

Dual Impact Of Climate Change

Intensifying vulnerability

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Abstract— World is suffering from poverty, inequality, and hunger. Millions of the people do not have the basic amenities of survival so acquiring quality of life would be farfetched. Further, the climate change and its effect in terms of natural disasters only add to the vulnerability of deprived section of society. In recent times, the world has witnessed climate change of gigantic proportions at one hand and Natural disasters have become extremely commonplace all over the world on the other hand as its potent after effect. Every year 250 million people are affected by natural disasters. Since 1992 the international community has spent some \$2.7 billion (1.9 billion Euros) to help mitigate the impact of hurricanes, floods and droughts. If we look at the number of those events over the last 10 years, then it is clear that they have increased in number. There is convincing evidence that changes in the earth's climate are taking place that cannot be explained without taking into account human influence, through the emission of greenhouse gases (GHGs). This paper attempts to understand the different facets of climate change including: factors affecting the climate change, its fatal impact on living creatures through low agriculture production, increasing sea level and Natural disasters. This paper also tries to understand the relationships between the ever increasing natural disasters and climate change. The concept of vulnerability, and the community led solutions towards managing the behavior for acquiring better world to live.

Keywords- climate change, natural disasters, vulnerability, community based solution

I. INTRODUCTION

Climate change is one of the most complex challenges of our century. No country is immune to its ill effects and deleterious consequences. According to a new report United Nations Framework Convention on Climate Change (2006) the world is in danger of missing targets for providing clean water and sanitation unless there is a dramatic increase in the pace of work and investment between now and 2015. A quarter of the population of the developing world lives on less than \$1.25 a day. More than 1.1 billion people in both urban and rural areas currently lack access to drinking water from an improved source and 2.6 billion people do not have access to even basic sanitation, the report shows. The health impact of this can be seen particularly in children. WHO estimates that in 2005, 1.6 million children under age 5 (an average of 4500 every day) died from the consequences of unsafe water and inadequate hygiene. 1.6 billion People do

not have access to electricity. A quarter of all developing countries' children are malnourished. Addressing this problem will remain the priority of most of the developing countries and the countries which are becoming more vulnerable to climate change with all absence of human conditions of human survival. Estimates say that developing countries would bear some 75 to 80 percent costs of damages caused by changing climate. Even 2 degree Celsius warming above normally evidenced temperatures could result in permanent reduction of 4 to 5 percent for Africa and south Asia. Most developing countries lack sufficient financial and technical capacities to manage increasing climate risks. They also depend more directly on climate sensitive natural resources for income and well being.

II. UNDERSTANDING DIFFERENT FACETS OF CLIMATE CHANGE

Humanity is facing its most serious existential crisis on planet earth which is witnessing its most dramatic climate change since the ice age. The threats posed by climate change because of the human disturbance with the environment have loomed large. Climate change has many visible and scientific after effects which are directly related to life and livelihood of human beings. Here two things are of great importance, firstly, the environment is not an unchanging system but constantly undergoing changes due to human activity, sometimes even radical ones. Second is that the ecosystem is not in static equilibrium but in a continuously evolving dynamic equilibrium. (Raghubandan et. al, 2008).

A. Before Arrival of Human Beings

Our planet has changed several times in history. It took millions of years for earth to settle to some kind of balance in which the ecosystem could begin to support life. Before the arrival of human beings, our planet has witnessed several ice ages during which global temperature dropped dramatically down. Many species became extinct and many species arose which were apt to the change in environment. All these changes were due to forces of nature, changes in atmosphere, changes in earth's core and crust, in the distribution of land and oceans, in global temperatures.

B. After the Arrival of Human Beings

Human civilization bought different kind of changes in the environment. It has developed through its ability to act

upon the nature and harness it not just for survival or sustenance but for growth of self at the cost of nature.

