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A Comparative Study of the Chile and Haiti Earthquakes of 2010 and the Nepal Earthquake of 2015

Latifa Sultana[1], Rumana Jannat[2]
[1]*Asst. Professor, Architecture Department Southeast University*
[2]*MATTRA Architects Ltd*

Abstract: ***Earthquakes have been among the most terrifying natural disasters since prehistoric times. When gas within the Earth escapes through cracks in the surface or volcanic vents, the resulting voids are filled by the pressure from the Earth's surface above, causing earthquakes. Furthermore, the shifting and sliding of subsurface rocks over one another causes earthquakes. There are roughly six thousand earthquakes per year on Earth. Volcanic activity, sudden Earth surface changes, and landslides can all cause them.***

This paper presents a comparative study on three devastating earthquakes—the 2010 Chilean earthquake, the 2010 Haitian earthquake, and the 2015 Nepal earthquake—and contrasts them in this essay. Evaluating the damage as soon as possible and assisting with rehabilitation efforts to demonstrate compassion for the impacted populations is imperative. Assistance of this kind is necessary for efficient disaster response and recovery. We may determine significant primary, minor, and major effects and short- and long-term plans for precise forecasting, defense, and readiness by looking at these case studies. This synopsis emphasizes the difficulties these countries face in overcoming these tragic occurrences.This comparative analysis provides insights into improving earthquake resilience in developing nations.

Keywords:Seismic Activity, Aftermath, Prompt Action, and Recuperation Earthquake, Impact, Immediate Response, Recovery

I. INTRODUCTION

A. Overview

Fear and panic are often associated with earthquakes. They happen when the tectonic plates that make up the Earth's crust move. Essentially, the movement and collision of these crustal plates cause an earthquake. Along fault lines, friction at the boundary between these moving plates increases pressure and causes an earthquake. The ground vibrates like ripples in the water as a result of this movement, which releases energy from elastic tensions. These seismic waves continuously radiate.

To a certain extent, scientists can anticipate the likelihood of significant earthquakes, but precisely determining the time and position of an earthquake is still a difficult task.

Natural disasters such as earthquakes are frequently associated with volcanic eruptions, which can be set off by powerful waves beneath the ocean's surface. Tsunamis are another potentially disastrous phenomenon that can result from the combination of seismic and volcanic activity. The height of a tsunami wave increases as it approaches shallow coastal locations; it does not reach its maximum height in the deep sea. Strong ocean currents propel these waves forward; they only begin to slow down when they approach shallow water. Oceanographers object to the term "tidal wave," which is frequently used to describe tsunamis.

A sophisticated country with a strong state structure, Chile has a past marred by large-scaleearthquakes. The local populace and the administration are both equipped to act swiftly and efficiently. On the other hand, Haiti, which has less experience with earthquakes, was severely damaged after the 2010 earthquake. The urban environment in Haiti is beset by flaws and deterioration, which are made worse by environmental catastrophes, climate change, insufficient utilization of open spaces, and general vulnerability. Haiti was in terrible shape after the 2010 earthquake, which led to an enormous recovery effort.

After an earthquake, famines, epidemics, and poverty are frequently the results. This pattern exacerbated the hardship of the country by causing major illnesses, such as a cholera outbreak, in Haiti. Nepal is likewise prone to regular earthquakes, with significant ones being recorded roughly every 80 years. For those nations, April 2015 is merely the beginning of something. Which had its final gathering in 1993? There have been numerous warnings, laws, regulations, and updated construction codes about earthquakes, yet

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not much has been done to take precautions. There are a few challenges in managing earthquakes. Among them is the fact that science is less successful here than politics. In other words, science is ingrained in politics.

"It's not difficult to explain to people why earthquakes matter," said Purdue University's Eric Calais, a geophysicist in West Lafayette, Indiana. (Jones, 2010) Sorting through the agendas and activities of the various groups operating in the area is the real issue. "It makes it tough but very interesting," he explains.

Additionally, earthquakes occur when subterranean rocks shift and slide over one another. Globally, earthquakes happen approximately six thousand times annually. They can be triggered by landslides, abrupt changes in the Earth's surface, and volcanic activity.

This paper compares three catastrophic earthquakes: the 2010 earthquake in Chile, the 2010 earthquake in Haiti, and the 2015 earthquake in Nepal. It is crucial to show compassion to the affected communities by promptly assessing the damage and supporting reconstruction efforts. Such assistance is essential for effective disaster response and recovery. By examining these case studies, we can identify key primary, minor, and significant effects and immediate and long-term strategies for accurate forecasting, protection, and preparedness. This overview highlights the challenges these nations face in recovering from these devastating events.

B. Background

Earthquakes are synonymous with terror and panic. They occur when the Earth's crust, composed of tectonic plates, shifts. An earthquake results from the collision and movement of these crustal plates. The friction at the boundaries of these sliding plates builds pressure, leading to an earthquake along fault lines. This movement releases energy from elastic strains, generating wave radiation that causes the ground to vibrate similarly to ripples in water. These seismic waves radiate repeatedly.

Scientists can predict earthquakes to some extent, especially the likelihood of large temblors, but pinpointing an exact time and location remains a complex challenge.

Earthquakes are natural disasters often linked with volcanic eruptions, which can be triggered by dramatic waves beneath the ocean floor. This combination of seismic and volcanic activity can cause another catastrophic event: tsunamis. Tsunami waves do not reach their full height in deep water but grow taller as they approach shallow coastal areas. These waves move forward, driven by powerful ocean currents, and slow down only when they reach shallow water. Despite objections from oceanographers, tsunamis are often called tidal waves.

Chile, a developed nation with a robust state system, has a history intertwined with major earthquakes. Both the government and the local population are well-prepared to respond quickly and effectively. In contrast, Haiti, with less experience in handling earthquakes, suffered greatly from the 2010 quake. Haiti's urban environment is plagued by weaknesses and degradation, exacerbated by climate change, environmental disasters, inadequate use of open spaces, and overall vulnerability. The 2010 earthquake left Haiti in a dire state, triggering a Herculean recovery effort.

