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CLIMATE CHANGE AND DISASTERS RISK REDUCTION OF EARTH QUAKE

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ABSTRACT

Disasters are significant disruptions to a community's operations that are more severe than whatit can handle on its own. The exposure and vulnerability of a community can be affected by a number of factors, including natural, man-made, and technological hazards. Seismic events are devastating occurrences with a low probability but high impact. They could heighten the effectson the economy, infrastructure, and health, among other things. The gradients might result froman earthquake. Aside from fatalities and injuries resulting from building collapses, earthquakes also carry medical risks. Fire, contaminated water, and electrical outages. Regardless of the fact that our ability to predict them is still relatively limited, research generally suggests that the number of structures adheringto modern earthquake resistant criteria is the most important factor in reducing implosion. When planning individuals for disasters like earthquakes, which involves city planning (which incorporates its compactness), urban planning notions must be taken into consideration. The number of open spaces and their spatial arrangement are sufficient for safe evacuation shelters. An extensive system of roads is always available to provide suitable escape routes. Regardless of how well climate change predictions pan eliminated lowering the risk of current weather-related disasters will cut losses and start the necessary climate change adaptation steps. Scheduling for extreme weather events has additional advantages because it helps people be ready for a range of other emergencies. The present investigation will make an effort to examineand provide a comparative analysis of earthquakes that have occurred over the last ten years following the years-long study of the facts. According to the available previous information, earthquake-resistant design strategies and policy recommendations will be developed. Many other earthquake-proof construction features will be considered in an in-depth investigation material depending on the building's location and intended use. This research will lead to the Earthquake Resistant housing in Pakistan in the form of Earthquake Design Strategies, Policy Recommendation with the help of data extracted and studied.

Keywords: climate change, disasters risk, reduction, earth quake

INTRODUCTION

The collection strengthens the connections between the environment, disaster, and community bybridging academic research and field work. The research done in this paper be based on field data and local customs, will offer specialists in the field detailed instructions that are supported by in-depth academic research. A particular focus of the series will be on community-based disaster risk management, urban environmental management, human security, the water community, risk communication, climate change adaptation, climate disaster resilience, and community-based practices.

The potential of disasters has increased over the past few decades, and more extreme weather is likely to result in more and larger-scale disasters in the future. At the precise same time, the current approaches and instruments for disaster risk reduction, and climate risk management in particular, offer strong capacities for significantly lowering risks and climate change adaptation.

No longer an issue, because climate change is real. Even though some specifics still require

research, the science has been thoroughly explained and evaluated in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). [1]Furthermore, there is growing evidence of changes occurring all around us, such as the Arctic ice melting faster than anticipated by IPCC reports. The prospects for us appears to be more serious and difficult themore information we have from new evidence.[2]

[1] IPCC, 2007(a): IPCC Fourth Assessment Report, Working Group I Report The Physical Science Basis,Intergovernmental Panel on Climate Change. http://www.ipcc.ch/ipccreports/ar4-wg1.htm

Currently, there is a shift in the climate. Disasters brought on by climate change are happening throughout the Asia-Pacific area, where a clearly rising trend has been noticed over the past few decades. This demonstrates that, in comparison to other parts of the world, the region is the most disaster-prone. According to studies on the causes of disaster in numerous afflicted countries, cities with dense populations typically experience increases in mortality and the number of affected people. Additionally inevitable are increased economic losses within the region. 65 to 90 percent of economic activity is centered in metropolitan centers in the majority of Asian nations.

By the year 2030, it's predicted that two out of every three people on the planet would reside in cities. If the proper steps aren't done in these urban areas, calamity incidents. As a result of their proximity to the local communities, historical experiences have demonstrated that local institutions and governments are the first to respond. In order to maximize the effectiveness of action, it is crucial to implement integrated disaster risk reduction strategies and disaster risk management at the local level. Residents of cities must be the primary actors in the planning and implementation of measures to reduce the effects of climate-related disasters on human life, natural and human systems, ecological diversity and function, livelihoods, and economic losses.

It is imperative that risk reduction be included into the design and development of cities since risk has always existed and will continue to do so. Their physical and social danger levels increase when populations move to a new place and settle in strange environments with aliens for economic reasons.These settlements develop in previously uninhabited areas and frequentlynear sites with high risk exposure, such as riverbanks, transport hubs, mining or industrial hubs,or other places with a lot of activity, high traffic, and high dangers. Urban settlers are cut off from their conventional social safety nets and may not have many resources at their disposal in times of need. (Sluis & Aalst, 2006).

Cities are naturally expanding due to migration and the reclassification of rural areas as urban. Regardless of the method, cities are expanding more quickly than ever, and the bigger the city, the faster it expands. Urban development and management, as well as insensitive or exclusive urban land-use planning, all contribute to the creation of a higher risk level within this growth. Most Asian cities use a master plan approach for these processes, which ignores the urban poorand the informal economy, excludes locals from participation, and relies on projection-based planning for fanciful horizons rather than making an effort to get as close to real-time planningas possible.

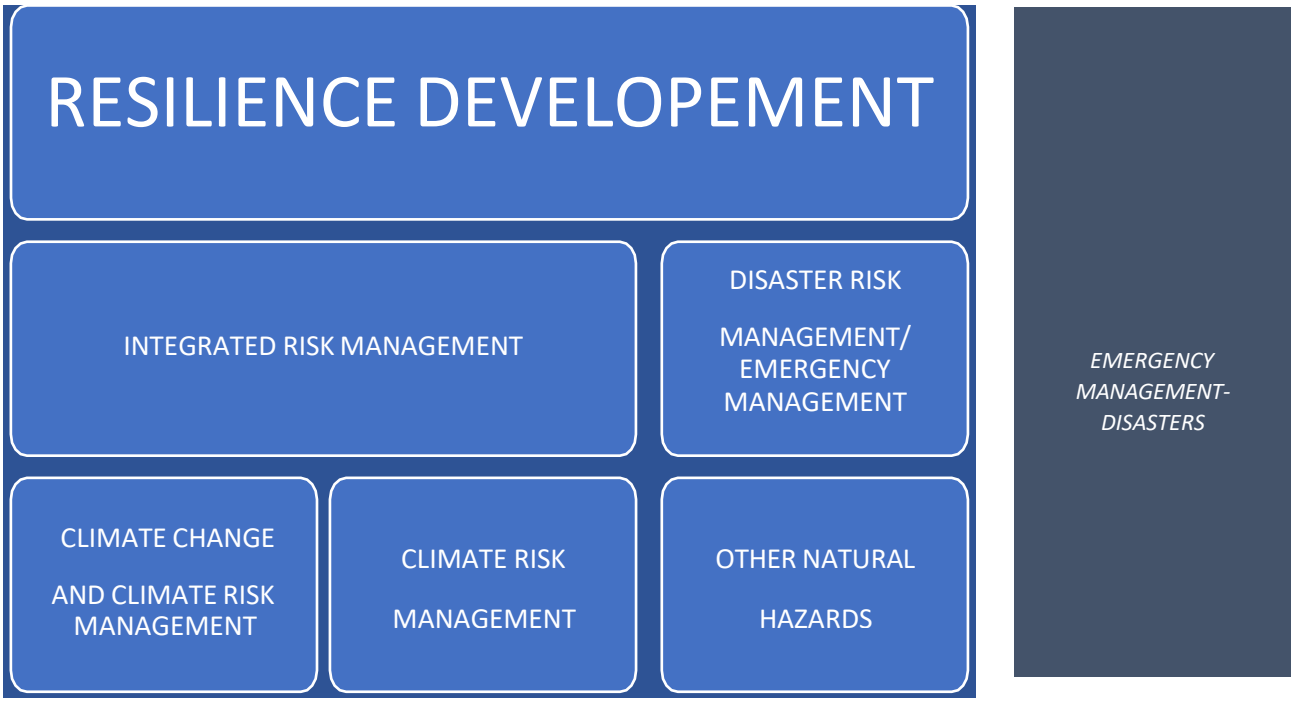
[2] IPCC, 2007(b): IPCC Fourth Assessment Report, Working Group II Report Impacts, Adaptation and Vulnerability.Intergovernmental Panel on Climate Change. http://195.70.10.65/ipccreports/ar4-wg2.htm.

