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Overview of Natural Disasters and their Impacts in Asia and the Pacific 1970 - 2014

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Overview of Natural Disasters and their Impacts in Asia and the Pacific, 1970 - 2014

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Abbreviations

ADPC	Asian Disaster Preparedness Center
EIC	Economic Institute of Cambodia
EM-DAT	Emergency Events Data Base / The International Disaster Data Base
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
GDP	Gross Domestic Product
GLOF	Glacial Lake Outburst Floods
HFA	Hyogo Framework for Action
IPCC	Intergovernmental Panel for Climate Change
LDCs	Least Developed Countries
LLDCs	land-locked developing countries
MDGs	Millennium Development Goals
NDRRMC	National Disaster Risk Reduction and Management Council (Philippines)
OECD	Organization for Economic Co-operation and Development
SIDS	small island dveloping States
UNISDR	United Nations Office for Disaster Risk Reduction
UNU-EHS	United Nations University Institute for Environemnt and Human Security
WCDRR	United Nations World Conference on Disaster Risk Reduction

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Highlights

- **Over 2 million people died from natural disasters between 1970 and 2014 in Asia and the Pacific, or 56.6 per cent of the fatalities globally.** Earthquakes and tsunamis were the main cause of deaths, despite their relatively infrequent occurrences.
- **6 billion people from the region were affected by disasters over the same period, or 87.6 per cent of people affected globally.** Floods and drought were not the deadliest disasters but affected the highest number of people at 5 billion.
- While reports on natural disasters are generally on the rise, **floods and storms showed a steep increase in number and were the most frequent events**.
- **The average number of fatalities per event is decreasing.** The percentage of disasters killing more than 100 people has reduced since 1970.
- **Over US$ 1.15 trillion was lost from natural disasters during this 45 year period**. Four types of disasters - earthquakes, tsunamis, floods and storms - were responsible for 91.8 per cent of the total economic losses.
- **Economic loss from natural disasters surged significantly in the region** from $5 billion in the 1970s to around $75 billion in recent years, or 28 per cent of the global economic loss to 51 per cent more recently.
- In Asia-Pacific, **economic losses increased by almost 15 times since 1970 while the region's GDP only grew 5 times**, suggesting that building resilience to disasters is likely a necessary condition for protecting region's growth prospects.
- **LDCs and SIDS are highly exposed to disaster risk**. Natural disasters often jeopardized hard earned development gains in the region, and at the national level, vulnerable people generally suffer more when a disaster strikes.
- When comparing the average annual economic losses from disasters with their GDP, **LDCs lost US$ 592 million per year on average, or 0.97 per cent of their GDP.**

Introduction

Asia and the Pacific is the most disaster-prone region in the world. Geologically, the region is characterized by active tectonic plate movements in the Pacific and Indian Oceans, which have been the source of major earthquakes and tsunamis. The Indian and Pacific Oceans also regularly generate tropical cyclones and typhoons. The region is home to young mountain ranges which are especially prone to earthquakes, landslides, flash floods, avalanches and Glacial Lake Outburst Floods (GLOFs). Geographically it is a region of physical diversity with islands, mountains, extensive coastlines, forests, deltaic plains and deserts. The weather and climate systems are driven primarily by monsoon variability and snow cover dynamics, which both contribute to the frequency and severity of floods and drought. Several major rivers flow through the region, often across several national borders, and a large portion of the population lives in the fertile valleys of these rivers.

In the past decade alone, a person living in Asia-Pacific was twice as likely to be affected by a natural disaster as a person living in Africa, almost six times as likely as someone from Latin America and the Caribbean, and 30 times more likely to suffer from a disaster than someone living in North America or Europe (ESCAP: 2013). News reports on natural disasters in the region has been ceaseless.

Since 1970, the region has been hit by more than 5000 disasters causing more than two billion fatalities and affecting the lives of more than six billion.[1] The worst disaster in terms of loss of life occurred in 1970, when Cyclone "Bhola" struck Bangladesh and caused a storm surge that killed 300,000 people and affected 3.6 million more. Around twenty years later when a more severe cyclone struck the same region in Bangladesh, 138,000 people died and 15 million people were affected, becoming the second largest storm with respect to fatalities, though notably less people died due primarily to disaster risk management efforts in the country. Cyclone "Nagis" killed a similar number of people in Myanmar in 2008. Storms and floods are annual events in some parts of the region. The Philippines is often devastated by typhoons, including the Super Typhoon "Haiyan" in November 2013 which killed over 6,000 people and displaced approximately 4 million people (NDRRMC: 2014).

Earthquakes and tsunamis have wrought devastation over the period, with some of the worst events being the 1976 Great Tangshan Earthquake which killed almost 242,000 people in China, the 2004 Indian Ocean Tsunami that killed over 220,000, and, more recently, the 2011 Great East Japan Earthquake that killed almost 20,000 people and affected the lives of around 369,000.

There are many social, economic and environmental factors that determine the vulnerability, exposure and impact of a disaster on people or a country. Over the past 45 years, the region's population has almost doubled from 2.2 billion in 1970 to 4.3 billion in 2014. Cities have expanded with the migration of people from rural areas in search of livelihoods and opportunities, with 47.7 per cent of the population of

[1] *EM-DAT*

Asia-Pacific now living in cities compared to only 25.9 per cent in 1970.[2] Often the poor and the most vulnerable settle in hazardous areas such as flood plains or along fault-lines because the land is more affordable or it is the only land available in densely populated areas. Over time, vulnerable populations' exposure to disasters has increased.

Likewise, economic development has been rapid in many countries of the region. As economies grow, so does the value of the infrastructure and assets that could potentially be destroyed by a disaster. These assets are increasingly located on land exposed to hazards due to a lack of available space and rapid development, and thus potential economic exposure has also increased over time.

Other changes over the past 45 years should also be considered as possibly affecting statistical trends. Disaster events are now more regularly and accurately recorded than they were in 1970. The progress towards achieving the Millennium Development Goals (MDGs) and the Hyogo Framework for Action (HFA) has improved the resilience of countries over time, reducing the disaster risks. Also, climate change could already be affecting the intensity and frequency of climatic disaster events in some countries.

With the Third United Nations World Conference on Disaster Risk Reduction (WCDRR) shortly to begin, and a new disaster risk reduction framework to be agreed upon globally, a brief overview of key statistics, issues and changes over the past 45 years is timely. This overview will highlight the progress made along with the challenges faced by the region.

In recognition of this, the current paper provides a review of natural disasters and their impacts in Asia and the Pacific by disaster type, subregion and level of development. The first section looks at the occurrence of natural disaster events. This is followed by an analysis of fatalities and economic loss in sections two and three respectively. The short-term consequences of natural disasters on the economy are also mentioned. The final section briefly discusses aspects regarding exposure and vulnerability of countries in Asia and the Pacific.

[2] *ESCAP Statistical Database*

I. OCCURRENCES OF NATURAL DISASTERS

A. Overview of Occurrences

From 1970 to 2014, the world reported a total of 11,985 natural disaster events, of which 5,139 (or 42.9 per cent) took place in Asia and the Pacific (Figure 1.1).[3] Floods and storms were the most frequent in the region, accounting for 64 per cent of the total number of such events reported between 1970 and 2014. This was followed by earthquakes and tsunamis (12 per cent) and landslides (6.9 per cent) (Figure 1.2).

Figure 1.1 Total Occurrences of Natural Disaster Events (1970-2014)

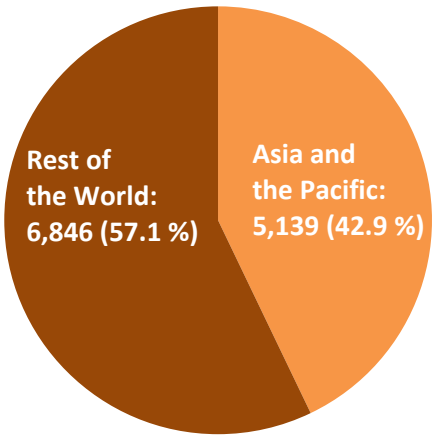


Figure 1.2 Occurrences of Natural Disaster Events in Asia and the Pacific by Type (1970 – 2014)

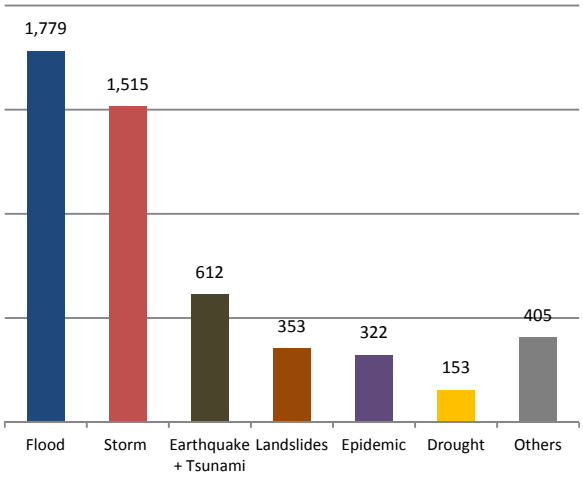


Figure 1.3 Occurrences of Natural Disaster Events in Asia and the Pacific by Subregion (1970 – 2014)

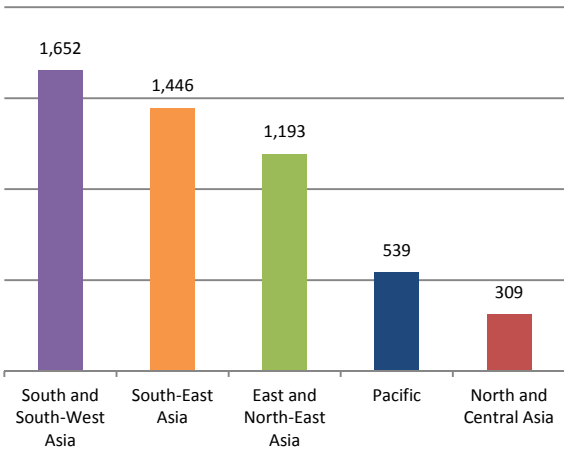
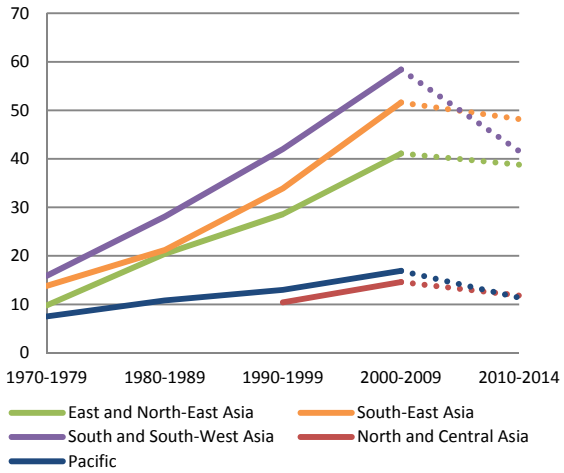