Disasters following earthquakes often lead to famines, epidemics, and poverty. In Haiti, this trend resulted in serious illnesses, including a cholera outbreak, compounding the nation's suffering. Nepal also experiences frequent earthquakes, with major events occurring approximately every 80 years. April 2015 was just a recent event for those countries, following the last major quake organized in 1993. Despite numerous warnings, regulations, ordinances, and new building codes, little has been accomplished regarding earthquake preparedness, not even fostering a precautionary mindset. There are challenges in addressing earthquakes; one of them is that politics tends to take precedence over science. In essence, the concept of science is intertwined with politics.

- "It's not hard to tell people that earthquakes are essential, "said Eric Calais, a geophysicist at Purdue University in West Lafayette, Indiana.
- The issue primarily lies in sorting out the actions and agendas of the various groups working in the region. "It makes it tough but very interesting," he says.
- That is very interesting," he says. (A.A.Milne, 2023)

C. Objective

This research compares the effects of the 2010 earthquakes in Chile and Haiti with the 2015 earthquake in Nepal and analyzes the geological causes of earthquakes. It seeks to appraise these nations' readiness and reaction plans and the short- and long-term impacts on the impacted areas. The study will examine reconstruction initiatives, point out major obstacles, and make suggestions for enhancing earthquake resistance in the future. It also aims to improve protection and forecasting tactics, comprehend the

function of governance and policy, and foster global collaboration. The paper's ultimate goal is to significantly contribute to academic research and real-world crisis management.

D. Research Methodology

A qualitative and quantitative comparative analysis approach was adopted. Three case studies are the main topic of this research article. According to the report collected from this case study, data has been included. Where the collected data has been subjected to ongoing literary piece critique, this article's primary goal is to distinguish the case study area's overall situation from its specific condition. Which will alert us? Data was collected from government reports, international relief organizations, and academic sources. Key indicators such as magnitude, casualties, economic loss, building resilience, and recovery strategies were compared through graphical representation. This essay is unique to every occasion or nation. Which can be used elsewhere with a different theme?

II. PREPAREDNESS

Throughout the 20th century, Santiago, Chile, was subjected to multiple significant earthquakes. Included in this is the 1960 Valdivia earthquake, which registered a magnitude of 9.5 on the Richter scale. (Pallardy, Chile earthquake of 1960, 2024)Which level is much higher? Later, in 1985, an earthquake of a magnitude of 4.8 rocked Chile, leading to the implementation of more stringent building regulations there. The country of Chile is one of the seismically active regions in the world (Writers, 2023), which makes it highly resistant to earthquake damage and greatly increases the number of casualties. This is due in part to post-disaster rehabilitation efforts and the government's awareness-raising measures, according to Slate.com. In this the construction code was rather helpful. Nepal ranks eleventh among earthquake-prone regions (Portal, 2024)and it has made notable progress toward developing disaster-sensitive guidelines as part of an earthquake preparedness program. The National Building Code and the National Strategy for Disaster Risk Management have already been developed by the Nepali government. Delivering capacity-building trainings and awareness programs is primarily the responsibility of several NGOS(Nepal), government agencies (Action Plan for the Implementation of the Expatriates Welfare and Overseas Employment Policy 2016, 2016) and local institutions (Talpur, Napiah, Chandio, & Memon, 2014) Resource mobilization was challenging following the earthquake. Even in an emergency, bureaucratic processes and the needless intervention of Nepalese customs officials prevented these desperately needed goods from reaching the affected people in the crucial initial few weeks
(Dev Ratna Dhakhwa, 2015)

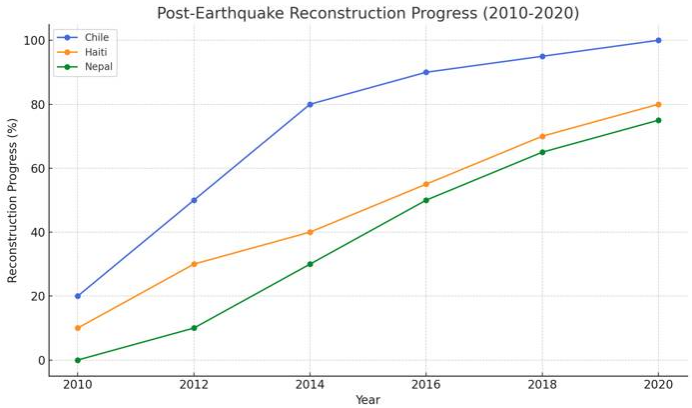

Figure Shows:: Post Earthquake Reconstruction Progress :: 2010-2020

The horrifying pictures of the devastation and deaths following Haiti's powerful earthquake serve as a wake-up call for the world community to offer humanitarian aid right now, but they also highlight a number of facts. First and foremost, the international community must act quickly to help Haiti, a country that has endured decades of strife, bad governance, and extreme poverty. (Situation Report, Wednesday 22 September 2021)

III. CASES INVESTIGATED

A. CHILI

1) Background:

The towns of Chile and south-central Chile both experienced an earthquake at the same moment. It was 2010. The earthquake left behind a great deal of devastation. This cannot be described.

The local timing of the Chilean earthquake, known as Teremoto del 27f, was 03:34 (06:34 UTC). Off the coast of Chile, the earthquake occurred. The tremors were slight at first, then became more intense. The lengths of these levels varied from 6.7 to 176. An earthquake caused a tsunami. It lasted for around three minutes.

Coastal areas were wiped away by the tsunami. 500 persons or more were killed by the earthquake and tsunami. Overall, the state of affairs was grave. The strongest recorded earthquake ever occurred in Chile. It came to an end on May 22, 1960. And whose score was 9.5? An earthquake caused a tsunami. An earthquake in Valdivia caused a tsunami to sweep across the Pacific. The tsunami wave was considerably bigger. The Philippines, New Zealand, and Japan's coasts were also affected by the tidal waves. Whose intensity levels were higher still?