- *Man Dependence on Agriculture:*

In ancient times when human were organized mainly by hunting and gathering, the human ecological foot print was minimal in terms of both extent and area of impact. With advent of tools of agriculture and clearing forests impact on environment became substantial though it was still limited to certain areas and extent. Great plains of huge and vast forests were made large scale cultivation areas, thus fundamentally changing the ecosystem.

It resulted on the regional weather change, in terms of higher temperature, change in rainfall pattern, and disturbance in regional ecology. But nature found equilibrium and adapted to human interference.

- *Man's imperative for industrialization:*

With the commencement of the industrial era, initially in Europe and then widened by the influences in colonies, some deep-seated changes occurred in the organization, functioning and management of human society across borders and regions. The extent and space of environmental changed with coal burning engines, machines and factories. The environmentally fatal gases were not limited to few regions but its impact was visible across borders.

The later period observed the spread of industrial technologies to ever- widening regions of the world with the conduct of economic activity on an increasingly global scale through colonialism and otherwise. Natural resources on land, underground, in forests and in ocean began to exploit on an unprecedented scale.

- *Post industrialization: finding comfort at the cost of nature*

With the consequent changes in patterns of energy production, consumption got drastically changed. Since 19th and 20th century fossil fuels and other irreversible sources of energy are running human life of luxury and comfort. The quantity and spread of environmental impact was such as to bring about the qualitative change in the global ecosystem especially its climate. We are today on the verge of global scale changes in our climate that could fundamentally and irreversibly alter the environmental conditions on our planet to the detriment of human civilization. (ibid)

III. SOURCES OF CLIMATE CHANGE

The changes happened during ice age and before are not clearly understood but in early 19th century it became scientifically proven that in the process of heating up the earth's surface, not all the incoming solar radiations warms up earth, some portion of the solar radiation is reflected back into the space by the earth's atmosphere, another portion is dispersed and scattered by the molecules in the atmosphere to reach the surface of the earth. Then the left radiations which are absorbed results in surface warming.

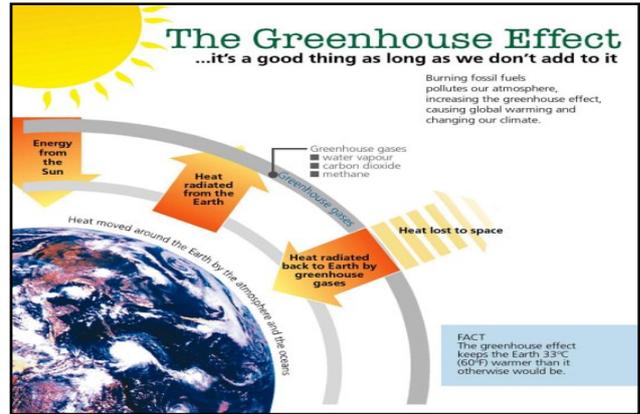


Figure 1. Understanding Green House Effect, Source: www.lessuk.org

Much of these absorbed energy is eventually re radiated outwards in longer infrared wavelengths, some of it escape out in the space, but much is reflected back by the earth's atmosphere. Gases that play a role in absorbing and radiating heat in the atmosphere, and in causing the green house effect, are therefore called Green House Gases (GHGs). These are mostly trace gases which constitutes approximately 1 percent of gases in the atmosphere, in effect control global temperatures. The problem is the abnormal increase in these gases thickened the blanket which eventually traps more infrared radiation reflected back from the earth's surface, warming up the earth temperature.