Figure 1.4 Average Yearly Occurrences of Natural Disaster Events in Asia and the Pacific by Subregion



[3] *Data source for all figures and tables are: UNESCAP, ESCAP Statistical Database; and EM-DAT, The OFDA/CRED International Disaster Database – www.emdat.be [accessed on 23 February 2015], unless otherwise noted.*

South and South-West Asia witnessed the largest number of natural disaster events with 1,652 cases reported. South-East Asia and East and North-East Asia also reported over 1,000 events. The Pacific and North and Central Asia had significantly lower numbers of reports (Figure 1.3).[4] Disasters have been reported with increasing frequency in all parts of the region since 1970. However, the numbers of reports on natural disaster events are diverging among ESCAP subregions (Figure 1.4).[5]

Figure 1.5 Average Yearly Occurrences of Natural Disaster Events in Asia and the Pacific by Category

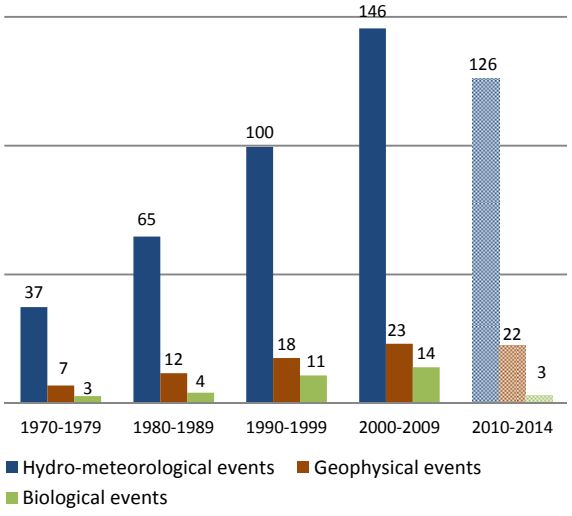
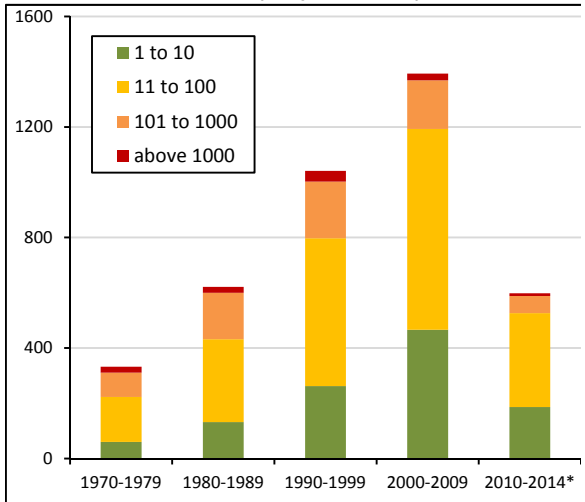


Figure 1.6 Occurrences of Natural Disaster Events in Asia and the Pacific by Number of Fatalities



**The last column represents only 5 years of data.*

The number of hydro-meteorological disasters quadrupled from 37 per year in 1970-1979 to 146 per year in 2000-2009, while reports of geophysical natural disaster events substantially increased as well during the same period (Figure 1.5). Floods and storms, the most frequent events recorded in the region, represented two of the highest increases in occurrence. In particular, reports on flooding soared over six-fold from 11 events per year in 1970-1979 to 72 events per year in 2000-2009.

However, these are mostly from the increase in numbers of small and medium scale disaster events. While the frequency of disaster events with more than 100 fatalities have not changed very much, the number of small and medium scale disasters have surged significantly between the 1970s and recent years (Figure 1.6). Also, it should be noted that these increases are partly due to improvements in reporting capacity and practices.

[4] *Data for North and Central Asia is from 1990 to 2014.*

[5] *Each period in the figure represents yearly average of respective decade, but the last period represents yearly average of recent 4 or 5 years from 2010 (dotted lines or columns). This time frame is used throughout the report.*

II. FATALITIES FROM NATURAL DISASTERS

A. Overview of Fatalities

In Asia and the Pacific, a significant number of people lost their lives from natural disasters over the past 45 years.[6] As mentioned earlier, the region was only hit by around 43 per cent of the disasters experienced globally, but the impact of these disasters in terms of lives lost was notable. Between 1970 and 2014, more than 2 million people died, accounting for 56.6 per cent of the total deaths in the world due to disasters (Figure 2.1).

Figure 2.1 Total Fatalities and Affected from Natural Disasters (1970 – 2014)

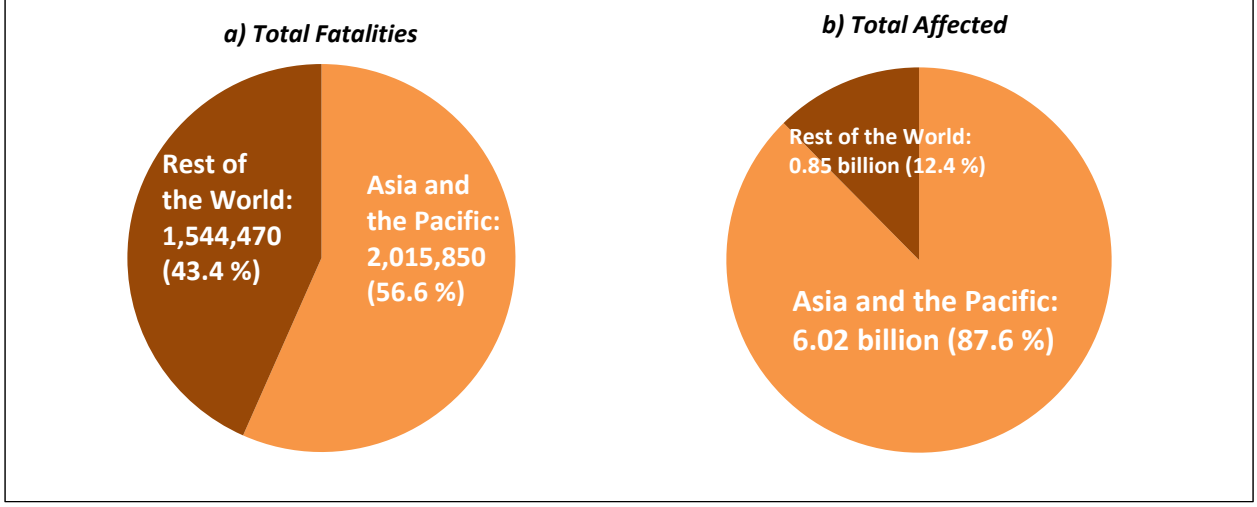
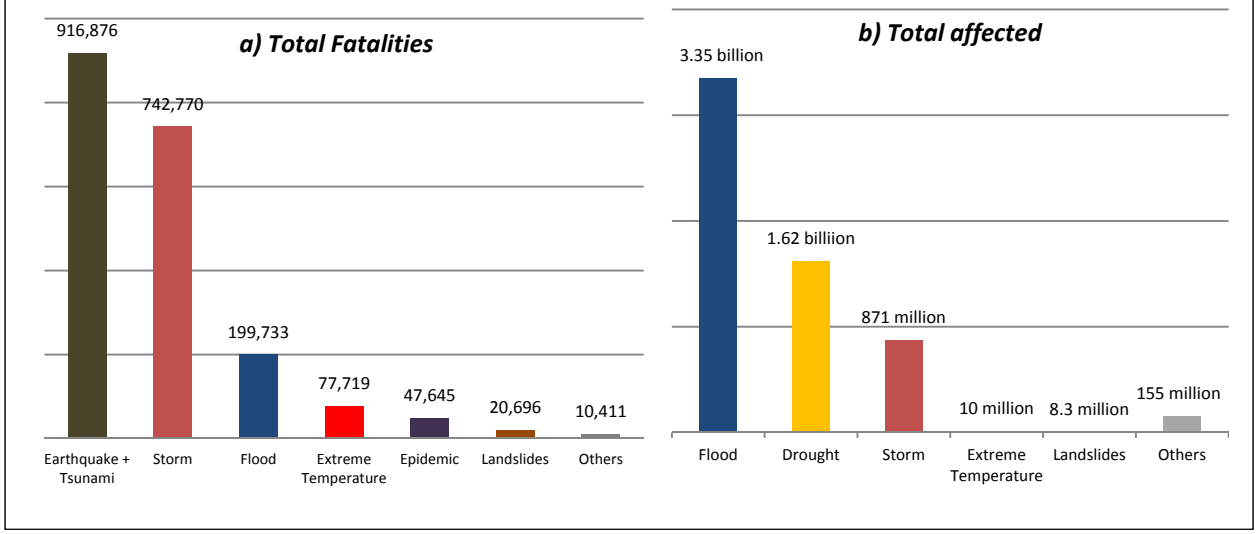


Figure 2.2 Total Fatalities and Affected from Natural Disasters in Asia and the Pacific by Type (1970 – 2014)



[6] *Fatalities (or deaths) in this report refers to persons confirmed as dead and persons missing and presumed dead as defined by EM-DAT.*

The impact and susceptability of Asian and Pacific countries to disasters is evident when considering the total number of people affected. Over 6 billion people in the region have suffered from natural disasters, accounting for 87.6 per cent of the global total. Among the fatalities in the region, 45.5 per cent were from earthquakes and tsunamis, as can be seen in Figure 2.2, while storms accounted for 36.8 per cent. Floods and droughts were not the deadliest natural disasters but have affected the largest number of people over the last 45 years - approximately 5 billion.