Cause: The location is called Chile. South America is the continent on which this Chilean city is situated. South America's bottom is home to another plate. The Pacific Ocean's Nazca Plate connects this plate. There is always friction between the two Nazca plates when one is present. One frequently gets swept under the other. During the Chilean earthquake, the South American plate moved beneath the Nazca plate. The Andes Mountains would eventually feel pressure from the tremendous motion created by the friction between these two plates. which is gradually shifting beneath the plate tectonics of South America. It has been accumulating about 80 mm annually. There are some more striking occurrences on the Nazca plate. It is evident that a significant portion of this plate's slip is moving quickly. A magnitude 8.8 earthquake consequently occurred at 3:34 a.m. This earthquake was a massive disaster. According to reports, Santiago, the capital of Chile, is 200 miles (325 kilometers) southwest of the epicenter. roughly 22 miles (35 km) below the Pacific Ocean's surface. (Earthquake, 2010)

2) Impacts:

In Chile, an earthquake interrupted daily life. For a brief period, a number of unusual things happened that were unusual in Chilean history. The Chilean earthquake has claimed nearly a tremendous number of lives. There were roughly 800 fatalities, 12,000 injuries, and approximately 800,000 people affected. (Pallardy, Chile earthquake of 1960, 2024)For the time being, the survey was quite large. Building codes were developed for each organization to impose limitations following the 1960 earthquake. Later on, this code was updated. In the 1990s, this amendment was prevalent. In spite of everything, the buildings sustained significant damage. Once many houses fell, the smoke became monotonous. 53 ports, 5 hospitals, 4500 schools, and almost 400,000 homes were totally destroyed.

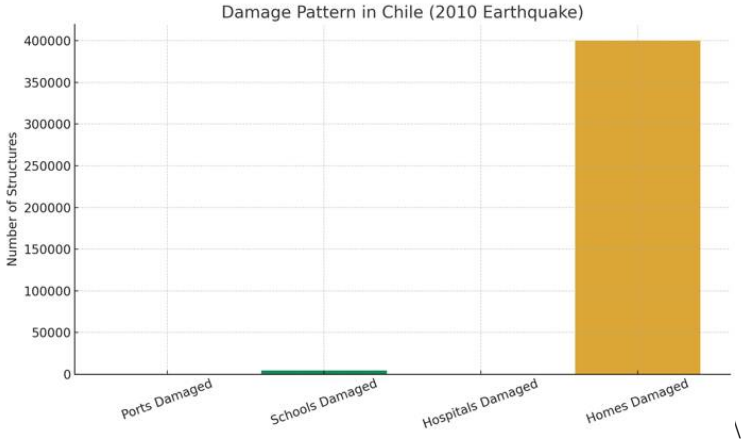

Figure Shows:: Damage Pattern in Chile 2010 Earthquake

The structural installations and human infrastructure are in a state of disrepair. Significant influence was also had by hospital policies like Temuko-Paral, Lleiten, and Concepcion. Both fatalities and injuries were widespread. One and a half times the patient was removed. There was a disruption in the local medical services. The greater harm to a person's medical condition, the more care they will receive. Initially, government services like communications and electricity were interrupted in Concept and Valparaiso. However, the majority recovered. At least three bridges on the main Quinta highway and inland roads were damaged by the telephone system. There is an impact on Talcahuano and Valparaiso ports. Commercial flights have been halted at Santiago Airport International Terminal for a maximum of two hours. Minor impact: Landslides have destroyed 1500 km of highways, closing

isolated villages for many days. There was no tsunami alert issued despite the epicenter being reported to be below the Pacific Ocean floor. It was noted that the epicenter was below the Pacific Ocean's floor. (Suprapto, 2023).

There was no tsunami alert sent out. When the Santiago chemical factory caught fire, locals were evacuated. (Richard Hinrichs, 2010)

Every country has a lot of myths around earthquakes. similar to Chile. Following the 2010 earthquake, some economists there have forecast that Chile's economy will come to a standstill. (Kunreuther, February 2010)That decade's growth will be severely constrained. Initially, economists held the same expectations. Their analysis indicates that 5.5% growth will occur. In one instance, a local named Pierre pledged to hasten growth via robust government initiatives.

For Montes, an eight-magnitude earthquake always has the potential to cause losses in capital, inventory, and production. It's a net loss, and while the impact is still too early to assess, it will undoubtedly show up in the quarterly results and continue to do so. Furthermore, it is highly likely that revenue expenditures would rise, making it extremely challenging to forecast how the disaster will affect measures of economic development." (Suprapto, 2023) At first, they believed that the earthquake was a fatal current or a potent weapon. In Chile, the ensuing losses came to almost US$30 billion. that amounts to 15% of GDP. However, Montes believes that the figure may be substantially higher. (Rosa Affleck, January 2010)

However, Mathias Braun, a financial markets and economic development professor at the business school at Adolfo Ibanez University, has strong views regarding the financial consequences of earthquakes. Which is less of a problem in the first place was the question at hand. Even while natural disasters inflict enormous and vital harm, people often add to the toll, which Jararanai does, he added. "At most, I would put the whole value between USD 4 billion and USD 8 billion. My estimates can be divided into the following numerous sectors: US$1.5 billion in commercial and industrial building; US$2 billion in road and port construction; US$2.5 billion in home construction, or 20% of the total number of houses destroyed in the hardest-hit districts; and US$2 billion in machinery and equipment. $500 million in lost goods, plus an additional $500 million.Unquestionably, the inevitable According to Brown, this earthquake "will lead to a high percentage of GDP growth between 1% and 1.5%," which can have a positive and active effect on the expansion of the nation and jobs. Prices will rise by roughly 2% in the upcoming months, but "[Chile's] exchange rate reaction should be significantly lower"—two years, capital losses, and the overall impact of eventual restructuring. Popular Adolfo Ibanez University Business School professor Rafael Romero, who teaches corporate finance and business valuation, agreed with Brown's presumptions. Romero emphasizes the need for reconstruction, saying that it is essential. This translates to more economic activity, which will spur building and encourage public works investments. Financial markets would raise the costs of construction-related businesses and inputs, as well as tolerances in response to cement manufacturers, as a result of this system." (Daniel M. Hall, 2022)

3) Responses:

Reactions to the Chilean earthquake were divided among a large number of people. Michelle Bachelet, the president of Chile at the time, is one of them. He made suggestions for UN support. A financial and supply proposal was sent to the United States, the European Union, and many Asian countries at the request of the United Nations. (Unknown, 2002)All emergency agencies must act quickly to provide field hospitals, satellite phones, and floating bridges that require help from outside. Quick interim fixes to the Route 5 north-south route will facilitate the dispersal of trade from Santiago's capital. (Emergency Telecommunications, 2024) In order to carry out relief efforts and preserve calm, the Chilean army dispatched approximately 10,000 soldiers to the earthquake-affected districts the day following the disaster. (Lacey, 2010) To prevent looting of the collapsed homes and allow the occupants to relocate to safer shelters, around 2,000 police officers were assigned to the task. Once, traffic was diverted from local roads to major highways by another police organization acting as traffic police. This allowed people to travel slowly to the various cities. In less than five hours, the majority of the phone service in Santiago and several areas of central Chile had been restored. Ten days after the earthquake, a half-million survivors are receiving water trucks into their houses, and over 90% of the residences in the disaster region have regular power and water. Food aid is being transported by tractor-trailers, military helicopters, large cargo planes, and naval ships. Over the course of a single nationwide phone call, countless volunteers have come forward to support the 14,000 troops who guard and assist in delivering aid, raising $60 million in total—enough to provide makeshift emergency shelters for the majority of the most impoverished survivors whose houses were destroyed. As a long-term recovery measure, Chile started a housing reconstruction initiative for 200,000 households damaged by the earthquake one month later. According to the president, it might take four years to finish recovery and restoration, including the port and the damaged building.

A few laws that were passed in Chile caused an incident. It was organized in May 2012 when they filed charges against eight

officials for willfully ignoring and disregarding warnings of a massive tsunami-like event and for substantial negligence for this failure.

Among them were the directors of the Navy's Hydrographic and Oceanographic Service and the National Emergency Office of Chile at the time of the earthquake.

Notify Residents Living Along the Coast The Hydrographic and Oceanographic Service tried to change its logbooks to indicate that the warning had been canceled, as was made public in February 2013. In April 2016, a settlement was reached that mandated the six defendants who were still on the books forego a trial in favor of paying a total of 235 million pesos ($236,300) to 104 households who had been impacted by the tsunami. In addition, the Chilean government was mandated to reimburse households harmed by the tsunami with roughly 2.7 billion pesos ($2.7 million) that same month.

B. HAITI

1) Background:Speaking of a small island.Haiti is a small island. (Katie Traynor, 2008)The island is located southeast of the United States.Moreover, the island is located in the Caribbean region east of Cuba.The capital city of Haiti is Port-au-Prince.(Port-au-Prince, 2014)

2) Cause: This earthquake was caused by the collision and overlap of two plates.(Asish Saha, August 2020)It can be seen that the earthquake caused the North American plate to recede across the Caribbean plate at the margin of the conservative plate and to arrive with the same dynamics. (Mann)One of the two plates was faster than the other. The collision of these two plates caused pressure, which created an earthquake 16 miles west of Port-au-Prince, which had a magnitude of 7 on the Richter scale.(Handy Geography)The focus was shallow. The earthquake was more than five miles long and struck on Tuesday, January 12, 2010, at 6:53 p.m. (4:53 p.m.) local time.

3) Effects:

Response:

The earthquake resulted in 316,000 deaths and left 1 million homeless.250,000 houses and 30,000 buildings, including the Presidential Palace and 60% of government buildings,were damaged. Transport and communication systems suffered extensive damage, with over 50 hospitals and 1,300 schools impacted. The main prison was destroyed, leading to 4,000 prisoners' escapes. Jobs were lost for 1 in 5 people due to the destruction of buildings, heavily affecting the garment industry. Hospitals overflowed with corpses, and many bodies lined the streets. Cholera claimed many lives, particularly among children. A storm followed, causing rain and flooding that destroyed numerous camps and created management issues at the airport, complicating aid delivery. Damaged homes forced many to flee, disrupting sanitation and health systems. Looting was another issue. The total damage was $11.5 billion. The problem at that time was looting. The total damage bill was $11.5 billion. (Zenawi Hagos Gufue)

C. NEPAL

Nepal is a little nation. The nation is situated halfway between China and India.Situated in Nepal Mount Everest is the tallest mountain on Earth,

(https://en.wikipedia.org/wiki/Mount_Everest)Its moniker, advertising, and global dissemination Nepal is the country where Mount Everest is situated. This nation is in really poor shape. Since the people living here are extremely impoverished, their homes are in equally bad shape. Therefore, the earthquake's damage is lethal. since it is not how their houses were constructed. There was a powerful earthquake on April 25, 2015.

Figure 4: Timeline of Nepal Earthquake 2015 Events

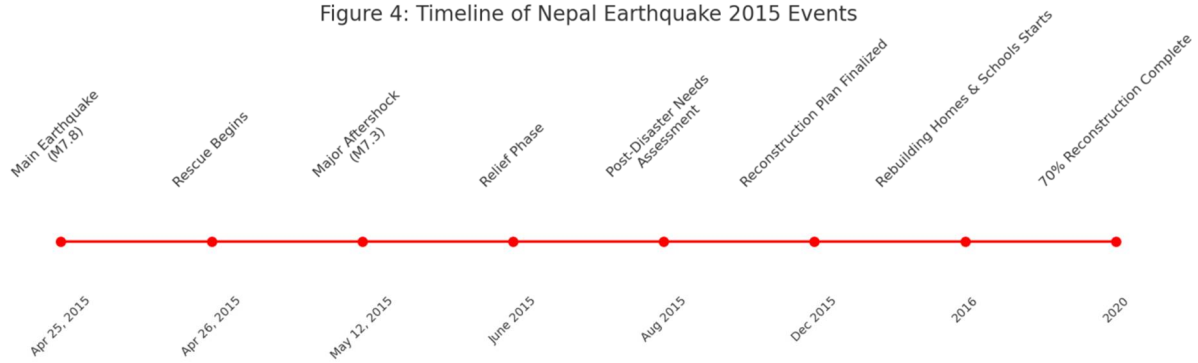

Figure Shows:: Timeline of Nepal Earthquakes on 2015 Events.

Both the capital cities of Pokhara and Kathmandu were impacted by the earthquake. Whose magnitude was 4.8? The earthquake also had an impact on adjacent nations and areas. Not only does Bangladesh not get overlooked, but neither do India or Pakistan. This earthquake had a fairly powerful magnitude. An further earthquake occurred on May 12, 2012. In eastern Nepal, the earthquake was felt close to Mount Everest. On the Richter scale, the magnitude was 7.3.