Greenhouse gases (GHGs) are minor components of the atmosphere compared to nitrogen or oxygen. However, their effects are predominant in the earth's heat balance. GHGs trap thermal radiation inside the atmosphere, thereby increasing temperature and contributing to a number of secondary phenomena directly linked with high temperatures, such as increased evaporation. The main GHG is water vapor, the warming effect of which remains practically constant. (FAO, 2008)

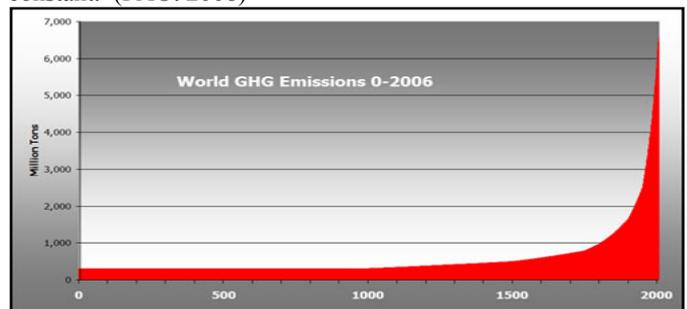


Figure 2. Changing trends of GHG emission, Source: www.idesign.wordpress.com

Intergovernmental panel on climate change (IPCC 2007)'s Assessment Report states that "warming of climate change is now unequivocal as is now evident observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea levels. It is extremely unlikely that global

climate change over the past 50 years can be explained without external forces.”

GHG emissions have grown by 70% between 1970 and 2004. GHG emissions have grown since pre-industrial times, with an increase of 70% between 1970 and 2004. The greenhouse gases, which are, directly or indirectly, affected by human activities, include carbon dioxide (CO₂), methane (CH₄) and nitrous oxides (N₂O etc.). Agriculture contributes to all of them. In particular, land use change (essentially deforestation, burning, peat fires, and decay of drained peat soils) constitutes an important source of CO₂. (ibid)

Agriculture and deforestation contribute more than 30% to GHG emissions. In 2004, agricultural production and deforestation contributed 13.5% and 17.4% respectively, to the total greenhouse gas emissions (in terms of CO₂-equivalent). Contributions from agricultural production stem mainly from chemical fertilizer (N₂O) and livestock and paddy rice cultivation (CH₄). However, emission from the food sector are even larger taking into account the whole food chain including agricultural waste, processing facilities, transport, etc. Much of the GHG emissions from agricultural production and deforestation are closely associated with rural poverty, food security and subsistence agriculture.

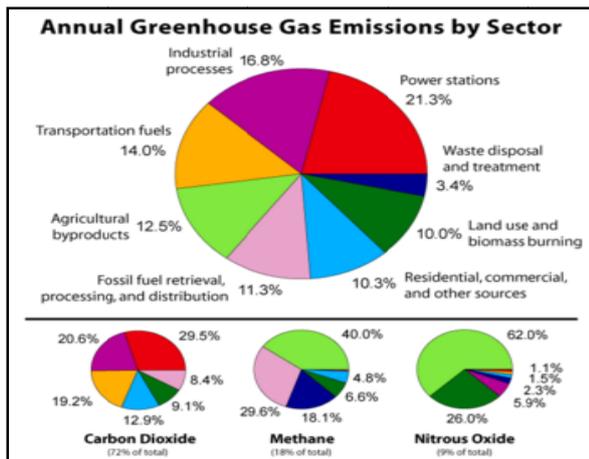


Figure 3. annual greenhouse gas emission by sector, Source: www.newworldencyclopedia.org

FAO assists countries in the establishment of monitoring systems through capacity building and develops and promotes improved methodologies to measure emissions from agriculture and deforestation. (ibid)

IV. NATURAL HAZARDS: IMPACT OF CLIMATE CHANGE

Extreme weather events can become natural disasters when they strike vulnerable communities that are unable to manage the risk and unprepared to cope with the hazard. Increased occurrence of extreme events due to climate change will also affect the poor most. In the cyclone in Andhra Pradesh in India in 1996, more than 1,000 people died and there was huge property loss. Cyclones of similar intensity in advanced countries like the U.S. may not lead to

any deaths and much hardship, due to stable and durable housing and other infrastructure and extended safety net available to the people in distress.

