

MANAGING THE RISK: MITIGATION AND RESILIENCE STRATEGIES OF CLIMATE CHANGE

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Abstract

Policy makers can significantly reduce the risk of disaster and other crises through adequate strategies focused on reduction of vulnerability. By designing and implementing the ways and means that protect the affected population especially those physically vulnerable to the environment. If we analyse the changing perception in this field, increasing awareness indicate that states within their obligations have to respect, fulfill and protect their environment. They have the primary responsibility for reducing any risk (manmade and natural) including international community bind by the duty to provide support and mechanism for risk reduction. One of the milestone was “Hyogo Framework for Action (HFA) at the world conference on Disaster Reduction in 2005, based on 10 year plan with multi-stake holders and multi-sectoral plan to invest in Disaster Risk Reduction (DRR), as a means to build disaster-resilient societies”.¹

The Paris agreement 2015 for the first time brings all nations into a common cause to under take the serious efforts to combat climate change and adapt to its effects. It is considered as a solid and comprehensive step forward for strengthening the ability of countries to deal with the impacts of climate change. The UN Conference on Climate Change (UNFCCC) 2018 emphasizing to limit the increase in GHG emissions.

Addressing climate change is the most vital issue for the survival of our planet and its inhabitants. In bio and geophysical terms, Climate Change is defined as Changes over time in the averages and variability of surface temperature, precipitation and wind as well as associated changes in Earth’s atmosphere defined by IPCC.²

¹ <https://www.unisdr.org/we/coordinate/hfa>.

² IPCC Working Group I, 4th Assessment Report on Climate Change. The Physical Science (Cambridge: Cambridge University Press, 2007), 996.

The term Climate Change is used to denote any significant but extended change in the measure structure of climate. The change could be due to natural variability or as a result of human activities, such as burning of fossil fuels to produce energy, deforestation, industrial processes and modern agriculture practices.

The IPCC special report of 2018 is special in a sense it dealt with impact of “global warming of 1.5 °C above preindustrial levels and related global greenhouse gas emission pathways”. This was the focal area that contained in the Paris Agreement of 2015, in the context of strengthening the global response to the threat of climate change, and sustainable development.

The article aims to find out what is actually happening at the policy level at national and international level. How governments are responding to mitigate the effects of climate change effectively? The track record of the government is very straight they are actively involved into those actions that are taken to reduce and curb greenhouse gas emissions, simultaneously attending the causes of climate change. Mitigations measures are those actions that are taken reduce and curb GHG emissions.

All the reports of IPCC are highlighting the urgency of climate action as the current practices on earth are leading towards climate breakdown. These reports are indicating the hard facts:

- Carbon pollution is leading to a massive ecological and humanitarian crisis.
- Devastating climate catastrophe can be prevented by limiting global warming to 15 C.
- This would require rapid, far-reaching and unprecedented changes in all aspects of society.³

The 4th IPCC assessment Report of 2007 and all the reports after till 2019 are emphasizing the fact that global surface temperature has increased by about 0.07 °C for every decade during the past 100 years; with the increase becoming more rapid at about 0.18 per decade in the last 25 years. The last

³ IPCC special reports on climate change and UN framework convention on climate change (UNFCCC).

decade (2001-2010) has been the warmest on record; with the average temperature reaching 0.46 °C.⁴

For Africa in particular it is indicated that the continent is warming up faster, all the year round, than the global average; a trend that is likely to continue. The interior of Semi-arid margins of the Sahara and Central Southern Africa will be most affected by such warming.

Changes in temperatures have been accompanied by changes in weather and climate that have resulted in a myriad of both direct and indirect as well as actual and potential problems and challenges. The intensification of these and other changes will no doubt present challenges to human societies and their environment.

