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A Review: Effects of climate change on agriculture, food resources and forestry

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Abstract
This paper describes that what are hazards and disasters, analyses their trends and evaluates the impact of climate change on them. Observations recorded since 1950 shows that increase in some thrilling weather events. The latest Special Report on Extreme Events and Disasters (SREX) by the Intergovernmental Panel on Climate Change (IPCC) forecasts that there will be more increase in the frequency of heat waves, intensity of droughts and speed of hurricanes till 21st century. Heavy rainfall events will also rise having a great impact on the frequency of floods and also have impacts on the landslides. This paper scrutinizes the knowledge of event attribution, its probability and issues. It also examines the worldwide distribution and effect of natural disasters.

Keywords: climate change, disasters, disaster risk distribution, floods, attribution

Introduction

Climate change shows the changes in the weather patterns for years or longer. The change in the climate occurs due to human activities and natural effects. By the emanations of Green House Gases, aerosols and changes in the land use by human activities results in an increase of global temperature (Brath *et al*., 2015) [11, 12]. The worldwide weather is changing due to rise in global temperatures, increase in carbon dioxide (CO2) and other Green House Gases (GHGs) and changing patterns of rainfall (Backlund *et al*., 2008) [6]. It has been found that the rise in average global temperature since the middle of 20th century is mainly due to an increase in the anthropogenic Green House Gases concentration (Pachauri & Reisinger, 2007) [39]. The change in the weather pattern presents main doubts into the earth's present and future ability to yield food, fodder, fuel, and fiber for the growing population (Smith et al. 2007) [45]. According to Intergovernmental Panel on Climate Change IPCC (2007) [27] emerging and the least industrialized countries are likely to suffer more than the industrialized countries due to changes in the weather pattern. Whenever there is any climatic glitch the poor people has to face a lot of difficulties due to deficiency of resources. Human activities are considered as a main source for increasing the disaster which are arising worldwide.

Disaster means an abrupt devastating and unpredicted event. At domestic level disasters can cause diseases, demise and social calamity. At communal level it can be in the form of a flood, earthquake and fire. At regional level large amount of individuals can be effected (Johns, 2006). A disaster is basically a situation which devastates native ability and causes destruction, demolition and human anguish (World Bank, 2010). Rise in overall temperature might have different effects such as surge in hurricanes, floods, droughts, rise in sea level and deterioration of glaciers (Brath *et al*., 2015) [11, 12]. The high level of water besides river conduit leads to the barrage of land but not typically inundated is known as flood. Floods occur progressively and might take hours or it can occur abruptly without any cautioning due to fissure in the embankments and heavy rainfalls etc. Floods could also leads to a huge area of agronomic land getting overwhelmed resulting in the loss of a large amount of crops. This leads to the scarcity of food and animal feed (Natural hazards and disaster management, 2006). The word drought is a constant and provincially widespread existence of below natural water accessibility (Van lanen *et al.*, 2007). It is not be get mixed with the aridity as aridity is a long term feature of dry weather which shows the circumstances of inequities between water sources and demands for a long period of time (Tallaksen and van Lanen, 2006). The effects of droughts are economic losses and death (Farell D, *et al.*, 2010). Landslides are the mixture of slide, spread, tumble, drop, flow, wreckage slide, ground flow, rock fall and rock slide (Science plan on hazards and disaster, 2008). Landslides can cause the damage to property, distraction of transportation paths and health problems. The quality, quantity and availability of water might be effected by the landslides (Meunier P *et al.*, 2008) [34]. The seismic activities of the earth can be recorded by the Richter's scale, So the fissures and cracks which occur on the ground, uprooted trees and rocks and building flop is known as earth quake. The abrupt destruction caused by the earth quake, such as crumpling of buildings, roads and channels (Naghi *et al*., 2005) [38].

General overview of climate change and disasters

There is an undeniable indication for discrepancy in the global weather conditions and for the natural cycles (figure 2) but there is also a very strong indication that some variations are presently taking place which are exceeding infrequently and are not acceptable for the natural patterns. It has been observed that the present earth's average temperature is higher nowadays than the past 2000 years (Jones and Mann, 2004) [32].