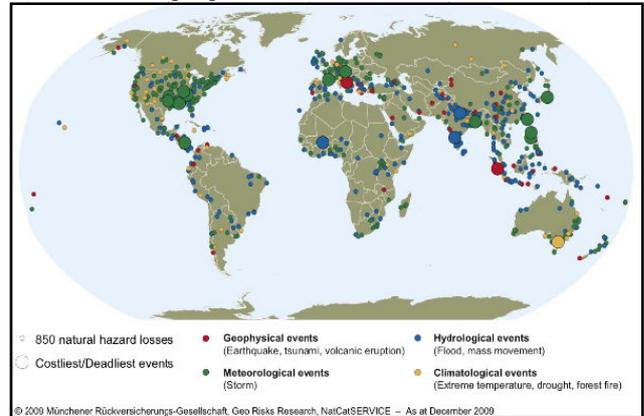


Figure 4. occurrence of natural disasters across globe

The global number of severe damage-causing storms has increased from an average of 150 per year in the early 1980s to between 250 and 300 per year in the period 2000 to 2004 (Mills, 2005). Total property losses (excluding health impacts) have been rising twice as fast as would be expected due to growth in world economies and population (Mills, 2005). Thus, a portion of the growth in disaster losses is attributable to a changing climate, as demonstrated by the increase in climate extremes of various kinds, and is consistent with climate model projections (Intergovernmental Panel on Climate Change, 2001a, 2007a). This has occurred despite attempts in many countries to reduce losses through, for example, tougher building codes, better warning systems and flood-loss-reduction projects. Nevertheless, the improved warning systems have resulted in fewer fatalities in the 1990s than in the 1970s, even as affected populations have risen dramatically (Figure 5; World Meteorological Organization, 2006).

Data from the Centre for Research on Epidemiology of Disasters indicates that 80% of all natural disasters in the decade from 1996 to 2005 were meteorological or hydrological, and that more than 1.5 billion people worldwide were affected by weather- and water-related disasters between 2000 and 2004 (United Nations Educational, Scientific and Cultural Organization, 2006).

The International Federation of Red Cross and Red Crescent Societies (2004) studied 3000 natural disaster events that occurred around the globe between 1994 and 2003. More than 80% of these were high-impact weather-related events. During this period, 580 000 fatalities and economic losses of US\$680 billion were recorded, and an average of 250 million people per year displaced from their homes.

More than 95% of the damage to property was recorded in affluent or moderate-income countries, with the largest losses in the United States. In contrast, more than 90% of the disaster fatalities and 98% of the people displaced by disasters lived in moderate- or low-income nations, primarily

in Asia and Africa (International Federation of Red Cross and Red Crescent Societies, 2004).

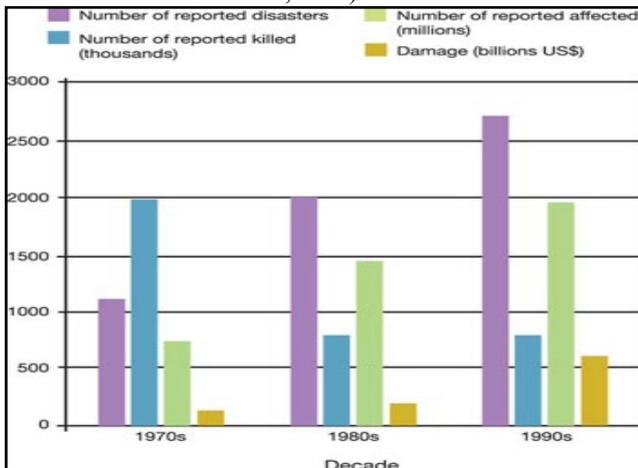


Figure 5. Global frequency of natural disaster impacts and associated human and economic losses from the 1970s to 1990s (World Meteorological Organization, 2006)

In highly developed countries, the average number of deaths per disaster is 23, whereas the number increases dramatically to more than 1000 deaths per disaster in less developed countries (World Meteorological Organization, 2006). Although the absolute dollar costs of disasters in highly developed countries are large, they are usually much less than the gross domestic product (GDP) of the country (Handmer, 2003). Although Hurricane Katrina caused large losses, it was a small fraction of the United States GDP. In contrast, losses from the hurricane in 1998 in Honduras amounted to more than 75% of its GDP. In Central America and the Caribbean, damages from hurricanes can set back national economic development for years by diverting investments from growth to recovery (International Strategy for Disaster Reduction, 2005a).