Most internationally poor people reside in developing nations with rapidly expanding populations, where poverty and population growth are mutually reinforcing. (Brown, 2001). Cities are expanding at a rate that is unprecedented as a result of population pressures and a variety of other factors. Cities are becoming more crowded and expanding vertically as there is no more room for them to grow. Cities are expanding at a rate that is unprecedented as a result of population pressures and a variety of other factors. Lands that were formerly uninhabited due to hazards like steep slopes, low lying lands, floodplains, riverbeds, and drains are now being developed, inhabited, and used for work. In addition, since the last 200 years or so, human activity, particularly in the developed world, has been warming the planet and posing

an irreversible risk to all areas, particularly habitations along mountain, riverine, and coastal regions.

Risk is a byproduct of urban areas' high developmental densities and population concentrations.Because of the informal nature of construction, densities, etc., the structures and infrastructure physically increase risk. In terms of social safety nets, close-knit communities lose them, and conflicts between unrelated communities actually worsen. Similar risks, unhealthy living conditions, and other factors can be linked to environmental degradation, but more importantly, to the deterioration of resilience. Over the course of their existence, cities expand, expanding more quickly as they grow larger. The city center is becoming a concrete jungle of chaos as it continues to become denser and denser.

Table 1- Climate Change Management Theoretical Framework
Source: By Author



As cities develop the "rural-urban fringe" is continually consumed. Overview of Urban Development and Associated Risks These peri-urban areas and small emerging towns are of concern because they develop in a haphazard manner. 3 manner, resulting in subpar living conditions, before being absorbed by the city. The work of risk reduction faces many difficultiesin these developing urban areas.

Methodology

The methodology adopted in this study is mixed medium of literature review and historical data record extracted in past years. These records are compiled in the form of pictorial documentation of maps. Earthquake resilient design and Management principles are proposed in the form of tables. Different form of vulnerabilities are recommended which involves Systematic vulnerability, structural vulnerability socio economic vulnerability and geological vulnerability. Strategical goals for the reduction of risk of catastrophe and global warming earthquake on urban design scaleare proposed.

Entailing strategies, Modification or design of physical infrastructure is proposed for earthquake resilient design strategies.

Novel approaches are used to reduce the risk of vulnerability of life caused by earthquake and climate variability under the auspices of applicable laws and standards of planning urban settlements. Disaster cannot be blocked or

barricaded; alternatively, it must be smartly dealt withusing a combination of solutions.

Climate Change and Adaptation

The predictions for the future are heavily reliant on technological devices climate system models, which include important aspects of the atmosphere, oceans, and expected increases from various socioeconomic instances in greenhouse gas emissions. An increase of 1.1°C to 6.4°C in the average global surface warming (change in surface air temperature);

Between the years 18 and 59 cm will be added to sea level;

Ocean acidification will increase;

Extreme temperatures, heatwaves, and heavy precipitation events are very likely to continue increasing in frequency;

The vast majority sub-tropical land areas are likely to experience less precipitation, while higher latitudes are very likely to experience more;

It is expected that tropical cyclones (typhoons and hurricanes) will intensify due to ongoing rises in tropical sea-surface temperatures, resulting in higher peak wind speeds and more substantial precipitation.

The management regarding water resources, industry, human settlement and land use, food and farming, health, and ultimately national security will all be impacted by climate change if no preventative measures are taken. The following are the main effects anticipated.

Water

Areas affected by the drought will probably spread out more. Greater flood risks will most likely result from an A greater incidence of heavier precipitation events. The amount of water accessible in mid-latitudes, the dry tropics, and other areas reliant on mountain range meltwater will probably decline by the middle of the century. The human population of the world is currently more than one-sixth dependent on meltwater from mountain ranges.

Consumption

While particular areas at mid- and high latitudes will initially benefit from increased productionof agriculture, numerous other areas at lower latitudes, especially in tropical and seasonally dry regions, will also benefit are likely to experience negative crop production as a result of temperature increases and an increase in the frequency of droughts and floods. This could result in a greater number of peopleat risk of hunger as well as a higher level of migration and displacement.

Industry, settlement and society

Industries, communities, and societies that are most at risk are typically those that are found along rivers and in coastal areas, as well as those whose economies are closely tied to resourcesthat are climate-sensitive. This can be especially true for areas that are already vulnerable to extreme weather, especially those that are rapidly urbanization. The correlated economic and social costs will rise as extreme weather events get stronger or more frequent.

Health

Many thousands of people's health status is likely to change as a result of the predicted climate changes, which could include an increase in heat-related illnesses, fatalities, and injuries, as wellas fires, floods, storms, and droughts. Malnutrition, diarrheal illness, and malaria will increase vulnerability to extreme public health in some areas, and longer-term harm to health systems from disasters will threaten development goals.

Security

The effects of warming temperatures on security are hypothetical and uncertain, but they might matter in some situations. The rivalry migration and competition for arable land in low-rainfall areas, mass migration from inundated coastal zones or small islands, civil unrest related to severedisaster events, particularly in urban areas, and political resentment of groups or nations who feelthey are unfairly impacted by climate change are all variables that contribute to scarce and diminishing resources like water, especially in transnational contexts. are all potential causes for concern.

