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Impact of Natural Disasters on World's Economy

Final Report
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Submitted to
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Introduction

A natural disaster is a catastrophic event resulting from natural processes of the Earth. Every year, millions of people are affected by **n**atural disasters. Simply, humans have no control over the events. Nevertheless, the only possible step which can be considered as to prevent it and to reduce the magnitude of its consequences is to increase the preparedness.

According to report published by Thomson Reuters Foundation, the recent United Nation statistics that since 1970 over two million individuals have been killed by natural disasters an average of 43,000 annually. Meanwhile in the Asia-Pacific, the most disaster-prone region, where 60 percent of world population lives, the disasters has claimed approximately five thousand casualties and economic damage in the year 2016 worth $77 billion. “The region accounts for 57 percent of the global death toll from natural disasters since 1970. The principal causes were earthquakes and storms, followed by floods. A person in Asia-Pacific is five times more likely to be hit by a natural disaster than someone living in other regions”[1].

Consequently, a natural disaster can cause loss of life and damage the infrastructure thus having economic and social impact like forced migration caused by natural disaster which do have direct impact on people’s life. An adverse event will not increase to the point of a catastrophe if it happens in a region without a fragile population. However, in a fragile region such as Nepal during the 2015 earthquake, an earthquake can have catastrophic effects and leave lasting damage that can take years to repair

[1] “Thomson Reuters Foundation. “FACTBOX-Asia-Pacific: The World's Most Disaster-Prone Region.” *News.trust.org*, http://news.trust.org/item/20171010030737-rqs41/.

Aim

The main aim of this report is to study the impact on socio-economic factors caused by the natural disasters and to analyze related data on different ways. In this report, I have tried to analyze and visualize the occurrence of natural disaster from 1900 to 2018 AD in different part of the world. And this report also covers the analysis of the adverse effect of the natural disasters with respect to economic damage and inter migration throughout the World.

Data collection and Analysis

Data collection

In this report the data require for analysis and visualization are accessed on the website of the Centre for Research on the Epidemiology of Disasters (CRED), School of Public Health, Université Catholique de Louvain, Brussels, Belgium maintaining the Emergency Events Database (EM-DAT). EM-DAT was launched in 1988 with initial support of the World Health Organization (WHO) and the Belgium Government.

According to CRED, "*The main objective of the database is to serve the purposes of humanitarian action at national and international levels. The initiative aims to rationalize decision making for disaster preparedness, as well as provide an objective base for vulnerability assessment and priority setting."*[1]

EM-DAT provides a huge collection of data on occurrences of natural disaster in the world from 1900 to the present day. EM-DAT is a database maintained collecting the information from different sources like UN agencies, non-governmental organizations, insurance companies, research institutes and press agencies. Among them the priority is given to data from UN agencies, governments, and the International Federation of Red Cross and Red Crescent Societies.

[1] "DAT: The International Disasters Database." *EM*, www.emdat.be/.

Natural Disaster classification

According to Centre for Research on the Epidemiology of Disasters (CRED), natural disasters are classified in six categories: Geophysical, Meteorological, Hydrological, Climatological, Biological and Extraterrestrial as on the table 1. Among all, "Geophysical" means that the processes occurring at solid earth like Earthquakes, mass movement(dry) and volcanic activities. And disasters caused by the short-live, micro to meso scale extreme weather and atmospheric conditions from last minute to days like extreme temperature, fog and storm are classified as "Meteorological". "Hydrological" are disaster caused by the surface and subsurface freshwater and saltwater like floods, landslide and wave action. Hazard those of "Meteorological" but due to intra-seasonal to multi-decadal climate variability like drought, glacier lake outburst and wildfire are consider as "Climatological".
"Biological" disasters are considered as disasters that ate related to living organisms along with their toxic substance including epidemic disasters, insect infestation and animal accidents. Lastly "Extraterrestrial" disasters are caused by asteroids, meteorites and comets as they enter into the Earth's atmosphere.

Table 1. Natural Disaster classification by CRED[2].