The reason for: According to the USGS, the earthquake was brought on by the collision of two plates. As can be observed, the Indian plate along the main fault line carrying India gradually subducts beneath the Eurasian plate and plunges into a deep arc as a result of an abrupt impact or a massive release of built-up stress. which for a long period has been carried by most of Asia and Europe. It is reported that in about 30 seconds, Kathmandu, a region or country situated on a block of crust measuring roughly 120 km (74 mi) in width and 60 km (37 mi) in length, moved 3 meters (10 feet) southward. On Wikipedia, 36

Repercussions Similar to how homes were harmed in infrastructure installations, numerous historical and archaeological monuments across the nation, including temples and memorials, suffered significant damage. As a result, there were more deaths. More than 6 million people are thought to have been impacted. The death toll was almost 9,000. There are currently 365 more persons officially reported missing. However, a lot of people believe they have passed away. Approximately 20,000 people have been hurt.There were over 694,000 damaged private and public housing units. This condition's measure is one in five. Numerous more buildings were destroyed in addition to the house. Numerous people lost their lives in the incident. This loss is too great to be measured by hand. Thirteen percent of the homes or installations, together with other items, were damaged or destroyed within a distance of 1222 miles, or two thousand kilometers within the network. following the significant impact on Nepal's network of roads and highways. At least 963 individuals were killed in the earthquake. There are roughly 480 casualties in total. The supply of electricity was totally cut off. The flow of water was interrupted. At the time, the most of the harm was done to the communication and sanitary infrastructure. One thousand schools were destroyed in the earthquake. Approximately 500 billion US dollars have been lost. Food, housing, and water are needed for ৩ 1.4 million as a result of the loss. 39].Roughly one-third of Nepal's GDP comes from agriculture, according to the World Bank. In the agricultural sector, NPR lost almost 28,367 million rupees. One of Nepal's biggest small-scale industries, almost 100 out of 100 ebb tides, suffered significant damage.

In response:A meeting of the Central Natural Disaster Relief Committee (CNDRC) was called for the purpose of making major policy decisions about the rapid and efficient search and rescue (SAR) and relief operations (Disaster Management Division, 2015). 40During that meeting, the government made a request for international assistance. Several clusters were established and activated to carry out the rescue and relief efforts, overseen by several national agencies.For search and rescue and relief efforts, 66069 Army, 41776 Police, 24775 Armed Police Force, and Civil servants were mobilized. There were 2,250 of them. Rescue efforts from the rubble for the buried and injured were largely carried out by national security forces (Disaster Management Division, 2015).

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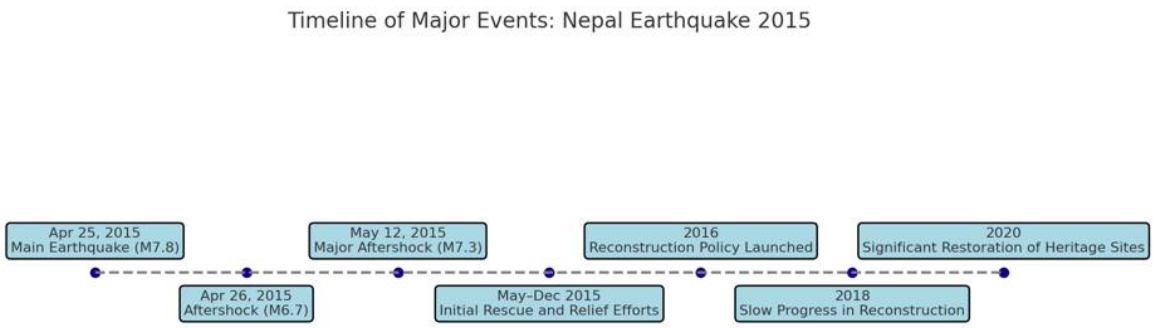


Figure Shows:: Timeline of Major Events: Nepal Earthquake 2015

Under the direction of several national organizations, a number of clusters, including the SAR and Logistics Cluster, the Health Cluster, the Emergency Shelter Cluster, WASH, the Nutrition Cluster, the CCCM Cluster, the Food Security Cluster, the Education Cluster, the Emergency Telecommunication Cluster, and the Early Recovery Network Cluster, were developed and activated to carry out the rescue and relief operations. When a community starts to replace or repair its homes, bridges, roads, and other infrastructure, long-term recovery can begin. (ISDR, 2005)where enhancements and positive modifications are taken into consideration, like tightening construction regulations, altering zoning and land use designations, enhancing transit routes, and swapping out the stock of "affordable housing". (Sridhar, May 2010)The primary institutional mechanism for distributing aid was the District Disaster Relief Committee (DDRC) and the VDC Relief Distribution Committee (RDC). Government policy was to give NPR 30,000 to relatives of the deceased to cover burial expenses and NPR 15,000 to households whose homes were deemed completely damaged in order to help people affected by the earthquake. Pay for emergency shelters; additionally, provide 3,000 NPR to households that were deemed to be "partially affected." (Foundation, 2016)

IV. WHY CHILE EARTHQUAKE WAS NOT SO DEVASTATING COMPARING TO OTHERS

Cause	Chile	Haiti	Nepal
Magnitude	The epicenter was reported below the epicenter, at 8.8 magnitudes.The duration of this earthquake was about 3 minutes	The magnitude of the earth quake that struck Haiti was 8 mega watts.The quake had a magnitude of 500 million at the time.	The magnitude 7.9 earthquake that struck Nepal had a magnitude of 21 on the Richter scale.(Rafferty, 2024)
Geographical Cause	The Chilean earthquake was deep. The earthquake was 22 miles below the earth's surface—twice as deep as in Haiti. "twice as much earth to absorb the shock before it reached building foundations," according to Newsweek.(Revkine, Feb 28, 2010) The epicenter of the Chilean earthquake was far from Concepcion (pop. 200,000).Which is about 70 miles away. The cracked area of Chile was mostly offshore.	Relatively shallow. The epicenter of the Haitian quake was 10 miles from Port-au-Prince (Pop. 3 million).(Alvarado)	Shallow — just 15 kilometers deep. The rupture zone in Nepal was entirely under land. The epicenter of the earthquake was about 50 miles from the densely populated capital of Kathmandu.

