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The Impact of Climate Change on Natural Disasters

Arti Sharma

Assistant Professor Department Zoology, Government Degree College Prithvipur District Niwari - 472336

Abstract
Climate change is significantly increasing the frequency and intensity of natural disasters, primarily by causing more extreme weather events like intense storms, prolonged droughts, rising sea levels, and wildfires, leading to greater devastation and impacts on human populations and ecosystems globally; essentially, a warmer atmosphere fuels more powerful storms and creates conditions conducive to extreme weather events.

Keywords- Climate change impact, Natural hazards, Disasters, Event attribution, Disaster risk Distributuion, Tropical cyclone

INTRODUCTION

The present study investigates the impact of climate change on biodiversity loss using global data consisting of 115 countries. In this study, we measure biodiversity loss using data on the total number of threatened species of amphibians, birds, fishes, mammals, mollusks, plants, and reptiles. The data were compiled from the Red List published by the International Union for Conservation of Nature (IUCN). For climate change variables, we have included temperature, precipitation, and the number of natural disaster occurrences. As for the control variable, we have considered governance indicator and the level of economic development. By employing ordinary least square with robust standard error and robust regression (M-estimation), our results suggest that all three climate change variables – temperature, precipitation, and the number of natural disasters occurrences – increase biodiversity loss. Higher economic development also impacted biodiversity loss positively. On the other hand, good governance such as the control of corruption, regulatory quality, and rule of law reduces biodiversity loss. Thus, practicing good governance, promoting conservation of the environment, and the control of greenhouse gases would be able to mitigate biodiversity loss **(Tol 2018)**.

2 Natural Hazards: what are they?

Disasters like Hurricane Sandy in October 2012 that affected the Caribbean and the East coast of America or floods in summer 2010 that inundated large parts of India

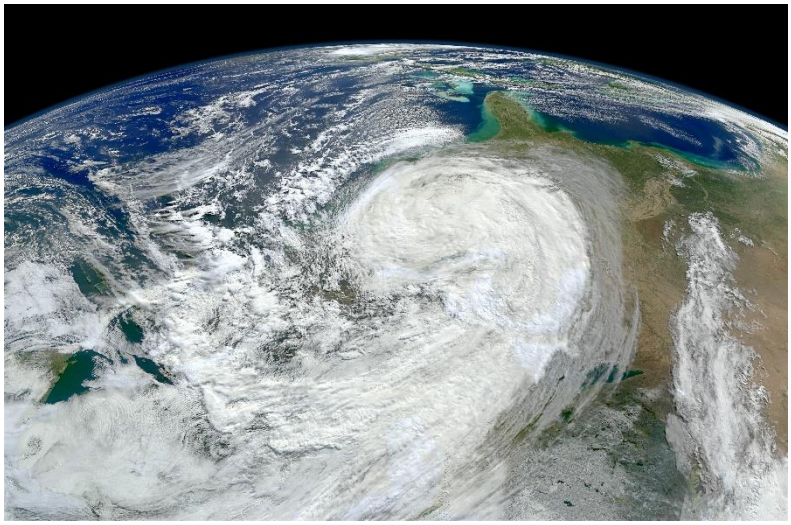

Fig. 1. Hurricane Sandy on October 28, 2012 on 1:45 pm eastern daylight time (Photo from Nasa Earth Observatory image (Strauss et al. 2021).

3. The Impact of Climate change on Natural Disasters

A Serious disruption of the functioning of community or a society involving widespread human material, economic or environmental losses and Impacts which, exceeds the ability of the affected community or society to cope its own resources. The United Nations international strategy for disaster reduction released a compilations of updated standard terminology related to disaster risk reduction to mainstream terms and their definitions, there exist a variety of definitions for extremes events, the world extreme can be used to describe the impact of the events of physical aspects of the events itself, which can lead to confusion. In general, extreme events, for example related with temperature or precipitation can be defined by Indices describing absolute quantities or the frequency of incidents beyond an absolute or relative threshold or by dimensionless indices, Natural hazards and extremes events fall into the same context and can be used interchangeably. Disasters and Natural hazards /extremes events are often associated with each other, but they are not the same. A disaster is the result of the severity of a natural hazard combined with the exposure to the hazard preexisting vulnerability and inability to cope with of the hazard, example of common hazards are hurricanes and forest fire, not every extreme event has a lead to a disaster, its largely depends on the prevailing conditions, the prevailing conditions are determined by level of vulnerability **(Ripple et al. 2024)**.