Disaster Group	Disaster Subgroup	Definition	Disaster Main Type
Natural	Geophysical	A hazard originating from solid earth. This term is used interchangeably with the term geological hazard.	Earthquake
			Mass Movement (dry)
			Volcanic activity
	Meteorological	A hazard caused by short-lived, micro- to meso-scale extreme weather and atmospheric conditions that last from minutes to days.	Extreme Temperature
			Fog
			Storm
	Hydrological	A hazard caused by the occurrence, movement, and distribution of surface and subsurface freshwater and saltwater.	Flood
			Landslide
			Wave action
	Climatological	A hazard caused by long-lived, meso- to macro-scale atmospheric processes ranging from intra-seasonal to multi-decadal climate variability.	Drought
			Glacial Lake Outburst
			Wildfire
	Biological	A hazard caused by the exposure to living organisms and their toxic substances (e.g. venom, mold) or vector-borne diseases that they may carry. Examples are venomous wildlife and insects, poisonous plants, and mosquitoes carrying disease-causing agents such as parasites, bacteria, or viruses (e.g. malaria).	Epidemic
			Insect infestation
			Animal Accident
	Extraterrestrial	A hazard caused by asteroids, meteoroids, and comets as they pass near-earth, enter the Earth's atmosphere, and/or strike the Earth, and by changes in interplanetary conditions that effect the Earth's magnetosphere, ionosphere, and thermosphere.	Impact
			Space weather

[2] "Classification: EM-DAT." *EM*, www.emdat.be/classification.

Data Analysis

In this report we will have a look at some data, graphs and maps to analyze the occurrence of natural disasters along with the consequent data set for economy caused by the natural disaster. In the addition, I have included data set of Internal migration caused by natural disasters, where the internal migration has a direct effect on people's living standard and also indirect effect on socio-economic impacts. I have extracted all the data from "Our World in Data" report by Ritchie, Hannah, and Max Roser, and source based on "THE UNIVERSITY OF OXFORD".

Tool used for Analysis and Visualization

Tableau is a software that helps in visualizing the interactive data. In this report, all the graphs are generated using the tableau. Each line graph is able to display the time series from 1990 to 2018 AD, whereas the map visualization of the data ranges from 2008 to 2018 AD.

Occurrence of Natural Disaster

The line graph shown in figure 1 shows the time course of number of all natural disasters which occurred from 1900 to 2018 AD. The data show that there a higher number of natural disasters in the last 20 years as compared to previous. Period from 1900 to 1980 the frequency of the occurrence was below 50 per year whereas between 2000 to 2010 more than 600 different disasters are reported yearly.