Figure 2.3 Average Yearly Fatalities from Natural Disasters in Asia and the Pacific by Category

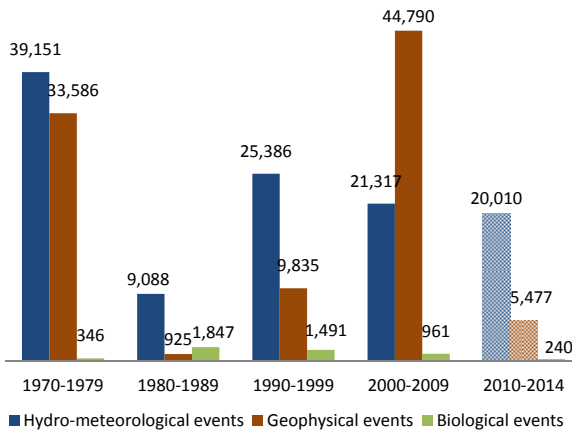


Figure 2.4 Average Yearly Fatalities from Natural Disasters in Asia and the Pacific by Type

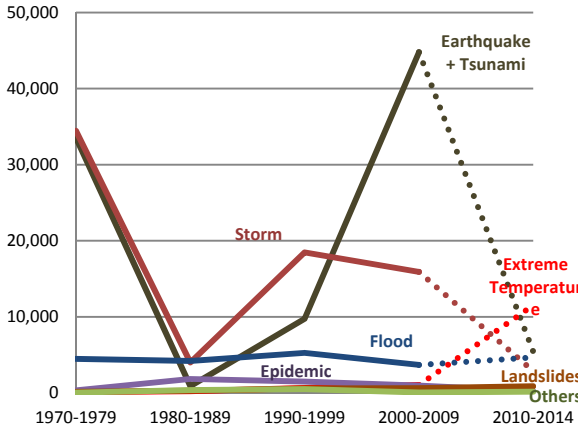


Figure 2.5 Fatalities per Natural Disaster Event in Asia and the Pacific

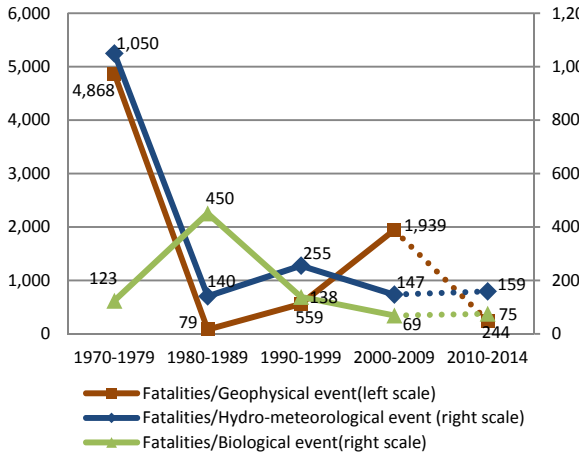
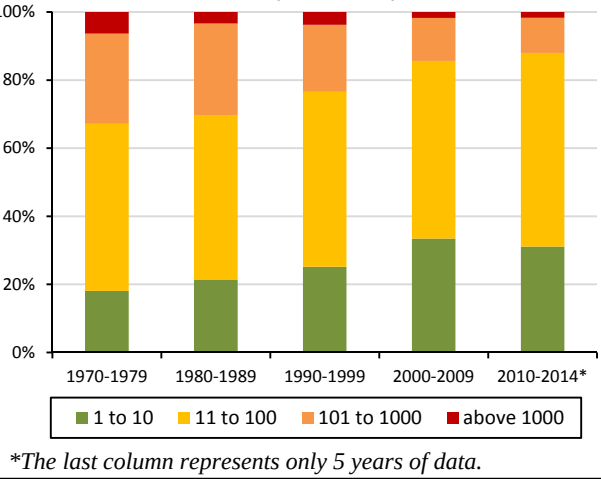


Figure 2.6 Percentage of Occurrences of Natural Disaster Events by Number of Fatalities



**The last column represents only 5 years of data.*

There is no clear trend in total fatalities associated with either geophysical or hydro-meteorological disasters between 1970 and 2014. The number of deaths fell between the 1970s and the 1980s despite an increased number of reported natural disaster events, but then increased substantially during the two decades that followed (Figure 2.3). The recent large number of fatalities has mainly been due to geophysical disasters, reflecting some major disasters experienced since 2000, including the 2004 Indian Ocean Tsunami, the 2005 Kashmir Earthquake, the 2008 Sichuan Earthquake, and the 2011 Great East Japan Earthquake. Among hydro-meteorological natural disasters, storms caused the highest number of lives lost (Figure 2.4).

However, if the average number of fatalities per event is considered, the region lost less people on average per disaster event in the 1980s than the 1970s, as shown in Figure 2.5. An average of 4,800 deaths per geophysical event was recorded in the 1970s. Since 1980, on average less than 2,000 people die per geophysical event. Hydro-meteorological events recorded significantly less fatalities per event, but they followed a similar pattern.

Figure 2.6 considers the percentage of disaster events per decade by the number of people killed. When compared to the total number of events, the percentage of events killing over 100 people has decreased over time. This could reflect either changes in the intensity of disasters or imply that improvements have been made in protecting lives.

B. ESCAP Subregions: Diverse Pictures

The number of deaths at the subregional level were generally correlated to the frequency of events occuring. However, South and South-West Asia and East and North-East Asia recorded relatively higher fatalities with an average of 625 and 403 deaths reported per event respectively (Figure 2.7). Fatality figures fell in the 1980s in most ESCAP subregions, but have risen substantially in the following two decades. South-East Asia witnessed the largest number of deaths in 2000-2009, while South and South-West Asia reported the largest number of fatalities in the previous three decades. North and Central Asia have had a significant number of fatalities from 2010 to 2014 (Figure 2.8).

Seismic disasters such as earthquakes and tsunamis were the main fatality drivers in most of ESCAP subregions, except North and Central Asia. Among the hydro-meteorological natural disasters, storms caused approximately 33,400 deaths per year in the 1990s in South and South-West Asia, and 14,700 deaths per year in 2000-2009 in South-East Asia. Extreme temperatures resulted in approximately 11,200 fatalities per year in North and Central Asia from 2010 to 2014 (Figure 2.9).

Figure 2.7 Total Fatalities from Natural Disasters in Asia and the Pacific by Subregion (1970 – 2014)

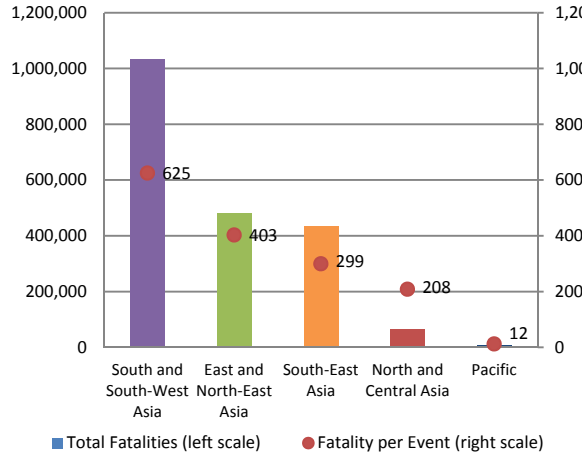


Figure 2.8 Average Yearly Fatalities from Natural Disasters in Asia and the Pacific by Subregion

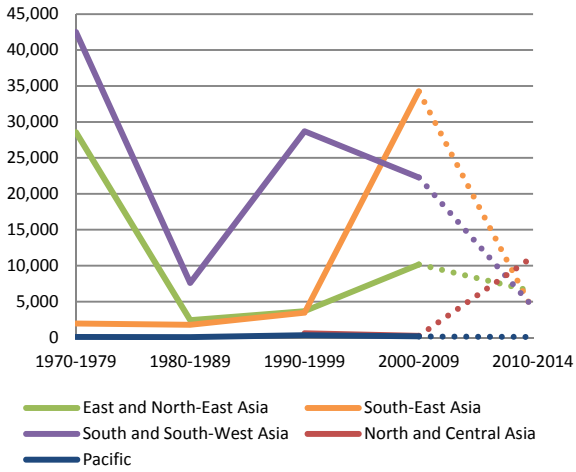
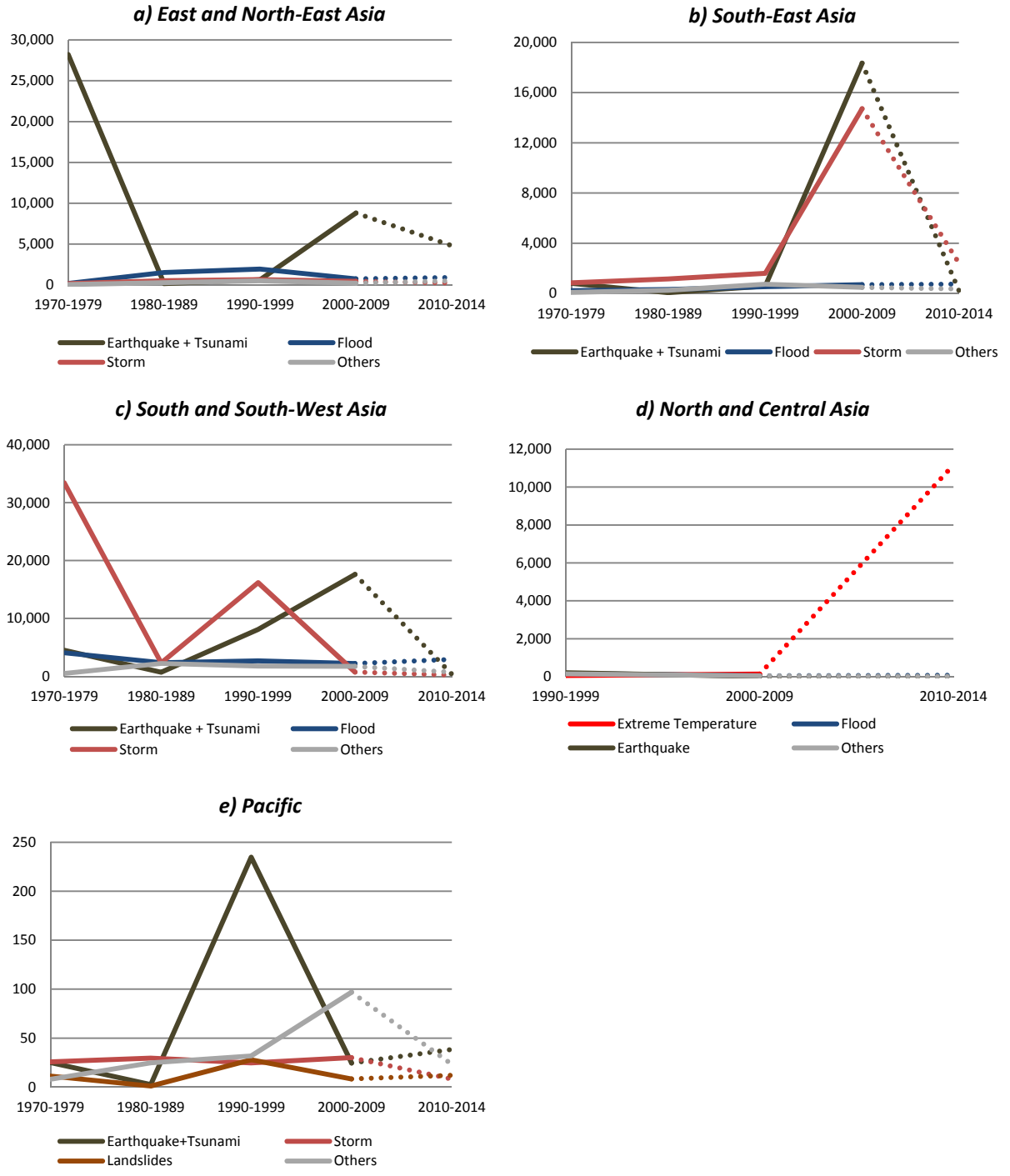