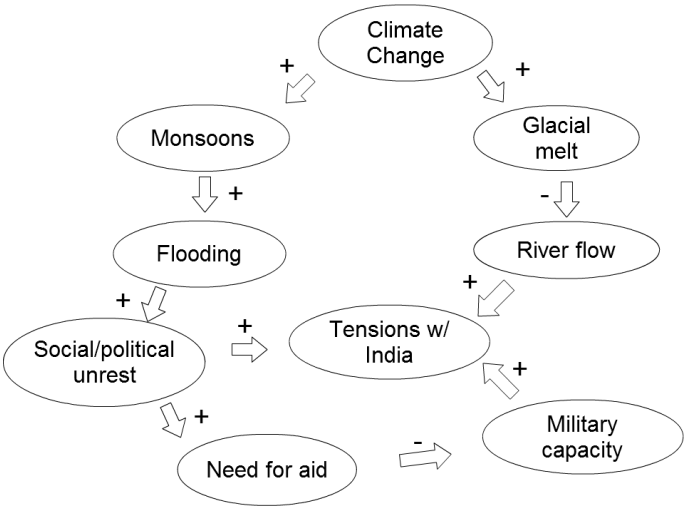

Fig 1: Variation in the Global Climate change (Jones and Mann, 2004) [32].

Intensifying occurrence of heavy rainstorms is considered to be the consequence of warming climate. In some areas there will be more chances of droughts as the precipitation decreases while some areas will have to suffer from heavy rainfall more frequently. There are also some areas which might not experience any change in the overall precipitation but can have rare precipitation, more intense surges leading to flashy floods interrupting time period of prolonged droughts. So the changes observed in heat, heavy rainfall and drought in different areas are constant with the global warming (Huber DG, 2011) [26]. Changes in the weather pattern, increase in the sea levels and the melting of the glaciers are considered to be responsible for the landslides, floods, volcanic eruptions and earth quake (Thompson A, 2007). In some places global warming can primarily increase agricultural production while in several places global warming will decreases the urge for energy. So as the climate change advances there will be more and more negative and irreversible impacts leading to the damage of ecosystem. For human systems, much will depend on our ability to adapt to the changes. Variations in crops, changes in the infrastructure designs and numerous other aspects can significantly increases the resilience to unfavorable climatic conditions and also increase the benefits of weather changes (Aalst MK, 2006) [1].

Climate Influences on Floods

Floods are multifaceted events initiated by the human exposures, unsuitable development design and climate changeability (ADPC, 2005) [3]. Floods damage buildings and frequently cause drastic displacement of human population. According to environmental view floods are known as the life blood of watercourses (Poff *et al.*, 2002) [41, 42]. Floods overflow is extremely a non-linear system vulnerable to natural and spatial changeability of geography, loam, vegetation, metrological and groundwater system **(**Figure 2), (Beven K, 1993) [10].

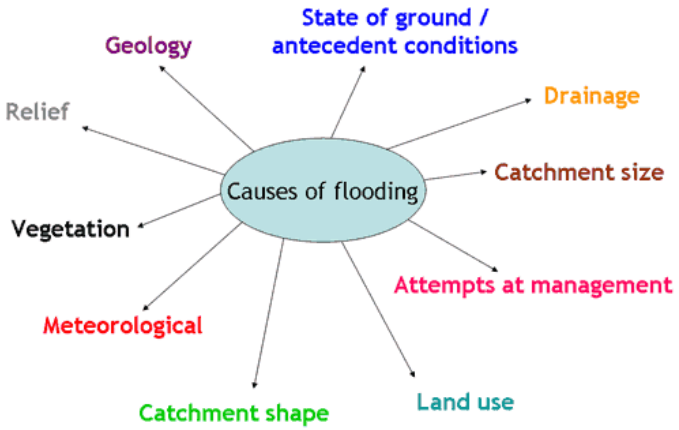

Fig 1: Causes of flooding (Beven K, 1993) [10].

Flood destruction effects are classified into two types direct and indirect effects. Direct flood can cause destruction related to instant physical interaction of the flood water to human beings, damage covers all varieties of harm which relate to the instant physical contact of flood water to humans, assets and the surrounding environment while the indirect effects causes distractions of the commercial and societal activities. One noticeable example is damage of the commercial products due to demolished facilities, deficiency of energy and the disruption of resources. Floods have numerous health effects. The infections most probably exaggerated by floods are those which need an automobile vehicle for transference from host to host known as vector-borne (Patz *et al.*, 2005) [40]. The areas which have been affected by the floods serve as an idyllic breeding land for microorganisms and can modify vector breeding land and zoonotic basin. Where contagious infection transmission is widespread (Baqir *et al.*, 2012) [7]. In both conditions the greater frequency of surface overflow can increase rubbish conscription, consequent transference and obstruction of surface pipes (Streftaris *et al.*, 2012) [46]. The interaction among groundwater and climatic conditions is not properly understood. Any change in spatial consistency of precipitation and temporal sequencing are thus likely to be essential (Taylor *et al.*, 2013) [47].