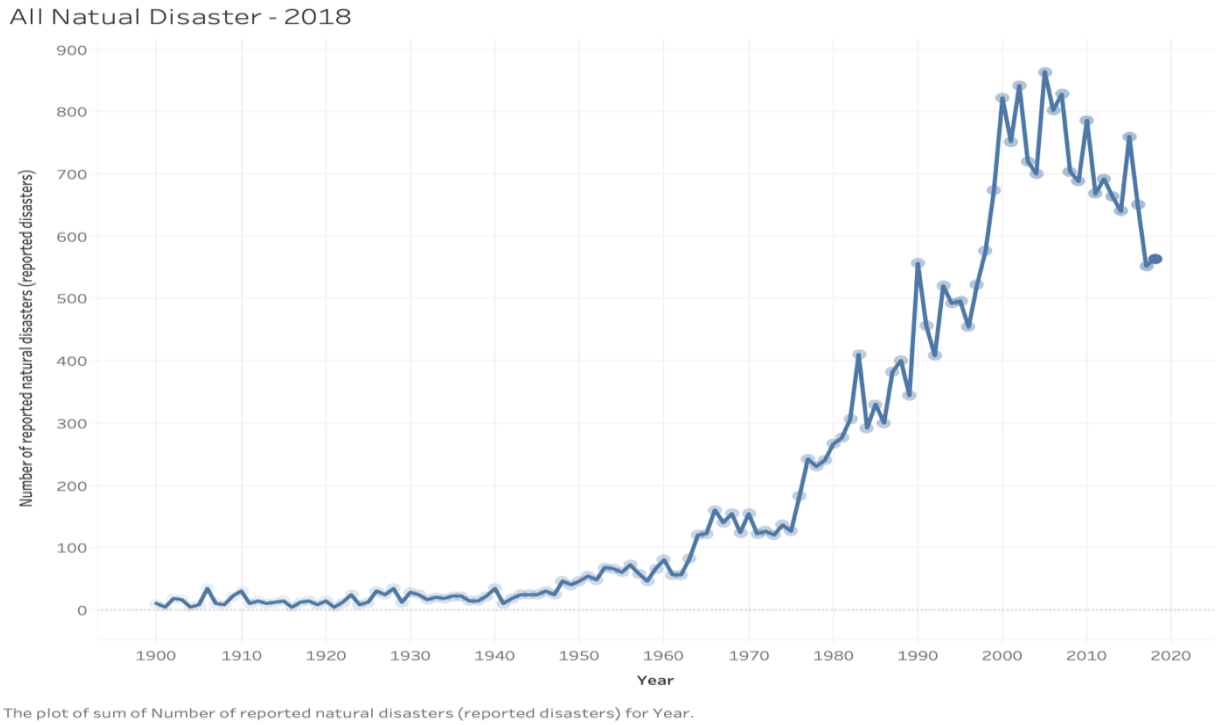

Figure 1. Time course of the global number of reported disasters per year

Figure 2 illustrates the number of occurrences of the different types natural disasters from 1900 to 2018 AD that include Drought, Earthquake, Extreme temperature, Extreme weather, Flood, Impact, landslide, Mass movement (Dry), Volcanic activity and Wildfire. During the last two-decade floods contributed the most to the total number of disasters. Along with change in life style of people from 20th century to 21st century which has direct impact on nature with that due to the emission of greenhouse gases and leading increased the temperature remarkably. Even though, there is no any inter connection with the different natural disaster but the number of the occurrence increase on every decade.