Figure 2.9 Average Yearly Fatalities from Natural Disasters in Each Subregion by Type



III. ECONOMIC LOSSES FROM NATURAL DISASTERS

A. Overview of Economic Losses[7]

Between 1970 and 2013, the world reported over $ 2.8 trillion (in constant 2005 US dollars) in economic losses from natural disasters, while it has been reported that "disaster losses are at least 50 percent higher than internationally reported figures" (UNISDR: 2013). Asia and the Pacific alone reported $ 1.15 trillion of economic losses, amounting to 40.7 per cent of the global total (Figure 3.1). Moreover, the share of Asia and the Pacific in the global total has shown an increasing trend, reaching half of global economic losses in recent years (Figure 3.2).

Figure 3.1 Total Economic Losses from Natural Disasters (1970 – 2013)

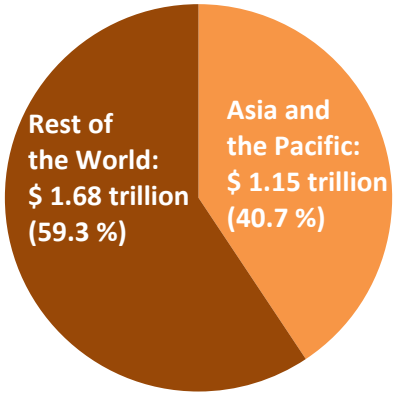


Figure 3.2 Average Yearly Economic Losses and the Percentage of Asia and the Pacific in Global Total

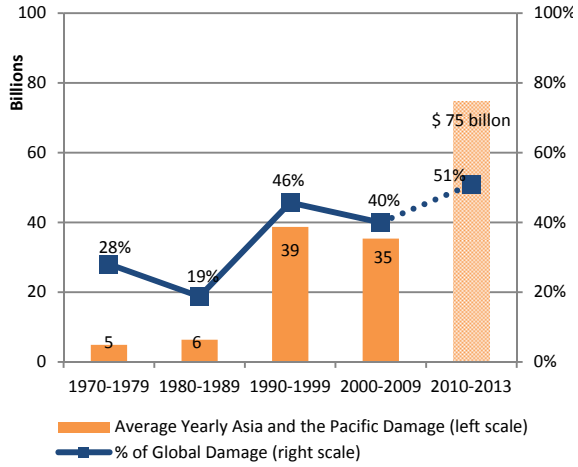


Figure 3.3 Economic Losses from Natural Disasters in Asia and the Pacific by Type (1970 – 2013)

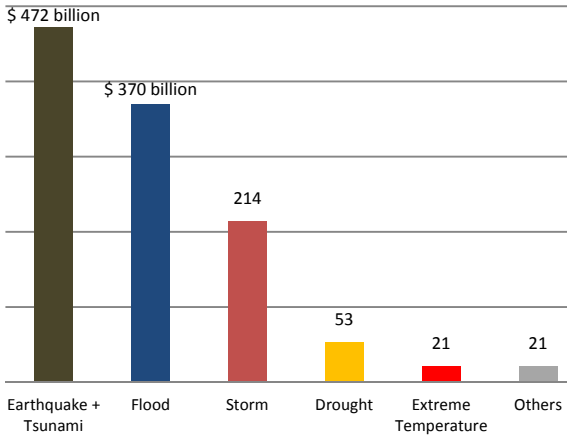
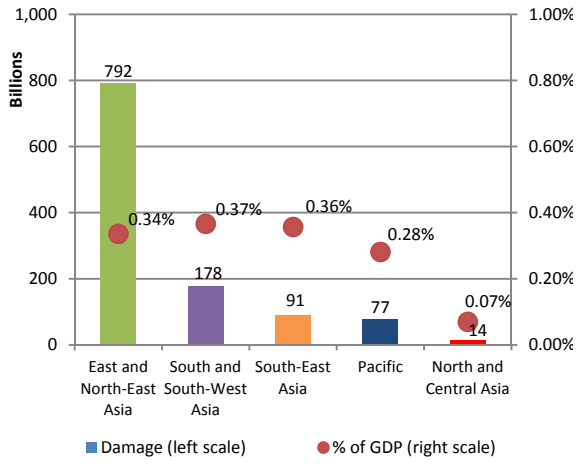


Figure 3.4 Total Economic Losses of Asia and the Pacific from Natural Disasters by Subregion (1970 – 2013)



[7] *Economic losses refer to the amount of damage to property, crops, and livestock as defined as "expected damage" by EM-DAT. Economic losses data in this report converted to constant 2005 US$.*

Four types of disasters (earthquakes and tsunamis, floods and storms) were responsible for 91.8 per cent of total economic losses in Asia and the Pacific between 1970 and 2013 (Figure 3.3). East and North-East Asia alone accounted for approximately 68.9 per cent of total economic losses of the region. This was followed by South and South-West Asia which accounted for 15.5 per cent.

However, it should be noted that the substantial economic losses in East and North-East Asia are due to the larger size of the economies of this subregion. When economic losses were measured as a percentage of subregional GDP, all ESCAP subregions, except North and Central Asia, showed similar results ranging from 0.28 per cent to 0.37 per cent (Figure 3.4).

B. Trends in Economic Losses: Outpaced Global Average

Economic losses from both geophysical and hydro-meteorological disasters have significantly increased in the region. While hydro-meteorological disasters have caused more total economic losses between 1970 and 2014 (Figure 3.6), after 2010 economic losses were greatest due to geophysical disasters, in particular the 2011 Great East Japan Earthquake (Figure 3.5).

Economic losses per disaster event also signifcantly increased between 1970 and 2013 (Figure 3.7). Geophysical disasters caused $ 288 million in economic losses per event in the 1970s, but from 2010 to 2013, each event damaged over to $ 1.5 billion. Average yearly economic losses per hydro-meteorological disaster event also significantly increased during this period. Economic losses from East and North-East Asia have grown by 21 times from $ 2.5 billion per year between 1990 and 1999 to $ 53 billion per year between 2010 and 2014. Economic losses in South-East Asia and South and South-West Asia also jumped significantly during this period (Figure 3.8).

Figure 3.5 Average Yearly Economic Losses from Natural Disasters in Asia and the Pacific by Category

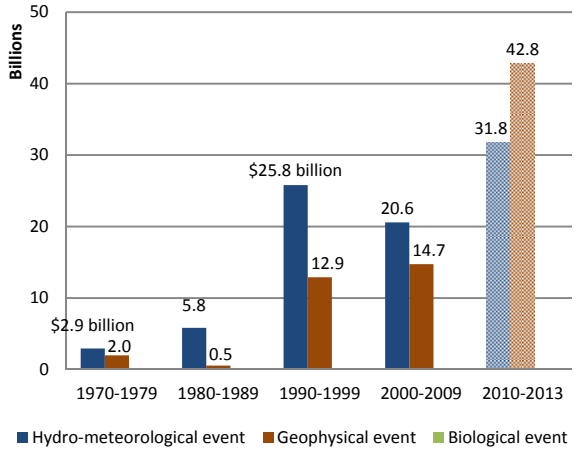


Figure 3.6 Average Yearly Economic Losses from Natural Disasters in Asia and the Pacific by Type

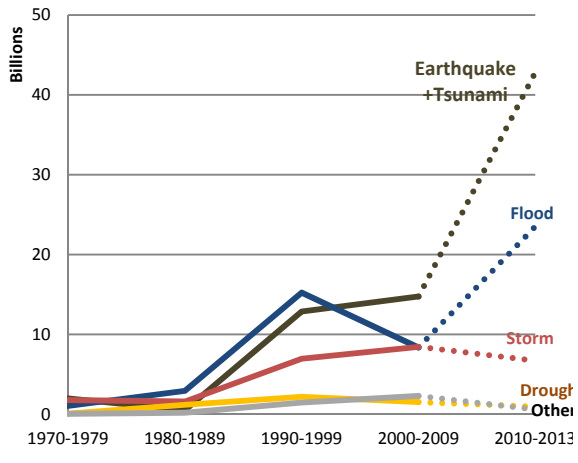


Figure 3.7 Economic Losses per Natural Disaster Event in Asia and the Pacific by Category