V. NATURAL DISASTERS AND HUMAN VULNERABILITY

With advent of the disaster vulnerability also increase and toll of unwelcomed event is given by human and living creatures. Vulnerability is defined as the extent to which a community, structure, services or geographical area is likely to be damaged or disrupted by the impact of a particular hazard, on account of their nature, construction and proximity to hazardous terrain or a disaster prone area. The topographical and climatic characteristics of each region make them susceptible to different types of disasters. 54% of land is vulnerable to earthquakes while about 40 million hectares of land is vulnerable to floods. (HPC on disaster management report, October 2001)

1 million houses are damaged annually in India apart from high human, social and other losses. Urban growth and concentration of limited resources are reality of our times while the rural sector faces a lack of access. This compounds the problem of disaster vulnerability. (HPC on disaster management report, October 2001)

The concept of vulnerability is highly a subject to the socio economic ability to cope and the measure of the risks involved. Broadly if we see in terms of physical and socioeconomic contexts of vulnerability then it can be found that the physical vulnerability merely depends on the factors including physical location of people and property and locational proneness to the natural disasters, the preventive measures and efficacy of remedial strategy. And on the other hand the socio economic vulnerability depends on context of the prevailing socio- economic conditions and the consequences of the natural disaster on these grounds. The extent of vulnerability depends on the social exclusion and discrimination of the individuals. Research in areas affected by natural disasters indicates that single parent families, women, handicapped people, children and the aged are particularly vulnerable social groups.

VI. COMMUNITY BASED SOLUTIONS TO CLIMATE CHANGE

Some people may believe that the current problem is only an extension of environment affecting human activity and that nature will restore the requisite balance. But if planetary ecosystem is damaged beyond a certain level then like any other living organism, the nature perhaps, will not be able to recover either by itself or by any external intervention.

The scientific evidences suggest strongly that we may today be dangerously closed to this summit beyond which the damage may become irreversible. Most importantly, In order to find out the solution to this problem, we need to understand the different role of an individual and the collective at different level.

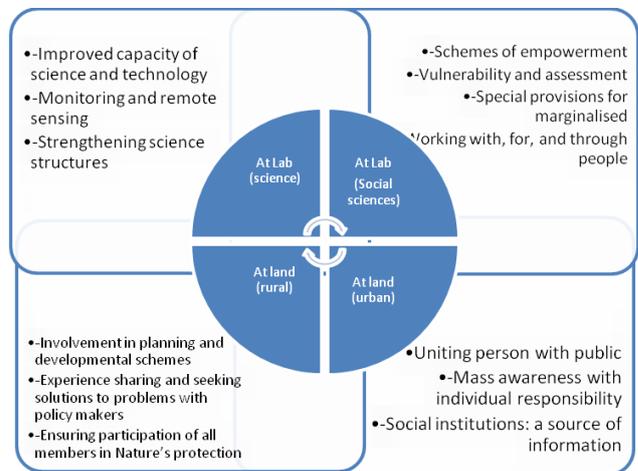


Figure 6. community led solution

What actions can be taken at individual or community level? And what actions need to be taken at national or international level? After all, global problem needs global solutions.

The climate is changing very rapidly with an ever increasing speed. If we will lose the hold on this speed it would be even more difficult to catch it in future. We should not only feel and think about it but also to act towards

sustainability. Climate is not changed for one region, state or country it affects the areas ignoring the boundaries, so in our intervention towards stopping climate change we must follow the strategy of togetherness beyond boundaries.

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