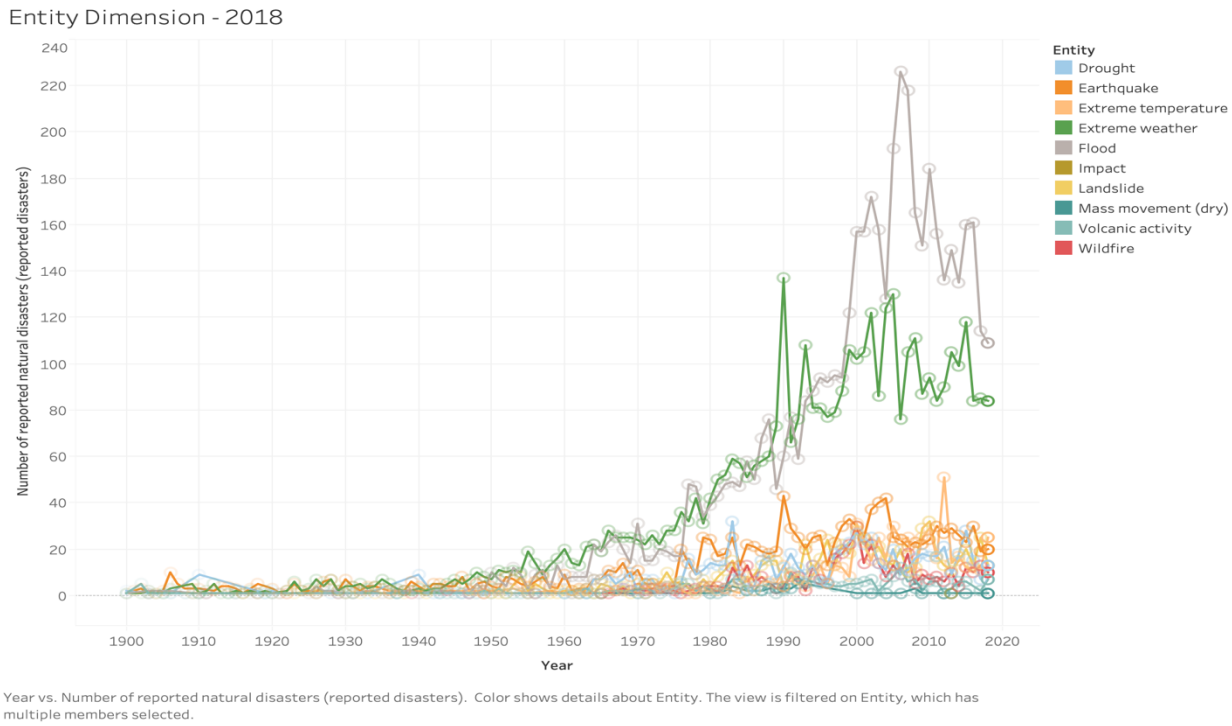

Figure 2. Number of occurrences of different natural disasters

The box plot shown in figure 3 shows there is larger deviation in occurrence of floods and disaster due to extreme weather than other natural disasters possess lower variance.

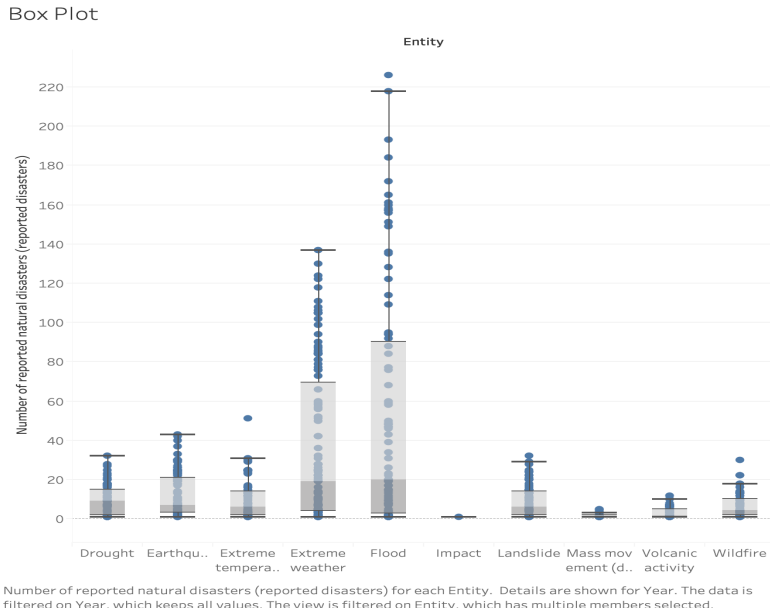

Figure 3. Variability of the number of occurrences of different natural disasters

Economic Loss caused by Natural Disaster

The biggest disasters have slowed down regional economic growth for the decades in the long run. A flood or the earthquake destroys bridges, highways and utilities. Homeowners who do not have insurance coverage go bankrupt.

The line graph shown in figure 4 shows the average economic loss due to the natural disasters. Along with increment in the number of occurrences of natural disaster from 1980 AD as from figure 4, economical damage also simultaneously increased. Regarding the maximum in 2011, it was stated "the 9-magnitude Earthquake and Tsunami that pummeled the nation on March 11, 2011, dealt a devastating blow to Japan's economic. An estimated 28,000 died and 500,000 have been displaced. It cost $360 billion."[4]