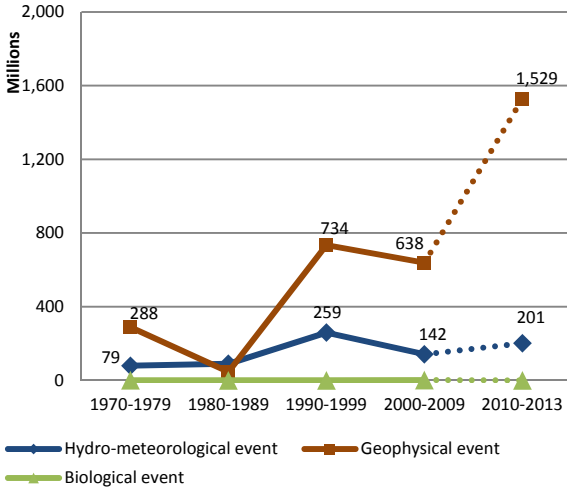
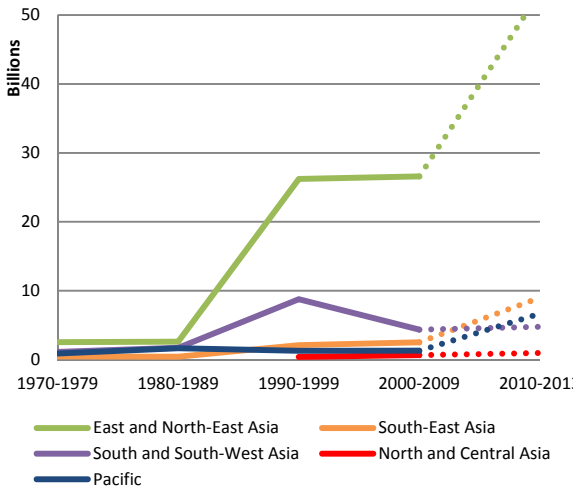


Figure 3.8 Average Yearly Economic Losses from Natural Disasters in Asia and the Pacific by Subregion



In East and North-East Asia, floods and storms have been the most frequent events, but earthquakes and tsunamis resulted in the greatest economic loss. In South-East Asia, and South and South-West Asia, floods have caused the largest economic losses, which have increased significantly over time. Floods have been the costliest disasters in North and Central Asia, but economic losses from droughts and earthquakes were also significant. In the Pacific, the recent large economic losses from earthquakes and tsunamis are notable (Figure 3.9).

Figure 3.9 Average Yearly Economic Losses from Natural Disasters in Each Subregion by Type

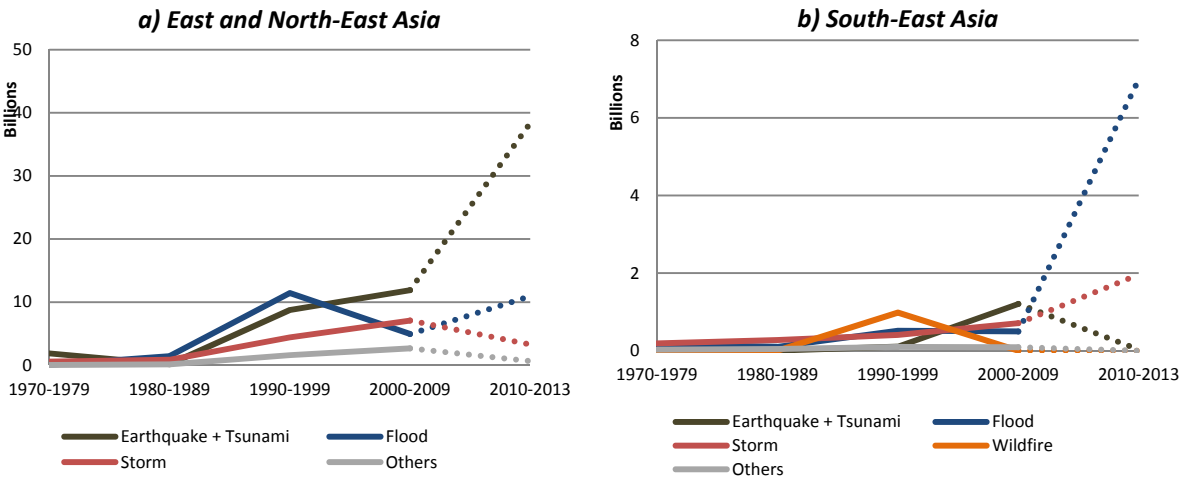
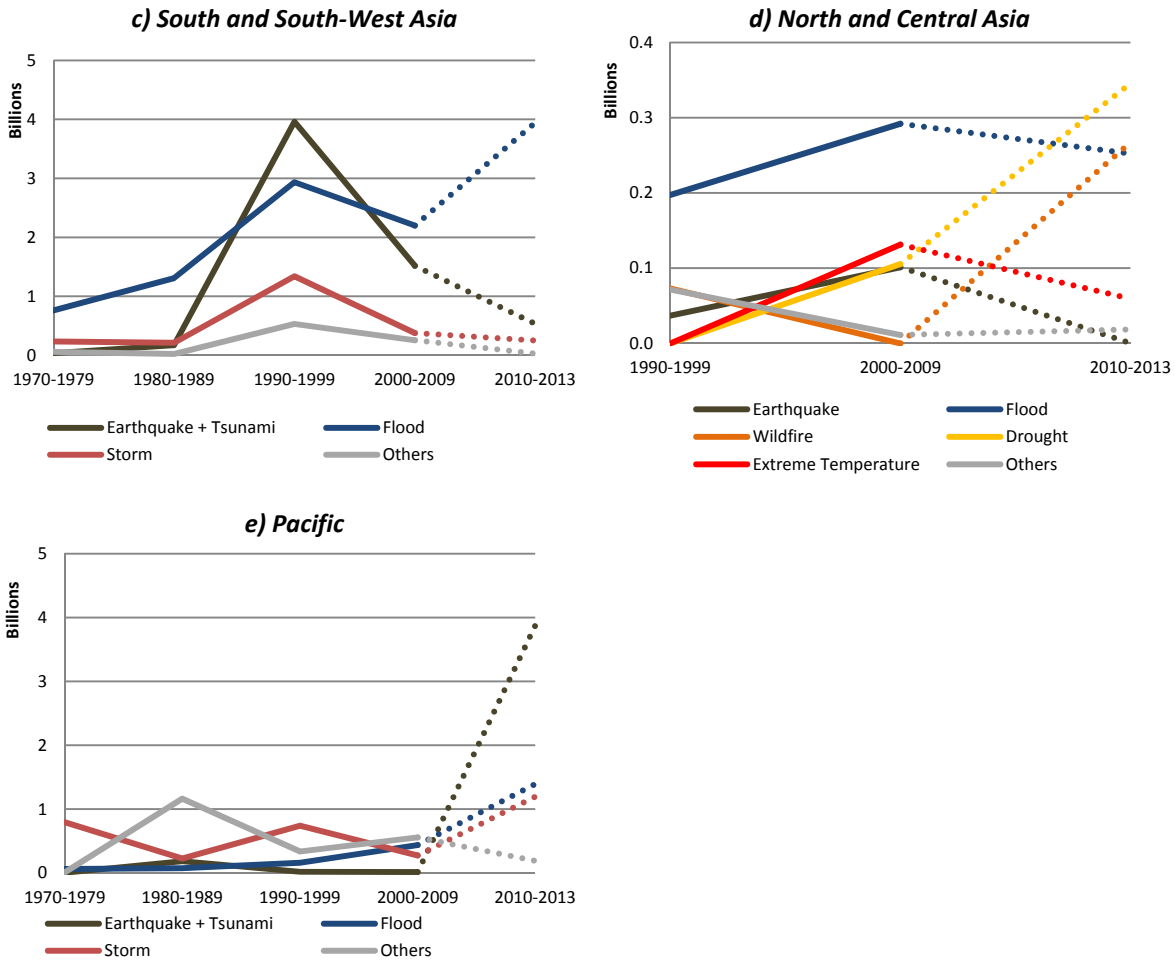


Figure 3.9 Average Yearly Economic Losses from Natural Disasters in Each Subregion by Type (Continued)

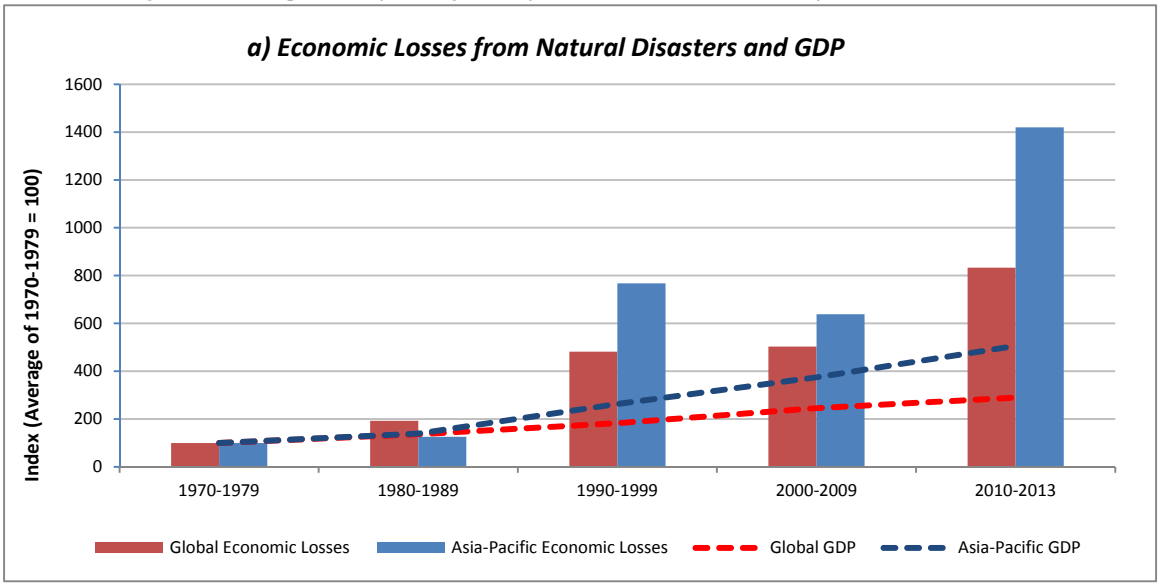


Records of Asia and the Pacific are also alarming in terms of economic losses as a percentage of GDP. Figures 3.10 and 3.11 compare GDP growth and increases in economic loss from natural disasters. Globally, economic losses from natural disasters multiplied by around 8.3 times between the 1970s and recent years, while the global GDP only increased 3 fold. Accordingly, economic losses from natural disasters increased from 0.09 per cent of the global GDP in the 1970s to around 0.27 per cent in recent years (Figure 3.10).