Literature Review

Asia's environment and Risk of Disasters

The number of hydro meteorological disasters has increased by twofold in recent years, and fromthe 1950s to the 1990s, there was a 50% increase in extreme weather events linked to climate change. (IPCC, 2001; UN-Habitat, 2007). Enhancing storm intensity, flooding, water stress, storm migration, and landslides brought on by climate change are already being felt in many cities. Challenges to their livelihoods, property, environmental quality, and future prosperity will also result from these and other effects.

To be able to inform policy choices for decision-makers for enhancing resilience, a methodology to measure the current level of climate disaster resilience of urban communities is required in order to address the urgency of the growing threat to cities. The resilience of cities must also be increased, with a focus on urban informal settlements where the effects of disasters brought on by climate change appear to be most severe.

Nearly 60% of the world's population will live in cities within the next two decades, up from the current 50%. The developing world experiences the fastest urban growth, with cities adding an average of 5 million people each month. Harmony between a city's physical, social, and environmental components, as well as its residents, becomes increasingly important as cities getbigger and more populous. Equity along with environmental responsibility are two essential pillars that support this harmony. Anna K. Tibaijuka, UN-Habitat (2008)

Risk Management and more in Resilience building

Numerous risks that fall under the headings of shocks and stresses can affect a city. It is an unusual event, and neither an urban community nor a household are equipped to withstand shock. Natural catastrophes such as an earthquake, tsunami (for hydro meteorological events), cyclones/typhoons, or something else entirely can cause this. Whether the event is natural, such as earthquakes, hurricanes, and floods (for climate-related ones), or man-made, such as a fire, bomb blast, or accident that is unexpected, strikes suddenly and quickly, it can have a devastating effect. Stresses gradually deplete resources and raise vulnerability; they frequently go unnoticed by the media. Whether the event is natural, such as earthquakes, hurricanes, and floods (for climate-related ones), or man-made, such as a fire, bomb blast, or accident that is unexpected, strikes suddenly and quickly, it can have a devastating effect. Stresses gradually deplete resources and raise vulnerability; they frequently go unnoticed by the media.

They might include unhygienic conditions that result in poor health and a loss of daily wages asa result. They could additionally result in hyperinflation, a decline in purchasing power, and theerasure of savings on a deeper level.

A review of Risks Associated with Urban Development Shocks and stresses in urban settings

Shocks: Low probability, quick-onset, high impact events known as shocks harm individuals, possessions, and the environment right away and visibly. An earthquake,Cyclone, Tsunami, Fires, Epidemics, Conflict, and Terrorism were among them.

Stresses: Especially within the context of the urban poor, slow-onset, low-impact processes that are highly probable and display a daily to continuum of hardships. The water shortages/droughts, poor drainage, poverty, slum living, public health issues, andsea level rise.

In accordance to the IPCC definition, vulnerability is primarily determined by exposure, risk, andadaptive capacity. Making a conceptual distinction between risk and vulnerability is crucial. Risk is typically understood as the likelihood or probability of happening to a bad exogenous event, inthis case, shocks or stresses caused by the climate. This impact- or risk-oriented approach focuses heavily on the physical mechanisms underpinning disaster and climate change vulnerability. (Brooks, 2003)

The inherent capacity of cities to recover naturally from disasters forms the foundation of theidea of urban resilience. Risk reduction and the notion of resilience are closely related, so knowing how to use risk reduction strategies will help build resilience in cities.

Paths to Urban Resilience

Asia has traditionally been a rural continent, which is sufficient justification for countries in the area to focus on "rural development," but at the expense of "urban planning." First and

foremost,despite having access to a wealth of traditional and historical knowledge, Western models of urban planning have dominated planning practices for the past century or so. The colonization ofsignificant portions of the Asian subcontinent is the root cause of this Western bias. In order to maintain control and administration, the ruling class kept a distance from the local population and planned the cities in a way that made it as convenient as possible to "rule and command" rather than "cooperate and prosper."

Although cities in Asia typically contribute 80% of the economies of their respective nations, a disproportionate number of the poor still live there. In most cities, more than half of the population is made up of those who live in slums or who meet other definitions of poverty. These intriguing "urban poor" people are the ones who have access to all of these things at the expense of complete marginalization, in contrast to the "rural poor" for whom access to alternative means of subsistence, transportation, health care, and education remains a pipe dream.

It is not impossible to find an urban poor family whose three generations have lived their entire lives in slums with minimal improvements that were provided piecemeal because this process of slum formation for temporary living is not so permanent. The design is important to remember that there are currently no well-established, simple paths to resilience. It is important to keep in mind that adaptation can fail, and because knowledge of this complex topic is still developing, itmay even prove harmful. In order to ensure safety nets in resilience, physical and social planningfundamentals must be followed.-building methods.

Harmonious Cities Integration

Both a journey and a destination, harmony is both. The fact remains that poorly planned and managed urbanization is directly related to this (Climate Change), relatively recent threat to harmonious urban development. Overpopulation of cities, a heavy reliance on motorized transportation, and urban lifestyles that produce a lot of waste and use a lot of energy are some ofthe main factors contributing to the increase in greenhouse gas emissions globally.

In an attempt to build a more equitable society, harmony has now emerged as the theoretical cornerstone for a deeper comprehension of the social, economic, political, and environmental fabric of cities. Three essential domains are highlighted for that purpose: spatial or regional harmony; social harmony; and environmental harmony. – UN-Habitat (2008, pp. iv, ix).

Urbanization is an intricate and difficult process. The communities that are not only economically poor but also socially dispersed can be found in the shadow of the glittering city lights of Asia's rapidly expanding cities. Risk can be easily traced back to how cities are developing. People move to cities that provide better or alternative means of subsistence from allregions of the nation, as well as occasionally from nearby and faraway countries.

This procedure guarantees the availability of low-cost labour for the city's various urban and economic development initiatives, which supports the city's overall growth. However, these migrants traverse far from their homes, lose contact with their social circles frequently, and beginresiding in areas that are already crowded with strangers. Identifying a common social bond among poor urban dwellers is a strong effort, but when it fails, conflict arises between unrelated communities.

Particular attention must be paid to the vicious cycle of urban migration, social safety net loss, unhealthy and hazardous living conditions, and exposure to the growing dangers of climate change. Improvement of the physical Overview of Urban Development and Associated Risks Improved urban resilience cannot be ensured by the environment alone. Participating in urban planning and risk management has significant benefits that will pay off in emergency situations. In Asia, participatory urban development strategies are common, but they still don't have muchof an impact on most urban development policy choices. A strong incentive is required on boththe part of city residents and policymakers in order for cities to achieve resilience. Asian cities need to encourage equitable social relations for urban development before they can determine this objectively.

The setting:

The First Casualties of Urban emphasizes

A large number of Asian cities today are on the verge of an environmental catastrophe. A life that is generally the most stressful for human habitation can be found in Asian cities due to factors such as the individuals and automobile concentrations that are out of control, rising amounts of noise, air, and water pollution, and dwindling open spaces.