The effects of floods on agriculture

Floods can decrease the overall vegetation of an area, causes soil erosion and deformed the topography of a land (Danilo *et al.*, 2013) [17]. Floods can cause substantial destruction to grassland. Pastures, weed invasion, soil type and the amount of sediments and rubbish. Floods also have influences on gases exchange among the roots, loam and atmosphere. Flooding also has impacts on the structure of soil, health and productiveness (John E, 2014) [30]. Agriculture is at risk to both groundwater and surface water floods (Morris and Wheater, 2007) [37]. Drowning of the agricultural land results in less production of crops and livestock productivities (Figure 3). The effects of floods on agriculture

fluctuate significantly by tolerance of the specific crops, frequency, time period and depth. Flooding in summer season can totally destroy the crops of grass ready for harvesting. Destruction of grass and forage crops depends on the farmer's estimations. Moreover, it was observed that after flooding no more cropping occurs in the flooded areas (Morris and Hess, 1988).

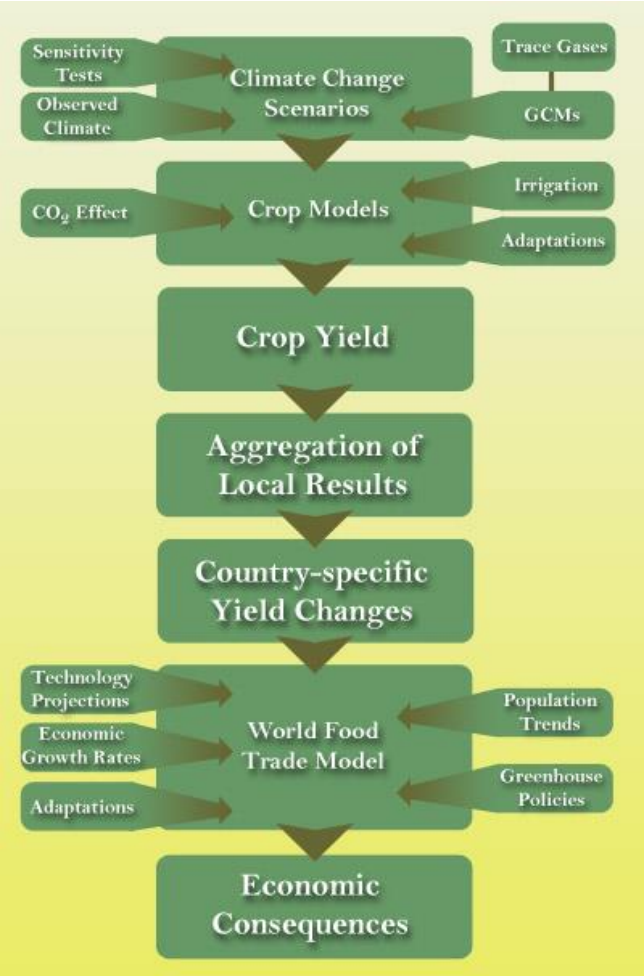

Fig 3: relationship between floods and crop yield (Morris and Hess, 1988)

The agricultural crops zone experienced the prevalent destruction at field areas including complete loss of crops. Drowning of vegetable crops generally leads to market refusal due to destruction and threat of contamination (Posthumu *et al*., 2008). The particular damage of agricultural production depends on the variety of crops, phases of plant growth and time duration of floods (Chau *et al*., 2013).

Floods effects on livestock and forestry

People attain their income from livestock in the form of food stuff, wages and organic fertilizers (Fanrpan *et al*., 2011). Irregular floods cause the destruction of livestock for income in the country. An irregular flood causes the hindrances for livestock serving and housing. The diseases like foot and mouth infections are caused by the mudflat and water lodging resulting in the loss of huge amount of livestock (Ahmed *et al*., 2012). Flooding can have direct or indirect effects on the cattle and their holders by death during flooding, destruction of animal feedstuffs and increased distress trades of cattle and other properties (figure 4). These problems commonly occur in livestock but the flooding exaggerate them (Jabbar A, 2016) [29]. Mature livestock was not as much badly affected by the floods as small cattle. Flooding cause diseases in animals like rashes and splitting hooves. A collective amount of livestock died during flooding years was subtracted from the total amount of the livestock present before the occurrence of the floods (Huber *et al*., 2009) [25].