The region follows this trend, but with much higher levels of economic losses as a percentage of GDP. In Asia and the Pacific, the economic losses increased by more than 14 times while regional GDP grew by 5 times. Accordingly, economic losses surged from $5 billion per year in the 1970s, or 0.16 per cent of the regional GDP, to around $75 billion per year in recent years, or around 0.45 per cent of the regional GDP. This suggests that building resilience to natural disasters in Asia and the Pacific is an imperative for economic growth to continue at the current pace (ESCAP: 2013).

Nevertheless, subregional performance differed. Figure 3.11 presents trends in economic losses as a percentage of the GDP in each subregion. The economic losses from natural disasters have risen substantially in East and North-East Asia as well as South-East Asia, in comparison to the subregional GDP.

Figure 3.10 Comparison of Average Yearly GDP and Economic Losses from Natural Disasters



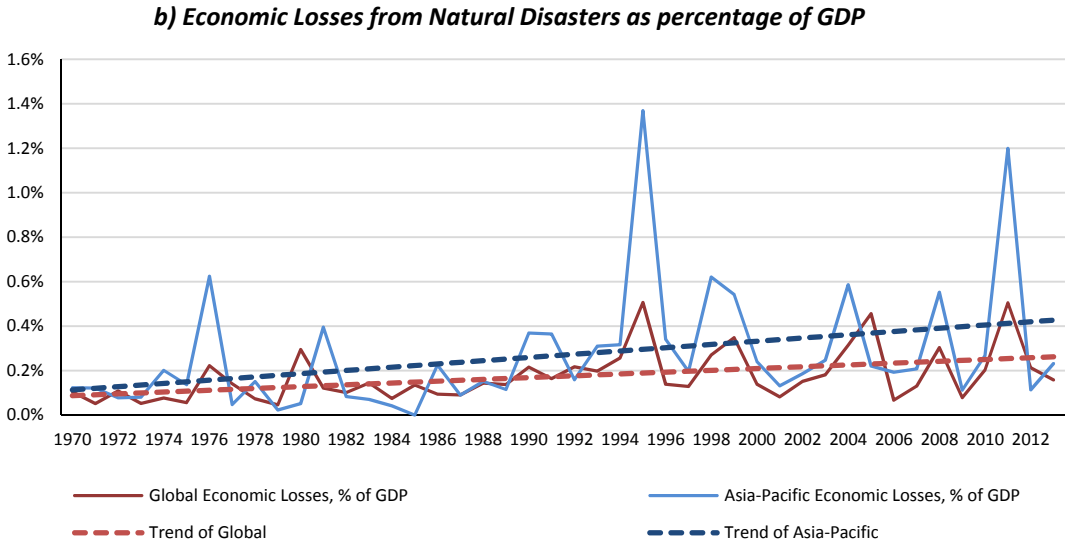
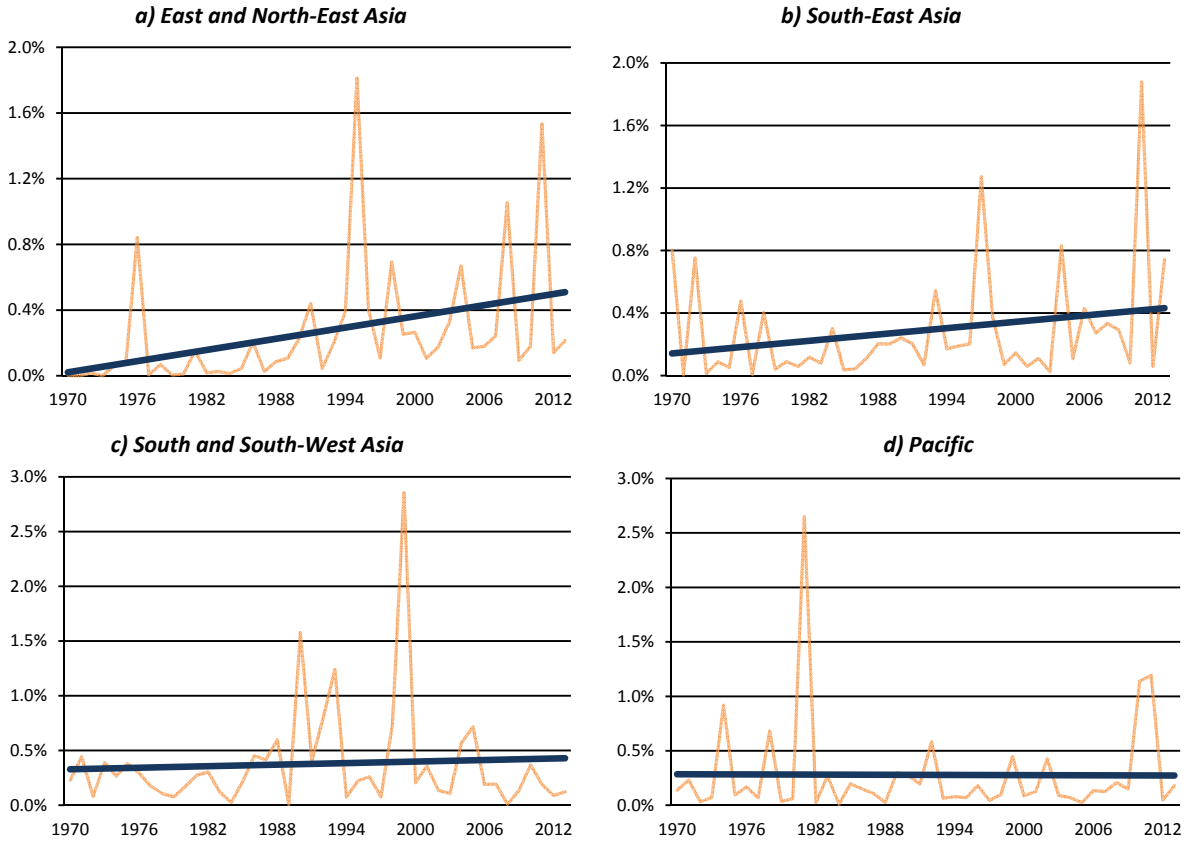


Figure 3.11 Economic Losses as Percentage of GDP in Each Subregion

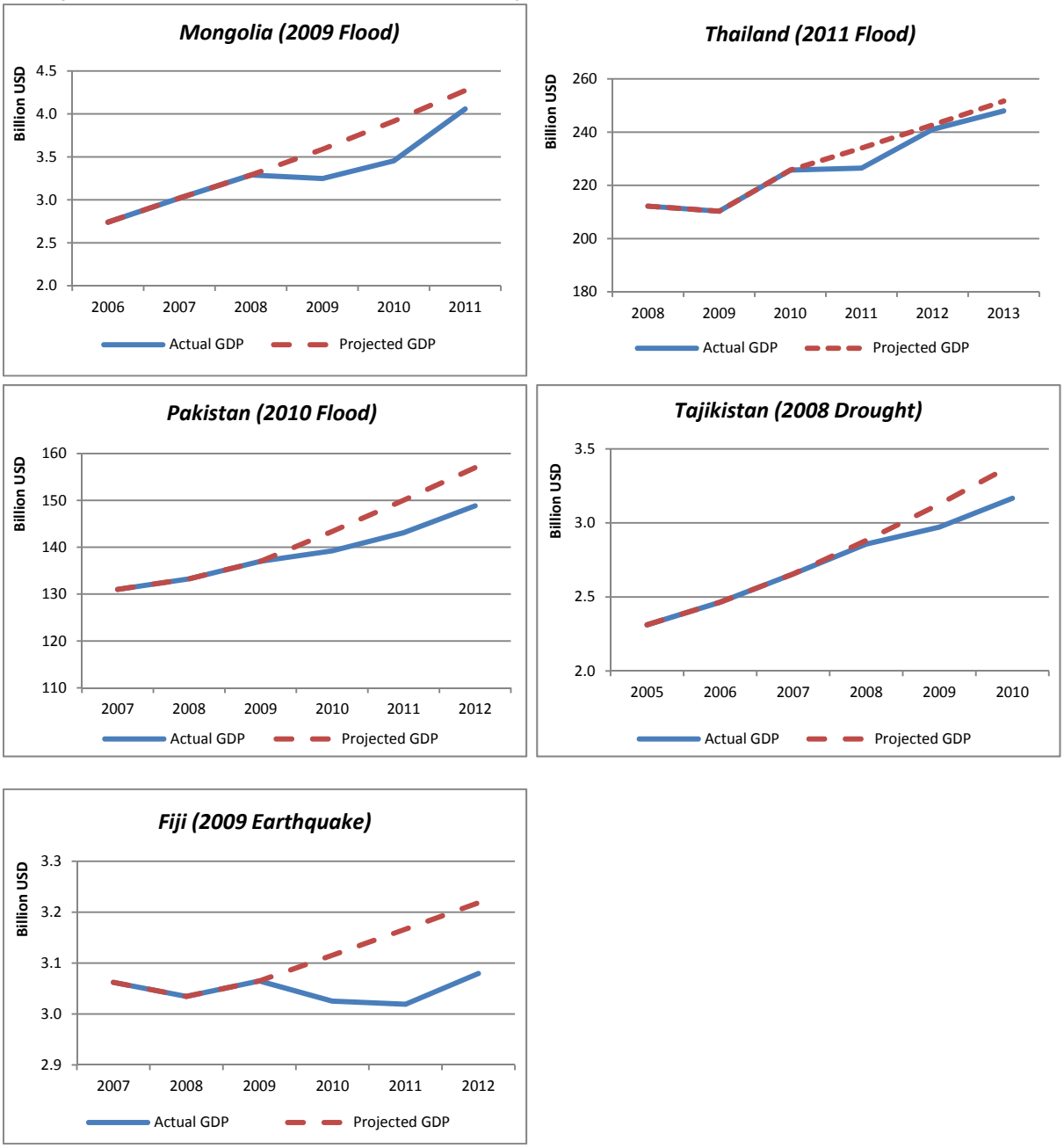


C. Adverse Impacts of Natural Disasters on the Economy

Natural disasters indeed have a significant impact on national economies. They destroy production facilities, assets and infrastructure as well as human capabilities, and thus, in most cases, they lead to short-term contraction in the economy (Noy: 2009, Cavallo et al.: 2010) although some sectors, such as construction, may experience short-term expansion due to rebuilding efforts.