Exactly one in three city dwellers do not have adequate access to adequate restrooms. More than 1 billion people in Asia alone breathe air with outdoor air pollutants that exceed World Health Organisation (WHO) guidelines, which results in 500,000 premature deaths each year.

The health and safety of those involved in the recycling industry are at risk due to poor waste management, which is also fueling it in a dangerous way in the informal economy.According to their ability to pay To partially compensate these costs related to the environment, both wealthyand poor they are to varying degrees exposed to the majority of these conditions.

Even so, if the majority of the communities experience stresses that are beyond the capacity of the population to withstand, the city's overall resilience will remain low. A further significant catalyst to increase the built environment's and urban societies' resilience is provided by climate change. It is still achievable to postpone this agenda because doing otherwise would leave us with a "at risk future. "A willingness to generate experience dealing with change and learn from mistakes is actually implied by the term "adaptive capacity."

Earthquake

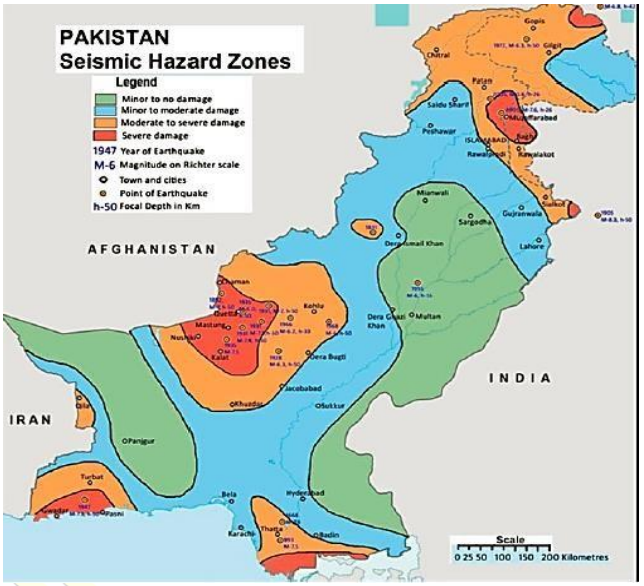


Figure 1 Seismic Zone of Quetta

The province's capital, Quetta, is situated in a seismically active area and has historically experienced a variety of disastrous earthquake events with varying degrees of potential harm.

Table-2 Historic Earthquakes in Pakistan

Source: By Author

From the year 893 A.D till 1929, a total of 11 earthquakes have rocked the modern-day Pakistan. Following is a chart that shows the list of historic earthquakes in Pakistan since 893

Number of Historic Earthquakes				
Year	**Magnitude**	**Deaths**	**Areas affected**	
893	8	150,000	Shah Bandar (coastal Sindh)	
May 2, 1668	7.6	50,000	Shah Bandar (coastal Sindh)	
June 16, 1819	7.5	3,200	Allahbund (Sindh-Gujarat border)	
September 24, 1827	7.8	1,000	Lahore, Punjab	
January 24, 1857	8	–	Kahan, Balochistan	
January 22, 1865	6	–	Peshawar, Khyber	
1883	–	–	Jhalawan, Balochistan	
1889	8	–	Jhalawan, Balochistan	
			Qilla Abduallah,Balochistan	

December 20, 1892	6.8	–		
October 21, 1909	7	100	Sibbi, Balochistan	
February 1, 1929	7.1	–	Balochistan	

