Internet and intranet connections. *Low = No; Average = Incomplete; High = The EOC has all computer system requirements*				
54. The EOC has an alternative communications system Determine an alternative communications system (e.g. cellular, two-way radio, etc.).				
55. "Action Cards" available for all personnel Verify that action cards describe the assigned duties of each hospital staff member in case of an internal or external disaster.				

4.2 Operational Plan for Internal or External Disasters	Level of Implementation	OBSERVATIONS

	Low	Averag	High	
68. Flood				
69. Fires and explosions				
Low = Plan does not exist or exists only as a document; Average = Plan exists and personnel have been trained; High = Plan exists, personnel have been trained, and resources are in place to carry out the plan.				
57. Procedures to activate and deactivate the plan				
58. Financial resources for emergencies are budgeted and guaranteed				
59. Procedures for expanding usable space, including the availability of extra beds				
60. Regular safety inspections are conducted by the appropriate authority Examine logbooks that record equipment tests and dates of inspections by civil defense personnel. *Low = Inspections do not occur; Average = Incomplete or outdated inspection; High = Inspections are complete and up-to-date.*				
61. Procedures for triage, resuscitation, stabilization, and treatment				
62. Transport and logistics support				
63. Cooperative arrangements with local emergency plan There are written arrangements regarding cooperation between the hospital and community authorities.				
64. Procedures for the evacuation of the facility Verify procedures to evacuate patients, visitors, and staff.				
65. Simulation exercises and drills The plan is tested regularly through simulations and drills, which are evaluated and modified as appropriate.				
4.3 Contingency Plans for Medical Treatment in Disasters				
66. Earthquakes,				
67. Social conflict and terrorism				

70. Pathogens with epidemic potential				
71. Psycho-social treatment for patients, families, and health workers				