Fig.2; Forest fire

Fig 3; Damage because of climate change

Exposure and vulnerability and exposure of population. The exposure and vulnerability are not static. A variety of factors influence vulnerability and exposure such as social economic and geographic factors but also governance plays a role. Further vulnerability and exposure can be depending on the season or on co-occurrence of other extremes events socioeconomic variables, such as income, education, and age, will not influence the occurrence of climate extremes but they can impact the way of populations are able to prepare for, withstand, and recover from the impacts. The focus should lie on exchange entitlement and not on declining food availability. Another example that demonstrated how natural hazards can turn into disasters is hurricane that devastated New Orleans in 2005. The hurricane itself was considered a natural hazard, the flooding of the ninth ward (a neighborhood of New Orleans) however led to a disaster but arguably not a natural disaster. The disastrous outcome was caused by both the natural hazard (the hurricane) and human- made factors such as the inadequate preparedness level (e.g. Levees) or existing differential social vulnerabilities, in other words, prevailing factors like these mentioned in regard with famine or hurricane Katrina can contribute to explain the severity of the impact of natural hazard, A natural hazard like a landslide in a deserted mountainous region is hence not a natural hazard as it is lacking the human involvement. Based on this definition of hazards and disasters, disaster risk is a function of the prevailing conditions (exposure and vulnerability) as well as the extreme event itself, the concept of human vulnerability will be further discussed **(Yang et al. 2024)**.

3.1 Categories of natural hazards and problems with definitions

3.1.1. Earthquakes

The connection between earthquakes and climate change is slightly less straightforward, and certainly less influential. Most earthquakes occur when tectonic plates within the Earth's crust change or move. Many things can lead to this, but where climate change comes into play is once again related to water. Earthquakes can be triggered or prevented by variability in stress on a fault between tectonic plates. Stress on these faults is impacted by surface water from rain or snow. When there is heavier rainfall, this precipitation and any subsequent flooding increases stress and decreases seismicity. When the season dries up and there's less water, the weight on the Earth's crust decreases and this can lead to micro seismicity **(Bohnhoff et al. 2024).** As of now, the majority of the connection between earthquakes and climate change is with micro seismicity, or tiny earthquakes, which have magnitudes of less than zero and are so small

that humans can't feel them. While additional connections can be made, such as impacts from pumping groundwater during droughts, connections between larger earthquakes and climate change have largely not been proven, though the rapid movement of glaciers has also been shown to cause glacial earthquakes.

3.1.2. Extreme temperature

Climate change can lead to both extreme high temperatures and extreme low temperatures. The connection with extreme high temperatures is more intuitive — greenhouse gases are being trapped in the atmosphere and this leads to warming. However, the connection to extreme low temperatures can be harder for some people to make. Lower temperatures in some regions are a result of the polar vortex being warmer, causing it to weaken and dip down further than it normally would, bringing with it colder temperatures. This is further exacerbated by impacts to the jet stream that change the pattern of where and when hot and cold temperatures typically occur. These two combined have led to hotter summers and harsher winters in some areas.

3.1.3. Landslides.

Landslides are connected to rainfall as well. Due to climate change's impact on evaporation and precipitation, more frequent and intense rainfall events can lead to more landslides.

3.1.4. Wildfires

Wildfires are a consequence of the drier conditions caused by climate change in some areas. The wildfire season is much longer than in previous years and the number of wildfires per season has tripled. Severe heat and drought provide fuel for fires through drier soils and vegetation that is more flammable. Additionally, due to warmer temperatures, snowpacks are melting earlier, meaning that forests are drier for longer periods of time and increasingly at risk of fires.

3.1.5. Volcanic activity

Similar to earthquakes, volcanic activity has a less direct relationship with climate change. Volcanoes do contribute to changes in Earth's atmosphere through spewing CO2, aerosols, ash, and metals into the atmosphere, but they have a net cooling effect. This is due to the impact that aerosols have on cooling versus warming. On the flip side, there is some evidence to suggest that climate change could increase eruptions in a similar way that they impact seismic activity, through lessening the pressure on the Earth's surface. In this case, this decreased pressure causes more hot magma to come in contact with aquifers, which triggers eruptions. Additionally, melting glaciers are exposing more volcanoes **(Ogurtsov 2024)**.

Conclusion

This study reviews the major impacts and challenges of disasters and climate change risks on sustainable development, summarizes the important events and evolution of international disaster risk reduction and climate change adaptation over the past 30 years, and reviews the linkages of DRR and CCA to sustainable development. The three main conclusions are: (1) Disasters caused by both intensive and extensive disasters risks have a huge impact on lives and livelihoods. Indirect losses and cascading effects may cause even more serious damage to the socioeconomic development of a region or a society. Most disasters triggered by natural hazards are related to weather/climate events. Especially under a changing climate, compound events and systemic risks are increasing, and record shattering extremes are likely to occur in the coming decades, which will significantly limit our ability to adapt.

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