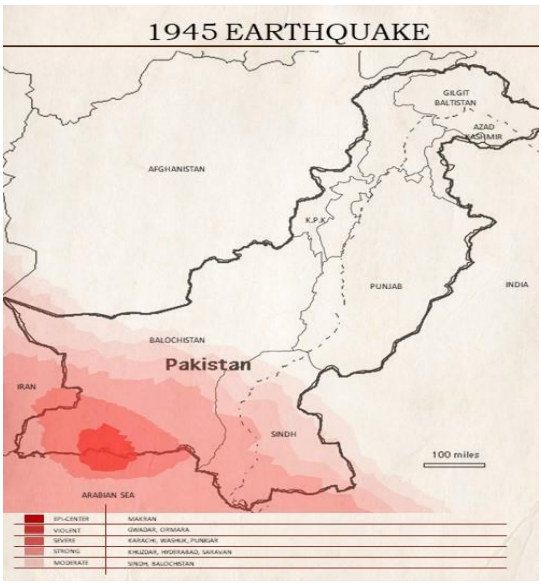


Fig 2 1945 Earth Quake
Source: By Author

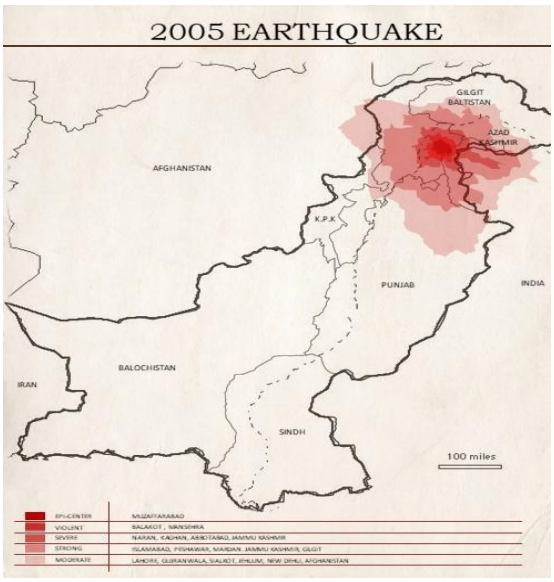


Fig 4 2005 Earth Quake
Source: By Author

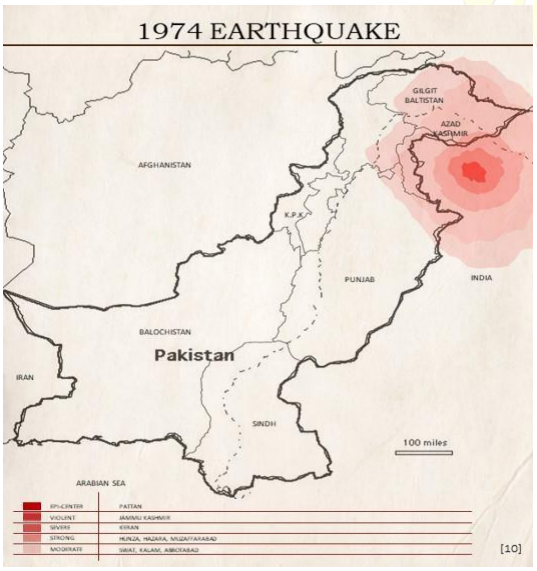


Fig 3 1974 Earth Quake
Source: By Author

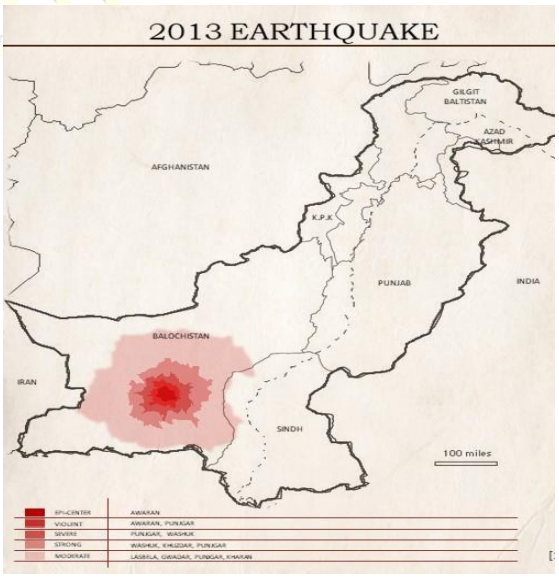


Fig 5 2013 Earth Quake
Source: By Author

Table-3 Modern day Earthquakes in Pakistan

Source: By Author

From the year 1931 till 2011, Pakistan has seen many major earthquake including a tsunami in 1945, two years before independence. Following is a chart that shows the list of historic earthquakes in Pakistan since 1931 till 2011.

Number of Modern Earthquakes				
Year	**Magnitude**	**Deaths**	**Areas affected**	
August 24, 1931	7	–	Sharigh valley, Balochistan	
August 27, 1931	7.4	–	Mach, Balochistan province	
May 31, 1935	7.7	60,000	Districts of Balochistan	
November 27, 1945	7.9 or 8 (tsunami)	4,000	Makran-Sindh coastal areas	
December 28, 1974	6.2	5,300	Districts of the Khyber province	
October 8, 2005	7.8	80,000	Parts of Khyber and Azad Kashmir	
October 29, 2008	6.4	216	Quetta, Balochistan	
January 18, 2011	7.2	2	Balochistan	

Relationship of Climate Change and Earthquake

Another possibility associated with earthquakes may be caused by melting the expanding temperature of glaciers the oceans as a result of climate change. In numerous regions of the world, rising sea levels are raising the water table, which may translate to a greater propensity for liquefaction during earthquakes.

Recent investigations have suggested a causal connection between rising sea levels during times of climate Increasing incidence and changing the environment of earthquakes and volcanic eruptions. (Morton, 2020).

Climate change's potential impact on sea level rise could have an impact on tectonic processes. Sea level variations customize the distribution of seawater along fault lines, altering the frequency of earthquakes and other characteristics. Similar to this, the pressure of water over an undersea volcano influences the frequency of eruptions as well as some aspects of eruption size.

Over the ages, eruptions of volcanoes have had an impact on the climate. When eruptions are sufficiently powerful, their emissions travel around the world and temporarily block some of thesun's rays, which can cause the climate to cool.

Aristotle, a Greek philosopher, thought that earthquakes were caused by air erupting violently from underground caverns in the fourth century B.C. The connection between climate change as well as earthquakes and other seismic activity appears to indicate that possible., even though that precise mechanism has long been known to be incorrect.

Only in the decade of the 1960s was the rigid plates that make up the earth's crust both above andbelow the oceans are perpetually in motion and tension with respect to one another, as the modern understanding of the phenomenon of plate tectonics confirmed. one another.

However, these plates move very slowly. For instance, the Nazca plate only subducts 70–80 millimetres per year beneath the South American plate. However, the movement is constant. The the current arrangement with regard to the Earth's surface is the end result after aeons.

Eventually, in the tectonic game of unstoppable forces, something yields, breaks, or moves aside. The planet trembles. The load that a plate is carrying affects how and when pressure is released. The load can take many different forms, including ice, water, or rock.

Analysis and Concluding Strategies

Table -4 Different Forms of Vulnerabilities

Systematic Vulnerability	Structural Vulnerability	Socio-Economic Vulnerability	Geological Vulnerability
Distance to openSpaces	Building with Poor Infrastructure	Population above 60years of age	Peak GroundAcceleration
Distance to Hospitals	Building with Poorroofs	Children below15years	Soil Type
Distance to emergency centers	Average road width	Women Population	Fault Lines Map
Distance to FireServices	Building with irregular shapes,Pounding & overhanging	Average household income	
	Number of stories , building density, building age,	Illiteracy Rate, Family Size, Population Density, Economically dependent Population	

Source: By Author

Recommendations

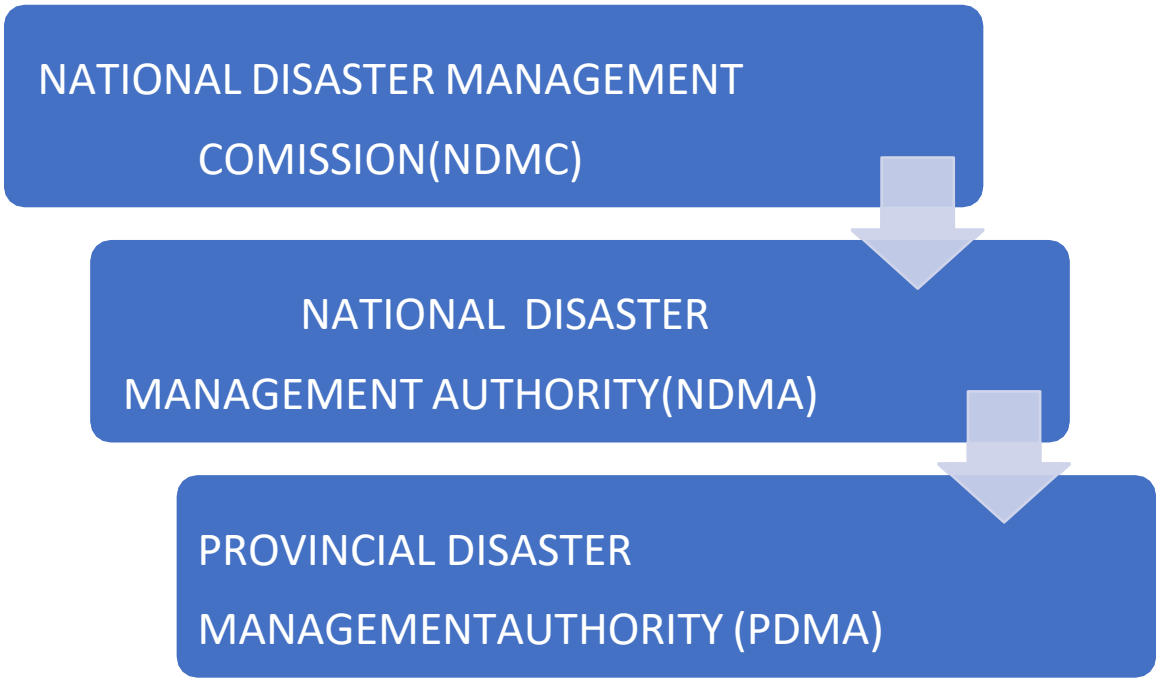
Earthquake – Pakistan:

Deterministic Seismic Hazard Assessment (DSHA),

The probabilistic Seismic Hazard Assessment (PSHA), andThe risk Assessment

Legislation Authorities related to spatial planning of Earthquake

Areas



After the catastrophic earthquake of 2005, the Earthquake Reconstruction and Rehabilitation Authority (ERRA) was the first organization set up with the primaryresponsibility of undertaking rehabilitation and construction projects in the areas that had been affected by the earthquake.