Figure 3.12 compares observed GDP and projected GDP with no disaster event scenarios, following one of the major natural disasters in selected countries. In all five cases (one from each subregion), in the years subsequent to the natural disasters, GDP was substantially lower than the projected GDP, and it took years to recover.

Figure 3.12 Variations between Observed GDP and Projected GDP with no Disaster Scenario in Selected Countries

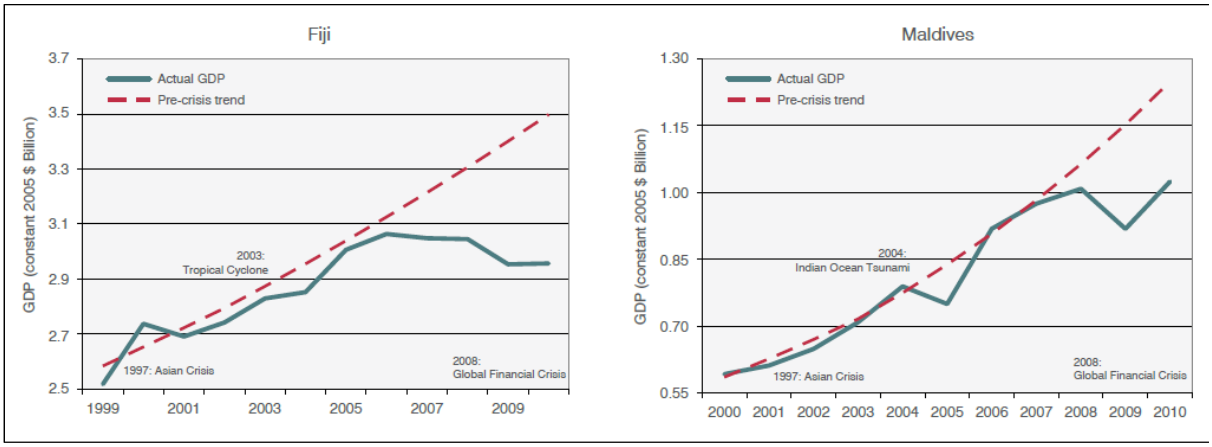


** Note: The GDP projections for the two years following disaster events are simple calculations from average of previous five years of GDP growth rates, assuming ceteris paribus.*

Moreover, there is evidence that large scale natural disasters can cause long-term economic losses, especially if the disaster is part of a series of exogenous shocks. This is clearly illustrated by the 2003 Cyclone "Ami" in Fiji and the 2004 Indian Ocean Tsunami in the Maldives, both of which were coupled with the 2008 global financial crisis (Figure 3.13; ESCAP: 2013). The Pakistan economy was also not

able to return to its long-term GDP trend after a major earthquake of magnitude 7.6 hit the country in October 2005, followed by the Cyclone Yemin and subsequent flooding in 2007 (ESCAP: 2012). Small economies, those countries that do not have well diversified economies, and those who face macroeconomic instability face specific difficulties in recovering from large disasters.

Figure 3.13 Persistent losses caused by shocks



Source: ESCAP (2013)

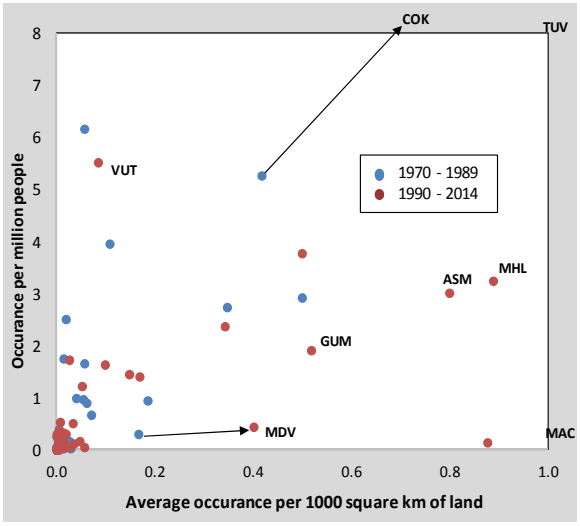
IV. EXPOSURE AND VULNERABILITY TO NATURAL DISASTERS

A. High Exposure of SIDS and LDCs

The economy of Asia and the Pacific has rapidly grown over the past decades. This has certainly contributed to socio-economic development with increased economic opportunities and improved education and health services, among other benefits. However, economic growth of the region, associated with rapid population growth and urbanization, has also contributed to increasing the exposure to disaster risks, as reported by the Asia-Pacific Disaster Report 2012 (ESCAP: 2012). For example, the number of people exposed to flooding every year more than doubled from 29.5 to 63.8 million between 1970 and 2010 (Herold et al., 2009; Herold and Mouton, 2011). Similarly, the population inhabiting cyclone-prone area has also grown from 71.8 million to 120.7 million during the same period (UNISDR, 2009, UNISDR, 2011a and Peduzzi et al., 2012).

Countries in the region are at different levels of exposure and vulnerability to natural disasters depending on their physical and socio-economic characteristics, and accordingly, it is necessary to identify the countries that are more exposed to natural disasters.

Figure 4.1 Average Occurrences of Natural Disaster Events per Million People and per 1,000 km^2 of Land Area



Source: ESCAP Statistical Database, EM-DAT, and World Bank

Table 1. Top 15 Most Exposed Countries Worldwide

Country	Exposure (%)	Rank
Vanuatu	63.66	1
Tonga	55.27	2
Philippines	52.46	3
Japan	45.91	4
Costa Rica	42.61	5
Brunei Darussalam	41.10	6
Mauritius	37.35	7
Guatemala	36.30	8
El Salvodor	32.60	9
Bangladesh	31.70	10
Chile	30.95	11
Netherlands	30.57	12
Solomon Islands	29.98	13
Fiji	27.71	14
Cambodia	27.65	15

Source: Bündnis Entwicklung Hilft and UNU-EHS, 2014

Figure 4.1 plots exposure of countries in Asia and the Pacific as represented by the total number of natural disaster events per one million people and per 1,000 km^2 of land area.[8] Several Pacific island countries were found to be highly exposed to natural disasters when population and land area are

[8] *Total number of occurrences from 1970 to 1989 and from 1990 to 2014 / total population, aggregated (or land area). ASM=American Samoa, COK=Cook Islands, GUM=Guam, HKG=Hong Kong, China, MAC=Macao, China, MHL=Marshall Islands, TUV=Tuvalu, VUT=Vanuatu*

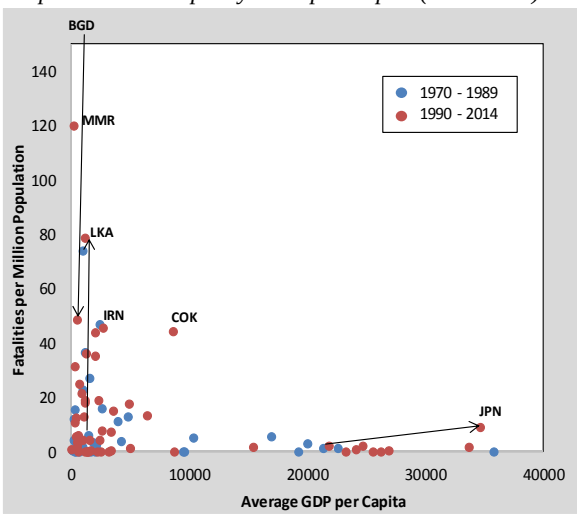
considered. Although the total number of events in these countries is lower than those in the larger and more populous nations of China and India, a person living in these countries is actually more likely to experience a natural disaster event than a person living in China or India.

This is consistent with the findings of the World Risk Index 2014 (Bündnis Entwicklung Hilft and UNU-EHS: 2014) where exposure is measured as the number of people exposed to or threatened by five types of natural disasters: earthquakes, storms, floods, droughts and sea level rise. Globally, nine out of the 15 countries most exposed to natural disasters are from Asia and the Pacific. Specifically, the high exposure of Fiji, the Solomon Islands, Tonga and Vanuatu is recognized. Bangladesh, Brunei Darussalem, Cambodia, and the Philippines are also highlighted as highly exposed countries (Table 1).

B. Vulnerability of LDCs

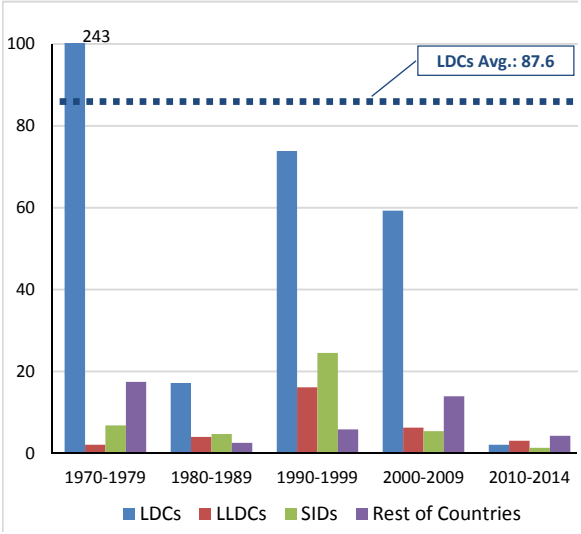
Figure 4.2 presents fatalities per million people of the countries in the region against GDP per capita to illustrate disaster impacts against a measure of the size of economy.[9] In comparison, fatalities per million people were quite low in all medium and high income countries, as expected from their presumably higher capacity to address natural disasters and implement disaster risk reduction measures. Although Japan experienced a substantial increase in fatalities per million people in recent years due to the Great East Japan Earthquake in 2011, none of the more developed countries recorded more than 10 fatalities per million people on average.