Building code	In 1985, after a magnitude 7.8 earthquake shook Valparaiso, Chile, people there laid down strict building codes. The government forces every builder to comply with strict building codes and regulations.	Countries like Haiti do not have their own building code, far from the national building code!Moreover, there is no way to check the building security. Destruction," Corruption, incompetence, instability and carelessness in a country like Haiti have always kept such control out of existence.And that is what has been happening there for ages.	The Government of Nepal has taken various measures to deal with the disaster. The first task is to formulate a national building code for the installation. But the most interesting thing is that despite the new national building code, there is so much damage and destruction in the earthquake just to get people trapped during the earthquake. It is understood that very little work has been done to prepare the local people for the earthquake.
Building Materials	In this new decade, the city of Chile has seen the transmission of many structural systems. As can be seen, the city of Chile has made earthquake proofing mandatory and vital for new structures. A guide to the use of rubber-like materials as needed in the structure of the building. Use some new technology to make a building bend or sway instead of collapsing during an earthquake that works like rubber.	In a country like Haiti, there is a lot of irregularities. People pay a small amount of money to get something from the engineers for the design of the building structure, but they want the work much more, as well as bribe a lot of so-called government inspectors to let the buildings grow a little. Structures are short-lived, one-on-one foundations are often weak. Progressively weaker and weaker.	
Preparedness	Chile has experienced major earthquakes in recent years.People here have an "earthquake consciousness".There's also a lot of "what to do" during earthquakes.	Haiti's people were not aware of the quake.	The Nepalis were not prepared sufficiently for this predictable event.
Use of social media	Extensive use of social media and mobile networks to broadcast alerts and organize pre-emptive evacuations.	Not used.	Not that much used.

V. RECENT UPDATE

Chile has not seen any significant changes. A major issue is that there is still no permanent housing system in place for the displaced.

Once more, individuals in the coastal districts affected by the tsunami are still having difficulty finding employment, access to water, and basic necessities of life. The protection of fishing and the fishing sector is still being worked on. In addition, they are battling for rescue while considering the harm done to the travel and tourism sector.It was the birthplace of several development trends. The initial completion of airport and roadway infrastructure development and maintenance took place in July 2013. About 744 percent of the 222,000 home reconstruction projects that the government claims to have started have been finished. In the middle of 2014, the remaining projects were finished. In April 2014, preliminary warnings from the 2010 disaster were released to save lives amid a.2 magnitude earthquake and tsunami in northern Chile. In May 2012, about 500,000 residents in ValparaValso also participated in the evacuation, and more drills were conducted in other coastal communities. After the 2014 Tembler, almost a million people were effectively evacuated from coastal areas in response to a tsunami alert. (Earthquake, 2010)TheIlapel beachfront has significantly improved since the 2015 earthquake. Notification, evacuation, and advance planning have all shown to be highly helpful.

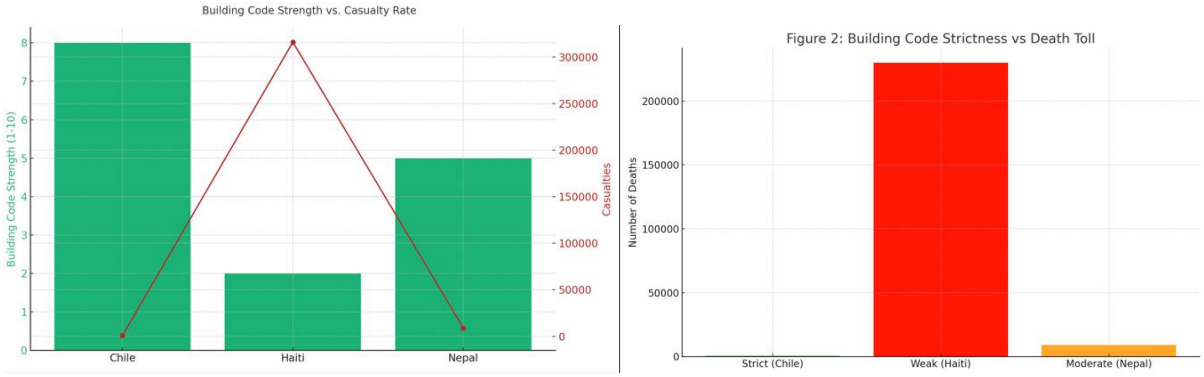


Figure Shows::Building Code Strength vs. Causality Rate

Haiti has also experienced significant change. It is evident that several heavily damaged locations in Port-au-Prince, such as the capital city, have experienced several alterations in all of these locations. Again, these modifications are quite striking. In a level suburban neighborhood, an iconic installation has occurred as a result of the earthquake. As can be seen, new clock towers have been added to the landmarks that once stood in the ancient Iron Market. A large portion of the land has been destroyed. 193 semi-permanent schools have been erected, and 225 classrooms have been renovated. Almost 3 million kids have been shielded from diseases that may have been prevented by vaccination. In the neighborhood affected by the earthquake, more than 600,000 people now have access to safe sanitation camps and improved water supply.

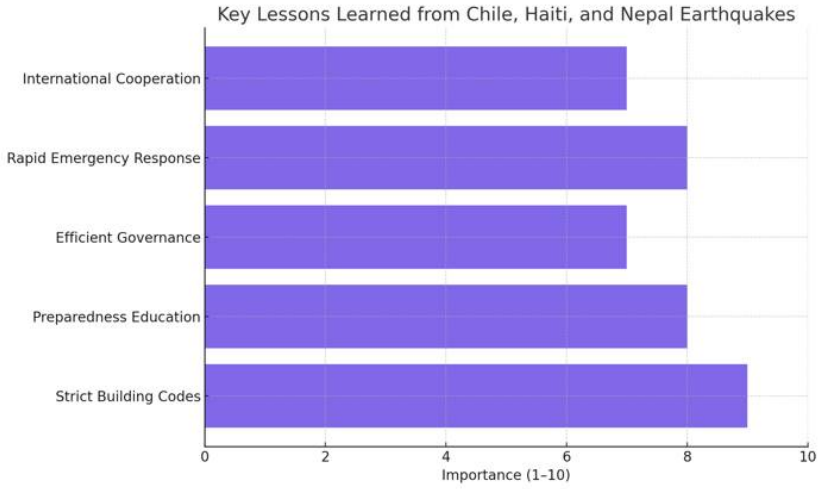


Figure Shows:: Key Lessons Learned from Chile, Haiti and Nepal Earthquakes.