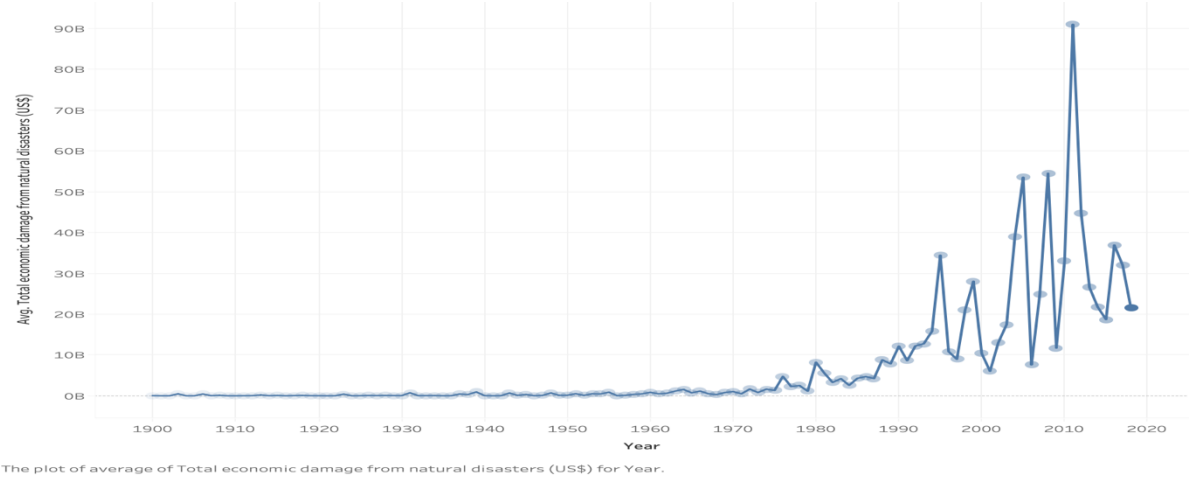

Figure 4. Average total economic damage from all natural disasters

Figure 5 illustrates the total economic damage from different types of natural disasters. It clearly shows that each and every time when Earthquake occurred there was the largest economic loss. Along with that, extreme weather events and floods have a high impact on economy due to fact that they have a high frequency of occurrence as seen on figure 2.

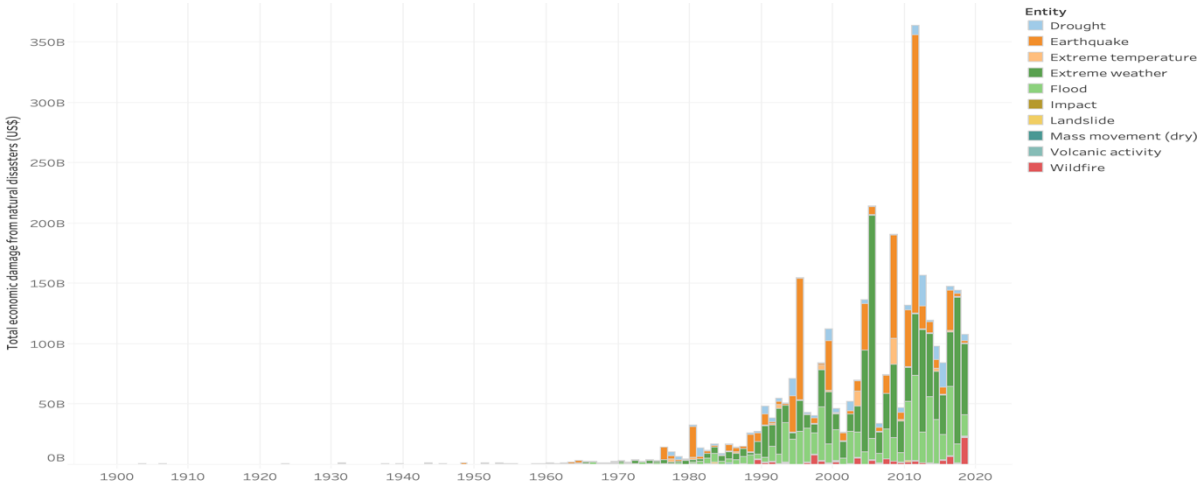

Figure 5. Average total economic damage from different natural disasters

[4] Amadeo, Kimberly. "Natural Disasters Are a Bigger Threat Than Terrorism." *The Balance*, The Balance, 25 June 2019, www.thebalance.com/cost-of-natural-disasters-3306214.