The National Disaster Management Commission (NDMC) was established on December 23, 2006, pursuant with the National Disaster Management ordinance, to develop and implement strategies for the management of natural disasters.

Similar regarding this, the National Disaster Management Authority (NDMA) was set up to oversee, coordinate, and put disaster management plans into action inPakistan's affected areas.

The primary duty of NDMA is to collaborate with provincial and district authorities at both the national and provincial levels to provide technical knowledge that will build capacity for those who are involved in developing future disaster risk reduction approaches. In order to ensure strategic coherence and operational harmony in the recovery planning and implementing activities that would follow, the government and international development partners jointly developed guiding principles as part of the damage and needs assessment. These comprised

Table -5 Damage and Needs Assessment for Earthquake Regions
Source: By Author

DAMAGE AND NEEDS ASSESMENT	
1	Livelihoods of People are Reconstructed Quickly
2	Self-reliance and Freedom
3	Separation of powers and decentralized governance
4	Pay special attention to the most impoverished and vulnerable segments of thepopulation, including women, children, and people with disabilities.
5	Ensure advancement in development and reducing poverty
6	recuperating the ability to control the healing process
7	Objectivity and accountability
8	Prevent the emergence of fresh disaster risks.
9	Persuade private sector and civil society participation
10	Cooperative as well as coherent recovery strategies

Earthquake resilient Design and Management-Design Principles

Natural disasters with a high impact and low probability include earthquakes. They may trigger alot of cascading effects, amplifying the effects on the economy, infrastructure, and health, for example. A tremor could cause landslides. Potential health hazards associated with earthquakes, aside from injury or death from building collapse

Fire, tainted water supply, and electrical failure. The available evidence seems to indicate that the most important factor in preventing collapse is the building stock complying with current seismicresistance standards, despite the fact that our ability to predict them is still quite limited.

For municipalities to prepare users for disasters like earthquakes, urban planning principles must be taken into account.

Urban Design, particularly its compactness

Size and distribution of open spaces for safe evacuation shelters are adequate.

A system of roads that enables suitable escape routes

Earthquake; Strategies Entailing Modification Or Design Of PhysicalInfrastructure

In order to reduce the risk of an earthquake disaster and protect lives, urban planning and design can create earthquake evacuation shelters in public areas.

Avoiding any possible dangers (such as liquefaction dangers, fault lines, and chemical storagefacilities)

Land use rights are under government control (e.g., city parks, schools, and sports facilities).
Proximity to residential areas and easy access for locals (i.e., the spatial distribution and number of shelters should be modified to accommodate the urban area's population density)

The investment's ability to make money.

The importance of anticipating risks associated with specific urban elements, such as the risk of explosion in close proximity to gas stations or fueling stations, as well as planning for adequate evacuation-route width to avoid or minimize blockage
It should also be taken into account that a significant increase in population density in a particular area of the city with a high concentration of public buildings (such as schools) couldresult in obstructions and traffic jams in the event of an evacuation.
One of the most urgent issues that may arise in the event of an earthquake is the impossibilityof reaching the affected areas due to obstructions on roads, and a methodology using geographical information system (GIS) tools focuses on evaluation of the vulnerability of the relevant evacuation route itineraries.
It should also be taken into account that a significant increase in population density in a particular area of the city with a high concentration of public buildings (such as schools) couldresult in obstructions and traffic jams in the event of an evacuation.
The relevance of anticipating risks associated with specific urban elements, such as the risk of explosion in close proximity to gas stations or fueling stations, as well as planning for adequate evacuation-route width to avoid or minimize blockage
It is also important to take into account the significant increase in population density in a particular area of the city where there are many public buildings (such as schools), which could result in traffic congestion and obstructions in the event of an evacuation.
One of the most urgent issues that may arise in the event of an earthquake is the impossibility of reaching the affected areas due to obstructions on roads.

Table-6 Strategic Goals for Climatic Change and disaster Risk Reduction ofEarthquake on Urban Design Scale
Source: By Author

Modification and design of Physical Infrastructure	Opening secure downtown areas as earthquake evacuation shelters while taking into account their location, size, and capacity across the city, access from residential areas, land use rights, and potential risks (such as fault line maps, liquefaction risks, or chemical storage facilities) Routes and safe places to meet within buildings and surroundings are being developed to reduce evacuation risks. Building disaster-resistant structures from the ground up orthrough retrofitting (increasing earthquake and fire structural resistance) When planning a new development for the relocation of displaced populations, accessibility to services (which includespublic transportation, place attachment, and community involvement) should be taken into account.

The Hyogo Framework's role in disaster risk reduction and adaptation

The Hyogo Framework outlines five action priorities, Based on an evaluation of previous successes and failures in reducing disaster risks, Priority For Actions each was elaborated into a number of specific areas of attention where real risk-reducing adaptation measures are required. The communities ofmeteorology and hydrology must participate in each one and contribute.