However, there is a distinct perception of Nepal. Approximately 70% of those impacted by the earthquake and tsunami continue to reside in makeshift shelters. Nepal has made some progress thus far. This includes: 222 or more homes have been designated for rehabilitation by the Nepali government. Roughly 3.5 percent of them had their homes renovated.

It is a robust and durable dwelling structure. They have also done an excellent job of restoring and reconstructing traditional buildings and houses of worship. Repaired are some of the damaged historic palaces and Buddhist and Hindu temples. Numerous private and public donations are being made in order to reconstruct these historic and sacred buildings. Thus far, it has been noted that approximately ninety structures are undergoing restructuring. Numerous damaged homes, dilapidated dwellings, abandoned temples, and other ruins have been discovered strewn throughout the nation's capital, Kathmandu. A large number of people spoke up. Their role was voluntary labor. Together with government, military, and foreign assistance workers, volunteers put out a lot of effort. Their first goal was to begin providing aid and rescue operations for those impacted by the earthquake and tsunami. For the past two years, recovery operations have been underway. Political attempts have been impeded in these circumstances. The primary causes of this include inadequate financial management, a lack of accountability and transparency, as well as interpersonal and political strife. The Nepali media has consistently labeled this situation as a "failure".

VI. DISCUSSION

The comparison reveals that Chile, despite experiencing a massive earthquake, recorded fewer deaths due to strong building codes and better preparedness. Haiti's weak infrastructure and poor emergency response led to massive casualties. Nepal, though moderately prepared, still suffered due to terrain and population density. These findings emphasize the importance of stringent building regulations, efficient disaster response systems, and proactive urban planning.

VII.RESULTS

The comparative analysis demonstrates that the impact severity of an earthquake is shaped not only by its magnitude but significantly by socio-economic conditions, preparedness levels, and governance effectiveness. For instance, Chile's strict building codes and well-coordinated disaster response minimized casualties and facilitated rapid reconstruction, despite high economic costs (UNDRR, 2016). Conversely, Haiti suffered catastrophic human losses due to fragile infrastructure and inadequate emergency planning (World Bank, 2011). Nepal fell in between, facing challenges from both its rugged terrain and limited resources, though its partial preparedness reduced the potential scale of disaster (Nepal Reconstruction Authority, 2017). These findings highlight the critical role of resilient urban planning, effective regulation enforcement, and institutional readiness in mitigating earthquake-induced damage (Seismological Society of America, 2020).

Figure 1: Earthquake Casualties Comparison::This bar chart compares the number of casualties across Chile (525 deaths), Haiti (230,000 deaths), and Nepal (9,000 deaths). The stark contrast highlights the critical role of infrastructure resilience and emergency preparedness.

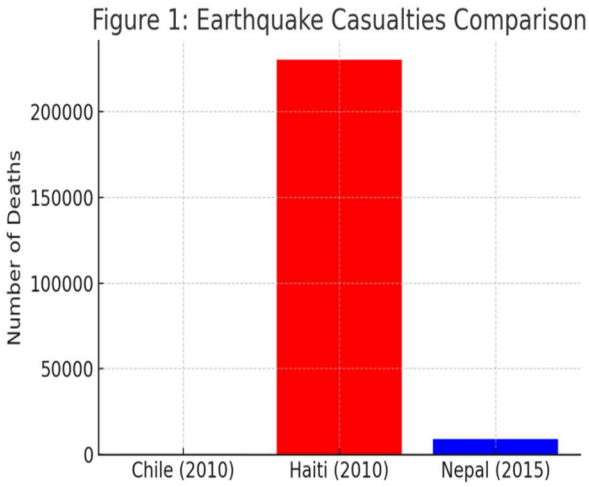


Figure 1 compares the number of casualties from the three earthquakes.

Figure 2: Economic Loss Comparison (in Billion USD)::This chart shows Chile with the highest economic loss (USD 30 billion), despite low casualties, due to developed infrastructure and insured damages. Haiti, though poorer, lost USD 8 billion, while Nepal lost around USD 10 billion.

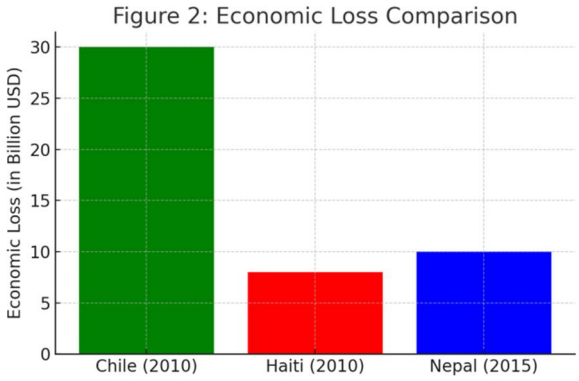


Figure 2 presents the estimated economic losses in billions of USD.

Figure 3: Reconstruction Progress After 5 Years (%)::This figure indicates Chile achieved 90% reconstruction, Nepal 65%, and Haiti only 40%. This disparity reflects governance efficiency, financial aid utilization, and policy frameworks.

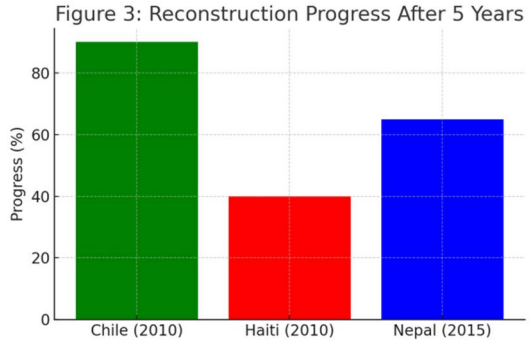
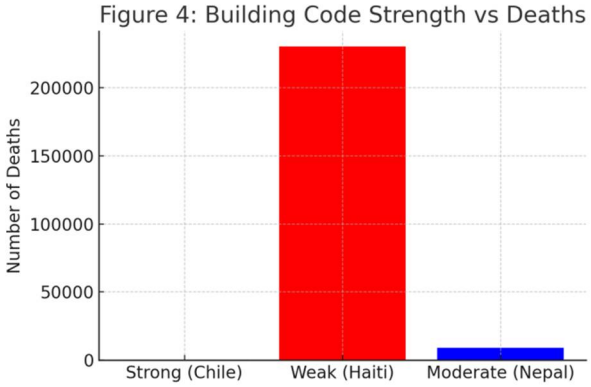


Figure 3 illustrates the reconstruction progress achieved within five years post-disaster.