The graph shown in figure 6 illustrate comparison on number of different natural disaster occurred with total economic loss caused by all natural disaster. That shows the relation of different natural disaster like Drought, Earthquake, Extreme temperature, Extreme weather, Flood, Impact, Landslide, Mass movement (dry), Volcanic activity and Wildfire with amount of economic damage by these disasters. Where each and every time Earthquake occur on 2004, 2011 and 2015 AD (Tsunami was occurred due to Earthquake within Sea are classified under Earthquake category) on Indonesia, Japan and Nepal respectively, tends to have high economic impact. As a whole, the frequency of occurrence is very high in recent year and long huge amount of economic damage followed through.

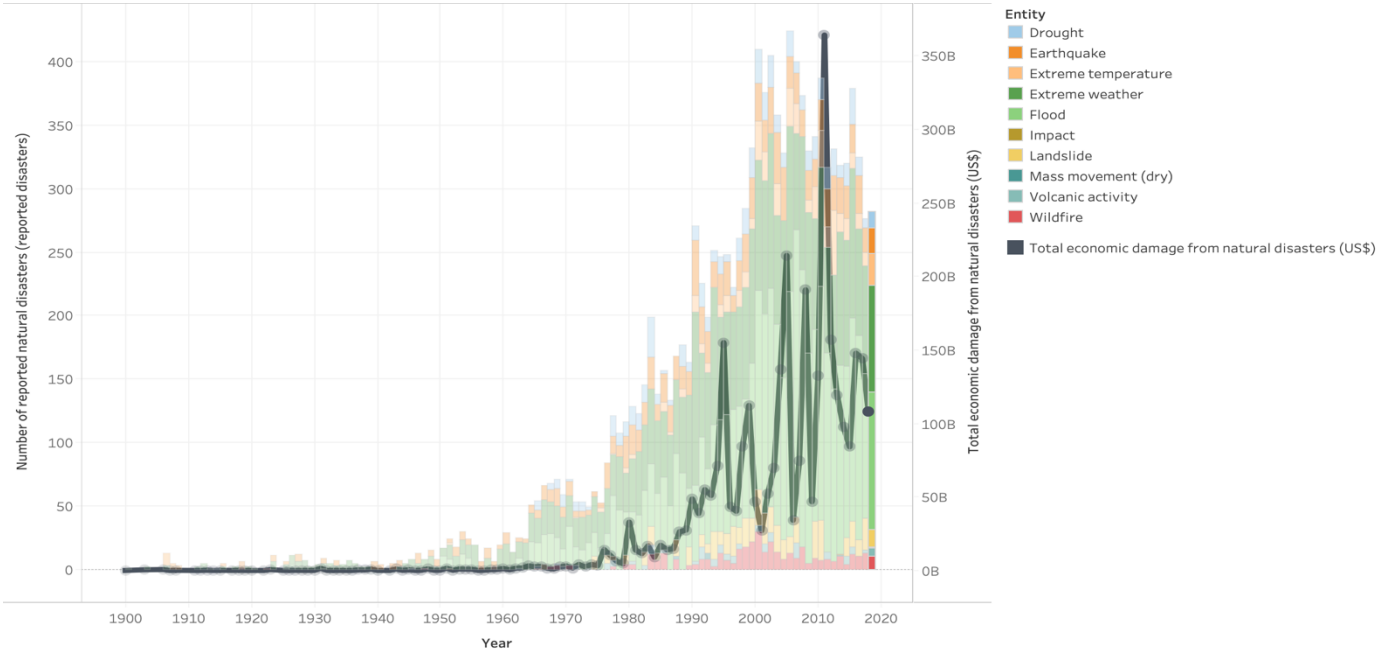

Figure 6. The time course of number of natural disasters occurred vs total economic damage

Internal migration caused by Natural Disaster

Every year since 2008 there have been approximately 26.5 million displaced by disasters. Whereas, the statistical data in 2014 are less than average but still the Norwegian Refugee council has stated by Alfredo Zamudio, director of the NRC's Internal Displacement Monitoring Centre that there is a long-term increase with the statement "Disaster-related displacement is on the rise and threatens to get worse in coming decades,"[5].