Table- 7 Actions for Disaster Risk Managements

Give absolutely certain that disasterrisk reduction has astrong institutional foundation and is a national and local priority.	This priority is crucial for risk mitigation as well as adaptation. Encourage a core ministry with a broad mandate, such as finance, economics, or planning, to be in charge of mainstreaming climate change adaptation policies and activities. Host a national high-level policy dialogue to developa national adaptation strategy that connects with disaster risk reduction strategies. establishing mechanisms to actively involve and empower women, communities, and local governments in the assessment of vulnerability and impacts and the formulation of local adaptation activities; formalizing collaboration and the coordination of climate-related risk Reduction activities through a multi-sector mechanism, such as a national platform for disaster risk reduction.
Identify, assess and monitor disaster risks and enhance early warning	Creating and disseminating high-quality information about climate hazardsand their likely future changes, conducting vulnerability assessments, especially for individuals who are vulnerable, and creating briefings for policymakers and sector leaders are important steps under this priority. Examining the efficacy of warning systems for emergencies, putting policies in place to ensure that warnings reach vulnerable populations, andlaunching educational initiatives to help people comprehend the dangers they face and how to react to warnings.
Create a community of safety and resilience at all levels by utilizing expertise,creativity, and education.	Both mitigation of disaster risks and adaptation are covered by this principle. Collecting and disseminating standards of excellence, conducting public education campaigns on local and individual actions that promote safety and resilience, and highlighting local accomplishments are some concrete steps that deserve to be taken. Educating the media about climate- related issues, creating curricula for schools on risk reduction and adaptationto climate change, funding resilience-related research projects, and enhancing transfer of knowledge processes from science to risk management in climate-sensitive industries.
Reduce the main risk elements	Included in this list are every one of the different societal and environmental elements that either contribute to or raise the risks posed by natural hazards. The following steps can be taken: requiring routine assessment and reporting; strengthening and maintaining protective works like coastal regions wave barriers, river levees, flood ways, and flood ponds; incorporating climate risk considerations into development planning processes, macroeconomic projections, and sector plans; and requiring the use of climate risk information in city planning, development plans, water management, environmental and natural resource Management
Boost disaster readiness for efficientaction at all levels.	Building evacuation mechanisms and shelter facilities, creating specialized preparedness plans for regions where settlements and livelihoods are at risk of permanent change, supporting community-based preparedness initiatives,and revising preparedness plans and contingency plans are just a few of the actions that need to be taken. This priority also benefits from early warning systems and resilience building.
Sector-specific illustrations of adaptation anddisaster risk reduction	National Meteorological and Hydrological Services play a critical role in the majority of industries that are concerned with or sensitive to climate change. They deliver data and expertise and work with other organizations to develop and implement policies and programs. Below are a few instances of cost-effective actions.

Security of nutritionand agriculture	Typical measures include modifying crop strains to increase their resistanceto pests and drought, modifying planting dates and crop patterns, and modifying the topography of the land to increase water absorption and
Water Production	Decisions on both water supply and water risks are included in adaptation measures, such as safeguarding conventional and infrastructure sources for drinking water supply, building flood ponds, improving irrigation, desalination, non-water-based sanitation, and enhancing watershed and transboundary water resource management.
Health sector	Forecasting systems and air conditioning are examples of measures to address extreme weather events. Additional initiatives include the enforcement of pertinent laws, In order to enhance the general public's understanding of watershed protection, vector control, and safe water and food handling regulations, support should be given to education, research, and development regarding the health risks associated with climate change as well as concerted efforts to combat water- and vector-borne diseases.
Environmental Management	Ecosystems that are resilient offer risk reduction services that have a significant positive impact on adaptability, resilience, and livelihoods. Strengthening The safeguarding of ecosystems like coral reefs or mangrove forests that shield communities from coastal regions hazards, environmentalmanagement in areas most at risk from adverse weather conditions, assistingin the transition of livelihoods away from those that rely on these ecosystems, and worsen risk and degrade the environment, and enforcing Regulations governing these practices are just a few examples of possible measures.
Rapid identification techniques	The obvious key role played in this situation is by the National Meteorological and Hydrological Services. An additional emphasis can beplaced on actions that strengthen current systems to address the altered hazards, ensure timely, practical, and understandable distribution of warnings to all impacted parties, and provide guidance on what actions to take after receiving warnings. Major deficiencies involve a thorough UN investigation of early warning systems revealed gaps in coverage for some hazards and some countries; a great deal more action is needed to address these issues, especially given the crucial role of early warning as a strategy for adaptation mechanisms.[3]

Practices and establishing for advancement

[3] UN, 2006: Global Survey of Early Warning Systems, an assessment of capacities, gaps and opportunities towards building a comprehensive global early warning system for all natural hazards. United Nations. 46pp. **www.unisdr.org/ppew/info-resources/ewc3/Global-Survey-of-Early-Warning-Systems.pdf**

Establishing adaptation and disaster risk reduction measures a formal part of developmentprocesses and budgets and incorporating them into pertinent sector projects is essential in order toprevent hazardous areas, ensure the security of critical infrastructure, such as hospitals, schools, and communications facilities, and achieve sustainable land management. The planning of communities, infrastructure, the development of coastal zones, the use of forests,etc. are a few examples of such projects. To reiterate, National Meteorological and Hydrological Services and relevant organizations for research need to be involved in these policy and planningprocesses on a regular basis.

Disasters and water for future use: novel recommendations for action

The purpose of the United Nation's Secretary-General's Advisory Board on Water and Sanitation (UNSGAB) is to promote ethical and sustainable water management practices, encourage cooperation, and raise public awareness of global water issues.

Among them were the three connected projects listed below, which are particularly relevant to theNational Meteorological and Hydrological Services.

The Panel decided to:

Ask the General Assembly of the United Nations to support national governments' declaration that hydro-climatic data are public goods that should be shared at all levels (regional, national, andlocal) in order to help decrease the probability of disasters;

Persuade the delta States to form the Large Delta States Network to work together to combat the negative effects of ongoing climate change's contribution to sea level rise;

Request the United Nations to support national governments' declaration that

Earth quake-resistant housing

On October 8, 2005, the region was struck by an earthquake with a 7.6 Richter scale that assassinated 70,000–80,000 people. Firm The foreign NGO Muslim Aid approached Article 25 to create building designs and lead workshops that would enable the locals to participate inthe reconstruction by showing them how to do so safely with a minimal amount of aid and their own salvaged building materials. Furthermore, Article 25 was hired to support the designand construction of houses that are earthquake resistant for the most vulnerable community members who are unable to rebuild themselves.

Project Data **Number of houses constructed: 60-80**	
House Type A Family Size: 9-10 maximum Gross Internal Area: 72m²	
House Type B Family Size: 7 maximum Gross Internal Area: 49m²	  

Earth Quake Building Features

Architects can choose from a variety of additional earthquake-proof building features, depending on the building's location and intended use, including:

The structure's core is made of a steel frame rather than the reinforced concrete core that is typical of Western structures.

The substitution of steel beams and columns for concrete ones, along with diagonal dampers

The pendulums on the building's roof or in the interior

dampers installed between the building's levels

Mesh defensive structures to strengthen the building

Designed-to-fail T-joints

Additionally, many new structures are connected to the nation's early warning system,which warns citizens of an impending earthquake.

Utilize fall-away doors to provide more escape routes

Covered lights to keep people safe in the event of lightbulb explosions

Additionally, many new structures are connected to the nation's early warning system,which warns citizens of an impending earthquake.