Figure 4.2 Fatalities from Natural Disasters per Million People by GDP per Capita (1970-2014)



Source: ESCAP Statistical Database, and EM-DAT

Figure 4.3 Fatalities from Natural Disasters per Million People in LDCs, LLDCs and SIDS

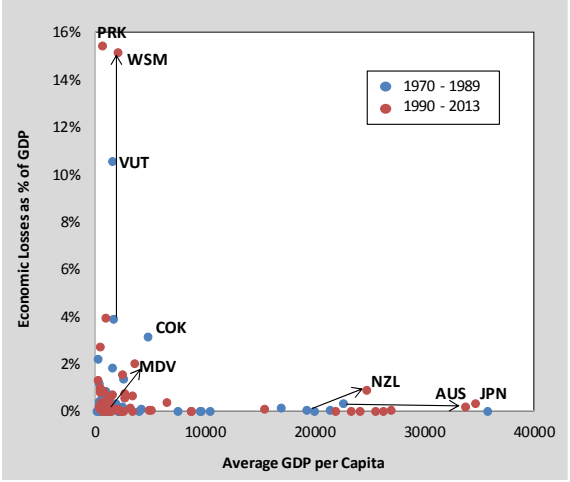


[9] *Total number of fatalities from 1970 to 1989 and from 1990 to 2014 / total population, aggregated. BGD=Bangladesh, COK=Cook Islands, IRN=Islamic Republic of Iran, JPN=Japan, LKA=Sri Lanka, MMR=Myanmar*

The changes of fatalities per million people in different groups of countries are presented in Figure 4.3.[10] LDCs in Asia and the Pacific show the highest number of fatalities per million people in all periods except the most recent 5 years. However, the extremely high fatality figure over population in the 1970s has substantially reduced in the decades that followed.

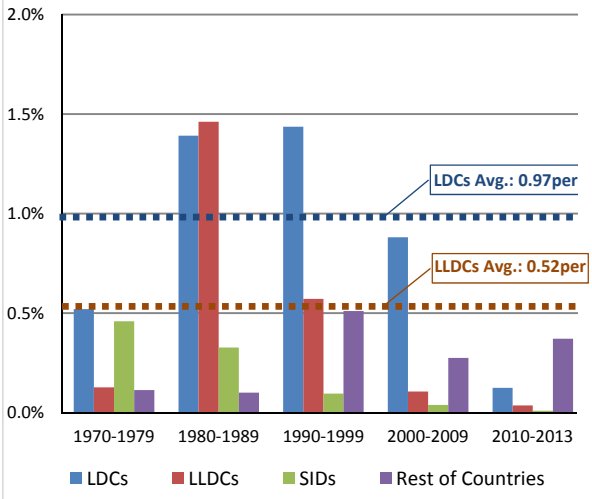
Total economic losses from natural disasters as a percentage of GDP are presented in Figure 4.4 by GDP per capita.[11] All countries with more than $ 10,000 GDP per capita recorded low levels of economic losses when measured as a percentage of their GDP. New Zealand and Japan are the notable exceptions due to the Christchurch Earthquake and the Great East Japan Earthquake in 2011. Both saw significant jumps in economic losses over the last two decades, but these were still less than one per cent of their respective GDP.

Figure 4.4 Economic Losses from Natural Disasters as Percentage of GDP by GDP per Capita



Source: ESCAP Statistical Database, and EM-DAT

Figure 4.5 Average Yearly Economic Losses from Natural Disasters as Percentage of GDP in LDCs, LLDCs and SIDS



However, several low-income countries suffered greatly, with high levels of economic losses as a percentage of their GDP. This indicates the vulnerability of low-income countries to natural disasters, and supports Noy (2009) who emphasized the vulnerability of developing countries rather than developed economies, and of small economies rather than larger ones. Small island countries recorded significant increases in economic losses as a percentage of GDP in the last two decades, threatening development progress. Figure 4.5 presents average yearly economic losses as a percentage of GDP among different groups of countries. The Figure shows very high levels of economic losses from natural disasters in LDCs and LLDCs as they have lost respectively 0.97 per cent and 0.52 per cent every year on average.

[10] *Grouping of countries followed the classification of ESCAP Statistical Database for the year 2013.*

[11] *Total damage from 1970 to 1989 and from 1990 to 2013 / GDP, aggregated. AUS=Australia, COK=Cook Islands, JPN=Japan, KOR=Republic of Korea, MDV=Maldives, MNG=Mongolia, NZL=New Zealand, PRK=Democratic People's Republic of Korea, TJK=Tajikistan, VUT=Vanuatu, WSM=Samoa*

The findings in this report are generally in line with the World Risk Index (Bündnis Entwicklung Hilft and UNU-EHS: 2014) on its vulnerability component that reflects susceptibility, coping capacities and adaptive capacities combining different socio-economic indicators. It ranked Afghanistan as the most vulnerable country in the region. Other LDCs including Bangladesh, Cambodia, Myanmar, the Solomon Islands, Timor-Leste and Vanuatu were also listed as vulnerable countries.

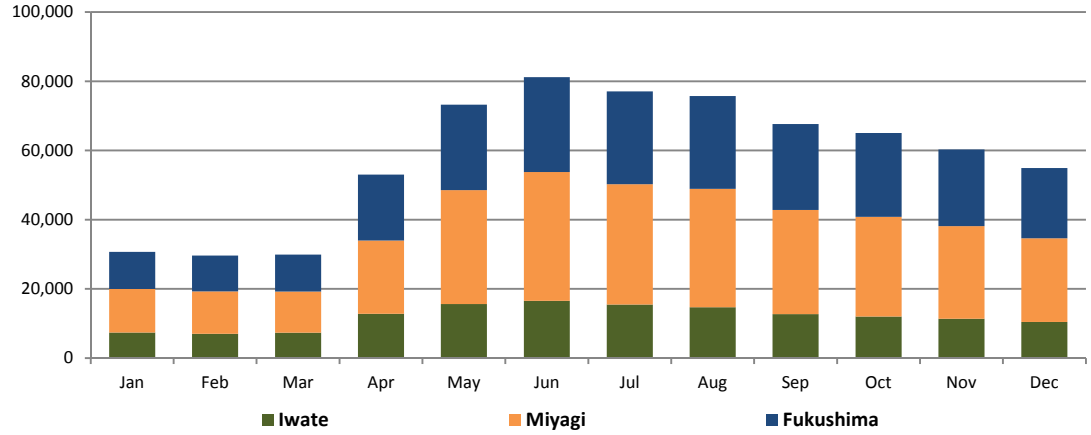
C. Impacts on Vulnerable Groups

At the national level, the poor are often the most exposed and vulnerable to natural disasters. Often living in precarious circumstances, they have few buffers against natural disasters and can fall into a vicious cycle of hardship. Members of society with the lowest level of income tend to settle in hazardous areas and are thus likely to be hardest hit by natural disasters. Each disaster or shock, such as an economic crisis, threatens to erode their ability to recover, particularly if erosive coping strategies are employed such as selling assets or taking children out of school.

The differential vulnerability of the poor compared to that of the rich has been well reported. According to Anttila-Huges and Hsiang (2013), low-income households suffered from larger cumulative losses from storms compared to high income households, and their income and consumption also recovered more slowly.

The impacts of natural disasters on employment are exacerbated by the reduced ability of the poor to cope with disasters as they are more likely to rely on income rather than assets. Disasters can also impact the labour market. After the Great East Japan Earthquake, the number of individuals receiving employment insurance benefits increased by 174 per cent from 29,630 to 81,179 between February and June 2011 in the 3 disaster-stricken prefectures of Tohoku: Iwate, Miyagi and Fukushima (Figure 4.6). During the same time, the total number of individuals receiving employment insurance benefits in the rest of Japan only increased by 12 per cent.

Figure 4.6 Number of Individuals Receiving Employment Insurance Benefits in the Disaster-stricken Prefectures of Tohoku (2011)



Source: Ministry of Health, Labor, and Welfare, Government of Japan

Among the poor, the most vulnerable to natural disasters are women, children and 'excluded individuals' who are often neglected or have less access to networks and fewer relationships, including persons with disabilities and older persons.

It was estimated that between 60 and 70 percent of deaths from the Indian Ocean Tsunami in 2004 were among women and children, while women were overlooked in the distribution of relief or had no access to places where relief was being distributed in case of the 2010 floods in Pakistan. Women and girls were also more vulnerable to storms in the Philippines. In particular, death rates in the year after the typhoon exposure were significantly higher among female infants compared to their male counterparts (Anttila-Huges and Hsiang: 2013).

In Aceh, Indonesia, 53.7 per cent of the victims of the Indian Ocean Tsunami were either children below 10 years or elderly above 70 years, and nearly two thirds of the dead or missing people were women or girls (Rofi et al.: 2006). Sri Lanka also reported high mortality of children (31.8 per cent for 0-5 years, 23.7 per cent for 5-9 years) and of people above 50 years (15.3 per cent) (Nishikitori in Sawai: 2011). It was also found that a large number of school buildings collapsed from the 2005 earthquake in Pakistan, killing more than 15,000 school children (SAARC: 2011). In Cambodia, floods have been a major factor in student drop-out rates. Students have suspended their studies due to inaccessibility to schools during flood events, while many schools are destroyed or used as emergency shelters (EIC: 2008).

The Great East Japan Earthquake 2011 also adversely affected the persons with disabilities. Their death rate was double that of the general population in major disaster-stricken regions. The coastal area of Miyagi reported a 3.5 per cent death rate of persons with disabilities, which was four times higher than that of the general population (Fujii: 2012).

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