Figure 4: Building Code Strength vs. Casualties::Stronger building codes in Chile significantly reduced death tolls, while Haiti's weak enforcement led to devastating losses. Nepal lies in between due to partial implementation of structural codes.



VIII. CONCLUSION

This essay compares these three earthquakes with an emphasis on preparedness, quick reactions, and determining why some were destructive while others were not. Although there are minor variations, all of the earthquakes are from the same type—subduction zones. Time Reports states that Chile has "the highest per capita GDP in Latin America, (Baron)". Chile had enough money to reconstruct and sustain itself. Earthquakes have previously been shown to have certain origins and symptoms. Resilient development and safe reconstruction techniques are now widely recognized. The extent of these concepts is well understood. These theories have really been validated.

Records were broken during the 2010 earthquake in Concept, Chile. The magnitude of the earthquake was the lowest ever recorded, ranking sixth in terms of size. Nonetheless, the mortality toll stayed below a thousand because the building construction regulations were effectively implemented.

Which is quite successful? And how catastrophes might lead to improvement Resilience constantly teaches us new things about social and community institutions as well as the built environment. Nepal is a culturally and historically rich nation. Nepal is well-known for its heavy tourism. It is the poorest country above him. The folks there are under stress due to the earthquake's destruction. There will be years of this pressure. Nepal needs to start getting ready for the next earthquake right now. This is the time that we have to work with. We learn new skills via resilience. Its systems and teachings are derived from both historical methods and contemporary construction methods. In Haiti, a Third World nation, the harsh threshing floor of poverty barely scratches the surface of human existence. A catastrophe relief service is also available. At one point, numerous NGOs were operating in Haiti. They had the highest density. It is evident that despite the significant devastation caused by the earthquake to the nation, no one displayed the required fortitude. After the earthquake, many things have changed. They raised more weight than was required. Then, control over safe restructuring was not entirely satisfied. Many more Port-au-Prince sites collapsed five years later. Immediate prevention should be the main focus of international cooperation. Numerous thousands perished. There was insufficient technology or expertise to distinguish between these fatalities. But no one has yet heard about these techniques. Earthquakes don't just happen. Therefore, rather than being addressed for a few months or years, this issue should be integrated into all advances permanently. In this situation, physical resilience is also crucial. Balance is a proper medium. it employs a thorough plan. The cities of "Haiti" and "Nepal" will be able to take preventative action thanks to these tactics.

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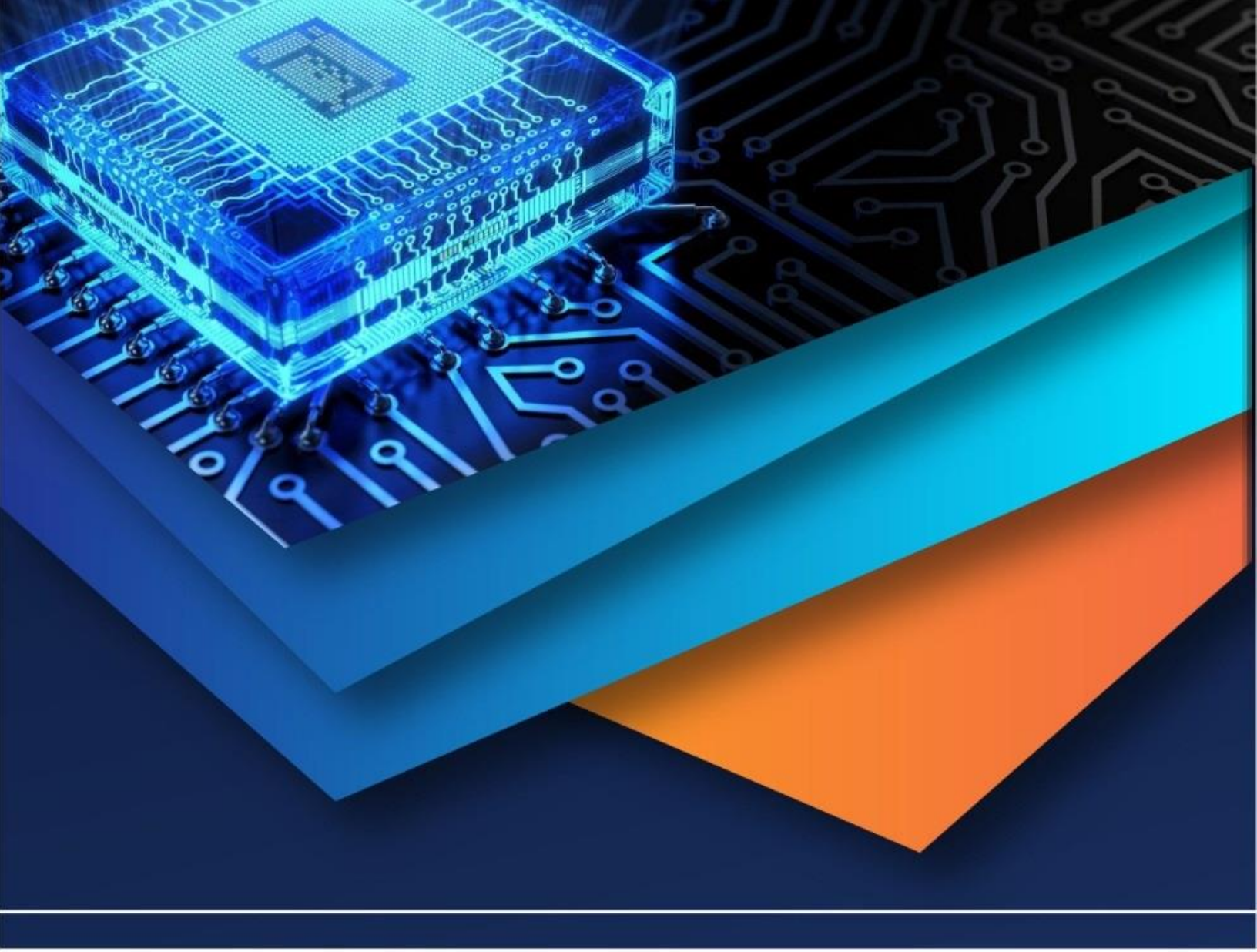

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