Take advantage of fall-away doors to provide more escape routes

Covered lights are needed to maintain people safe in the event of lightbulb explosions

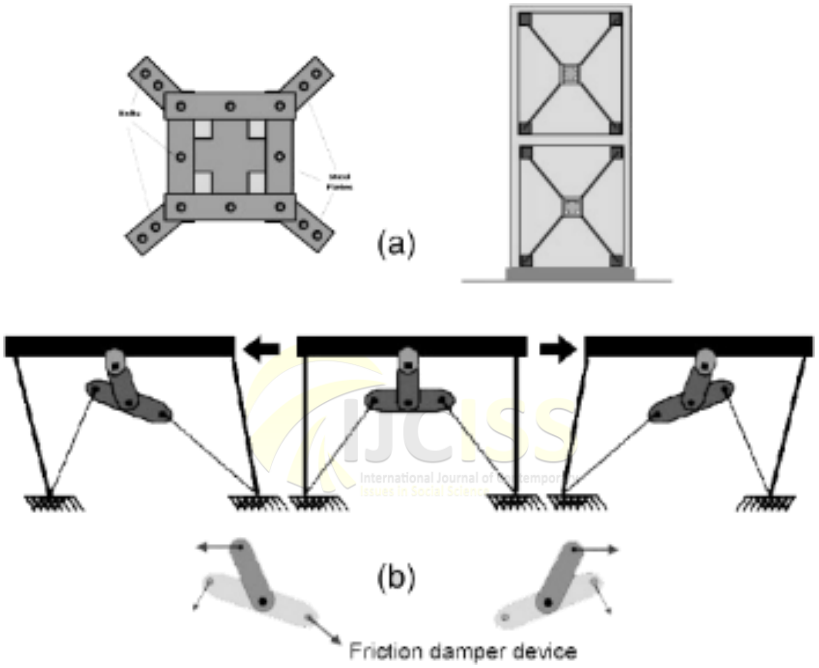


Fig 6 Friction Damper Device

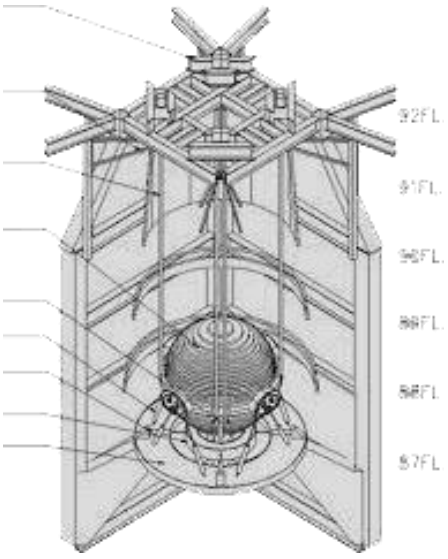


Fig 7 Pendulum on building Roof

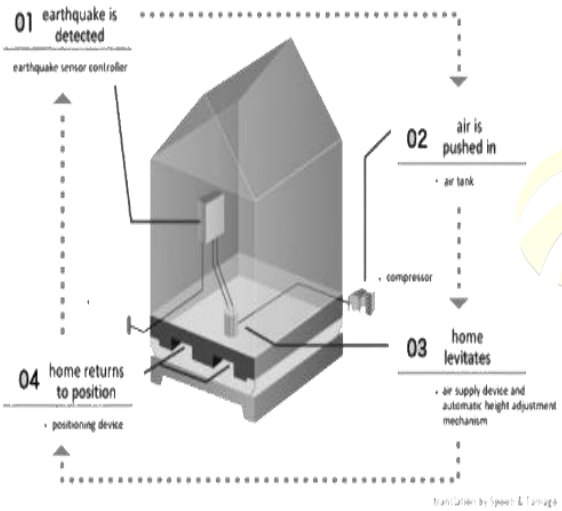


Fig 8 Earthquake Controller Device

Equations

We have gained a lot of knowledge about earthquakes over the past century. We have gained moreinsight into them with each passing generation. To better withstand their devastating effects, we have gradually improved the building codes for earthquakes. Older structures are continually demolished and replaced. Our structures and cities become safer with each round of demolition and substitution.

Since the 1935 UBC, quake-resistant building design has advanced significantly. The 2006 International Building Code's current earthquake formula is V = CS W. The present approach is much more complex and benefits greatly from decades of experience and analyses of buildings following numerous earthquakes around the world, despite the fact that it may appear to be similarto the 1935 UBC's F = CW.

V is referred to as the "seismic base shear," which roughly translates to the equivalent lateral shaking force that the building must withstand at its base. The weight of the building as a whole, plus a portion of other building loads like live loads, snow loads, long-term storage loads, partitionwall loads, and stationary equipment loads, is known as the "effective seismic weight," or W. The"seismic response coefficient," or CS, is calculated using a number of formulas and tables and varies with respect to the building's lateral load resisting system, the state of the ground, the building's swaying traits such as and occupancy the significance factors.

Division of Building Codes For Earthquake Zones

Roman numerals I through IV are used in the code to classify the importance of buildings into fourgroups. The hospitals, power plants, emergency shelters, and fire and police stations are examples of Group IV structures, which are additionally referred to as "essential facilities". Group IV facilities are required to withstand greater seismic base shear forces as opposed to other types of buildings that are thought to be less important. As we have observed, earthquakes act as demolitioncrews, frequently making planning decisions for us that we lacked the motivation to make. We have used earthquakes as a justification for planning choices such as capping building heights and constructing dams across rivers. Because of earthquakes, San Francisco's Embarcadero, Chinatown, Bay Bridge, and the city's water supply from Hetch Hetchy are all the way they are.

The built environment has been influenced by earthquakes. We will be put to the test once more by the next significant earthquake. Despite all our efforts, depending on its severity and epi centers,it may still cause terrible destruction. Without a doubt, it will cause significant property damage and the loss of many lives if it hits an important metropolitan area. It must happen. Equally inevitable, though, will be our response: we'll get up, take stock, and rebuild. Once more, earthquakes will sculpt the structures and urban areas where we conduct our lives.

Conclusions

The connections between sectoral management, disaster risk reduction, and national development are obvious. There are numerous significant technical capabilities, international strategies, and frameworks for action that are relevant and required. Yet, these resources have notbeen combined in a coherent and efficient manner, with the continued involvement of all fields of expertise and responsibility, to achieve a systemic elimination of risks on a global scale. The ongoing increase in vulnerabilities and disaster impacts show that there are still many issues.

Although developing nations are most at risk, all nations are exposed to these problems and cannot ignore them.

In these processes, National Meteorological and Hydrological Services must be fully involved. Because of their specialized knowledge and extensive experience dealing with weather-related impacts, climate variability, and sector partners, they are in a good position to offer crucial abilities to assist with integration across a range of time-scales, from short-term hazards and daily risk management to longer-term variation and change of the climate.

International organizations like the World Meteorological Organization, the IPCC, the International Society for Disaster Reduction, and the Global Facility for Disaster Risk Reduction and Recovery of the World Bank, along with their various frameworks and forums, particularly the Hyogo Framework, the Global Platform for Disaster Risk reduction, and the Third World Climate Conference, are crucial crucibles for the new commitments, ideas, and coordination that are required. These, while not being ends in themselves, are crucial tools for planning and directing swift, decisive action where it matters, namely in assisting the long-term reduction of risk and vulnerability for all nations and all individual

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