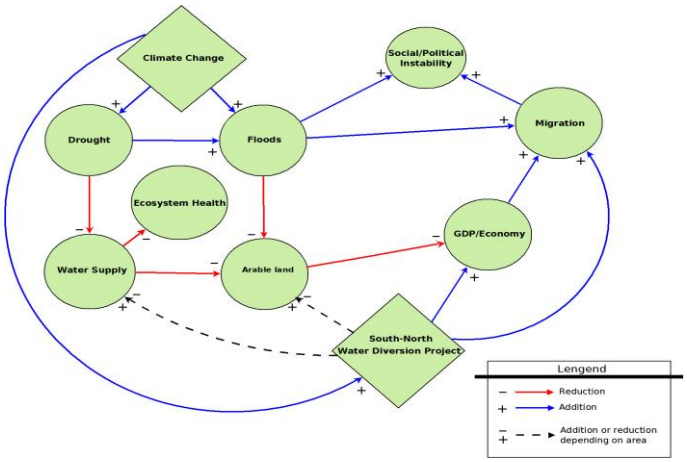

Fig 4: Effects of irregular flooding on Economy (Huber *et al*., 2009) [25]

Flooding can affect height of trees, growth of trees and their persistence. The changes in the soil, physical destruction, pests and ailments can cause damage to the trees. Trees which suffers from flooding shows a variety of symptoms like reduction in the size of leaves, consequent defoliation, growth of epicormic shoots, leaf chlorosis, premature fall coloration and leaf drop. These symptoms might progress and eventually results in the death of trees (Beckerman, J. 2001) [8]. Floods increase the pH of acidic soils and decrease the pH of basic soils. The degree of decaying of organic material in flooded loam becomes half than the unflooded loam. The main products of decaying of organic material in flooded loam are carbon dioxide (CO_2), methane (CH_4), and humic matter. Flooded water can have chemicals from the city areas or agronomic arenas that might be detrimental for trees when the roots of the trees absorbed them (Gillitzer, P. 2009) [22]. Flooded water which covers the vegetation on inferior branches will inhibit the process of photosynthesis and gaseous exchange resulting in the death of the branches (Bratkovich *et al*., 1994) [13]. Trees are more vulnerable to floods damage in dawn spring after the initial level of growth. A flood dislocates air in the loam leading to the death of the roots. Trees which are vigorous before flooding can persist flooded water worthy condition. After flooding the maintenance of trees relies on either you are handling various acres of forest or limited yard of trees (Johnson, B. 2009) [31].

Commutative Effects of Disasters

Those disasters which occur naturally are known as natural disasters like landslides, floods, volcanic activities, forest fires, cyclones, windstorms, earth quake and tsunamis. All the disasters do not occur naturally some disasters are due to the human activities like battles, extremist attacks, nuclear events, endemic

diseases, industrial calamites and transportation calamities (Cavallo and Noy, 2009) [16]. Extreme precipitation means that more chances of floods mainly flash floods. In winters there is more rainfall than snow and there is more chances of abrupt overflow (EEA, 2004) [20]. In Mediterranean areas having fewer rainfall but strong precipitation this results in crippling mixture of droughts, heavy rains and vicious flash floods. Together with soil deprivation and forest fires which results in desertification (EEA, 2003) [19]. Combined with the intensifications in high temperature which causes the surface aeration, the decrease in overall summer rainfall which increases the chances of the droughts (Klein *et al*., 2002). Flooding is more evident and faster sensed than the effects of deprived air quality. The water can retreat rapidly the impacts have similar long-term consequences that disturb numerous sectors (IPCC 2012) [28]. Tornado and floods are deal together as they are frequently interrelated. Tornadoes destroy buildings by storm pressure specially damages the rooftops by wind-born armaments, storm driven water diffusion of constructing covers and through wind surges. Cyclones are frequently attended by heavy rainfall resulting in the widespread flooding. During winter season snowstorms are likely to reduce in mid-latitudes resulting in fewer substantial snowmelt floods in spring season. (Brath *et al*., 2015) [11, 12]. Floods can have substantial long-lasting effects on humans due to uncleanliness of drinking water. Earthquakes cause destruction in many ways the utmost important of which is liquefaction, avalanches, and forest fires. Liquefaction usually take place in free drenched sandy land and damage the power of that land due to resilient ground movement (Torregosa *et al*., 2001) [48]. Earthquake causes major distractions to transport, power systems and to provide water for agronomic activities disturbing agronomic production abilities and selling and supply activities. The cattle population deteriorated promptly as they are killed during the earthquake (Benson *et al*., 1997) [9]. Environmental deprivation also has an important role in the occurrence of natural disasters such as deterioration of forest protection leading to an increase in the overflow of water, causing more recurrent flash floods, avalanches and droughts (Bravo *et al*., 1990) [14]. A catastrophe occurs due to the combination of dangerous hazards, susceptibility and insufficient safety of the exaggerated people. Catastrophes might leads to long-lasting hindrances in education, well-being and occupation opportunities through starvation, inhibiting and missed education. It is significant to notice that not all disasters results in such deleterious long-lasting impacts and retrieval can be comparatively fast in some nations as compare to other nations (Andrew *et al*., 2013) [5].

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