Asia, led by typhoons in China and the Philippines and floods in India, accounts for almost 90 % of 19,3 million displaced people in 2014, said the Norwegian Refugee Council. Asia is espe cially susceptible to natural disasters.

Figure 7 shows the map view of the internal migration caused by the natural disasters in the year 2017. Actually, the map view designed using tableau allows to scan through data of years from 2008 to 2017. For the report I have selected the year 2017 values where the change in color density specifies the number of people forced to migrated by natural disaster.

As we can see, migration caused by different natural disasters occurred through-out the world.

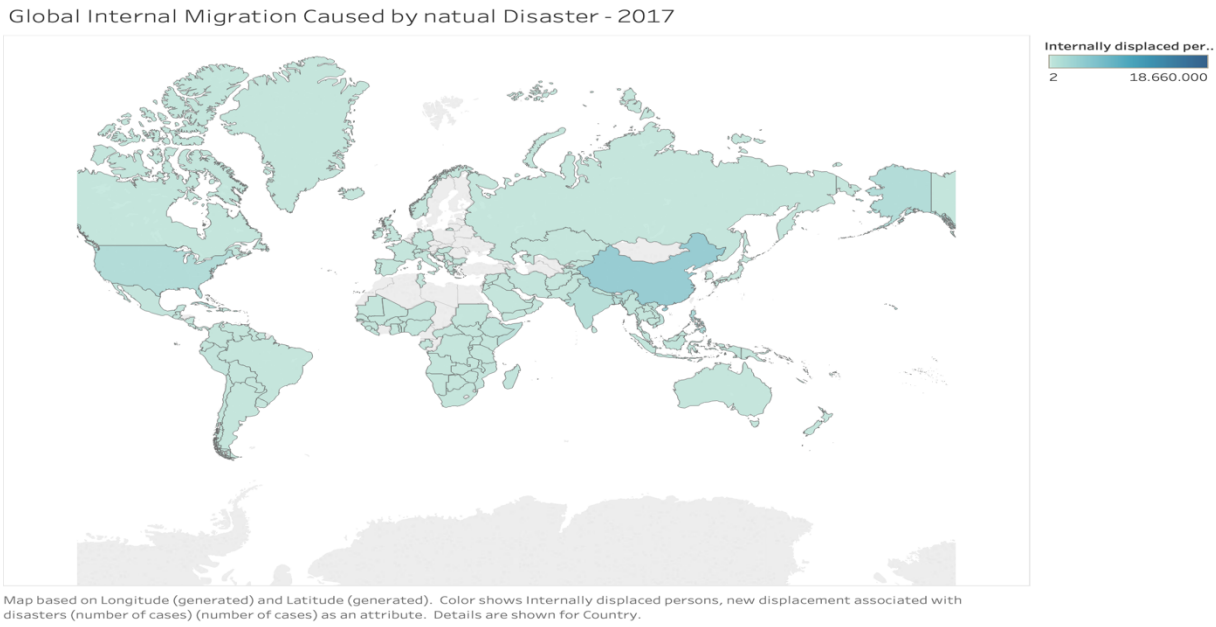

Figure 7. Global Internal Migration caused by natural disasters

[5] Nebehay, Stephanie. "Natural Disasters Forced 20 Million from Their Homes in 2014: Report." *Reuters*, Thomson Reuters, 20 July 2015, www.reuters.com/article/us-climatechange-migrants/natural-disasters-forced-20-million-from-their-homes-in-2014-report-idUSKCN0PU1M120150720.

Summary

Even after the evolution of technical science, the natural disasters are unpredictable in nature. The only way to minimize the effect of the natural disaster is to take precaution. Along with that sensitive regions should be equipped with essential material to minimize the effect and consequences natural disasters. During the recent decade there was a clear trend towards a higher frequency of disaster and a higher economic loss due to disasters. Thus, assisted humanitarian action should be taken to rationalize decision-making for disaster preparedness and to provide an objective basis for vulnerability assessment and priority setting in sensitive regions.

Reference

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