To tackle the phenomenon of Climate Change effectively, human societies have put in place a combination of mitigation and adaptation mechanisms and strategies. Whereas mitigation aims at avoiding or lessening the impacts of the unmanageable, the goal of adaptation is to manage the unavoidable.⁵

Mitigation Strategies entail deliberate steps to counteract the risk from climate change by making choices that reduce greenhouse gas pollution. While no consensus has been developed to address yet to what specific steps and actions should be taken or mooted to combat climate change, but states are unanimous by agreed that something must be done. This is evident by the various global and regional conferences and protocols and treaties binding signatories to fight against Climate Change. Taking the lead was the UN conferences on Environment and Development in Rio de Janeiro in 1992. Kyoto Protocol, Copenhagen Accord in 2009, the UNCC conference 2010, Cancun Agreements in 2011 Mexico, Durban Agreement 2011. The Paris Agreement 2015 and now UN Madrid Conference COP25 of 2019. The deliberations of these conferences represent the key steps forward made by the international community to address the long term challenges of climate change collectively and comprehensively by GHG emissions.

⁴ IPCC Working Group II, 4th Assessment Report on Climate Change – Impact, Adaptation and Vulnerability (Cambridge: Cambridge University Press, 2007), 976.

⁵ World Bank, Development and Climate Change: A Strategic Framework for the World Bank Group – Technical Report (Washington DC, 2008, available at: <http://siteresources.worldbank.org/EXTCC/Recources/407863-1219339233881/DCCSFTechnicalReport.pdf>).

The key findings of the 2018 IPCC special report stated that the world is warming rapidly due to the increase in temperatures and its reached to a alarming level.*

Other initiatives for the mitigation of climate change effects include investments in clean energy in the developing world to help their transition to a lower carbon development path, the adoption of less greenhouse gas intensive technologies, searching for efficient transportation technologies so as to reduce carbon emissions, and adopting better forestry and agriculture techniques to improve livelihoods, reduce soil erosion and protect biodiversity.⁶

Adaptation refers to “Changes in processes, practices and structures to moderate potential damages or to benefit from opportunities associated with climate change.⁷ It basically has to do with the adjustment in natural or human (eco) systems as a means of ameliorating the actual or anticipated adverse effects associated with climate change by moderating harm or exploiting benefits. From a temporal perspective, adaptation interventions can be short or long term, localized or widespread. Adaptation calls for more resilient infrastructure, broader disaster relief and preparedness measures to counter the increased climate risks.

Technological and policy instruments to Mitigate causes and adverse impacts of Global Environmental change

The notion of compliance-Plus behavior – out performing the standards set down in government regulations has gained wide currency in the boardrooms as well as in the business studies literature. Clean technology, which promises both environmental improvement and economic gains, holds out the enticing prospect of a double – dividend which renders irrelevant the traditional tensions between cost and higher environmental standards.

* Human activities are estimated to have caused approximately 1.0 °C of global warming and likely to reach 1.5 °C between 2030 and 2052.

⁶ Ibid.

⁷ AMCEN Report, Addressing Climate Change Challenges in Africa; A Practical Guide towards Sustainable Development (2011) available at: <http://www.unep.org/roa/amcen/docs/publications/guidebookClimateChange.pdf>.

One element of compliance – plus behavior is to raise standards of environmental performance voluntarily, especially when it is profitable to do so. Programme for waste minimization and energy efficiency can cut costs while reducing environmental burdens.

The other element of compliance – plus behavior is the management of regulatory process by companies. The compliance – plus gap can be maintained by slowing down the development of new laws and regulations and by influencing the implementation of existing rules.

The Reports of IPCC of 2014 especially 2019 report has emphasized once again the role of human can play in global warming. Government must now act to reduce emissions. The IPCC has found it “extremely likely” that humans are behind global warming. This is the strongest stance of the panel yet on the issue.

The 2014 panel report has reported specifically that humans are responsible for 95 percent of global warming actively, they found a five point increase over the previous report in 2007.* Usually Climate scenarios are predicted on the basis of modeling, and results from climate modeling give important indicators, which help in understanding various aspects and processes and how to simulate them. Now the 2018 IPCC report together with United Nations Framework Convention on Climate Change (UNFCCC) are emphasizing and persuading to limit the increase.

Climatologist divide 52 Climate models Scenario simulations into three groups according to the calculated increase in global means surface temperature between 1961-1990, 1990-2000 and 2071-2100. For the years 1990-2000 all 52 model runs are included in each warming level; after the year 2000, only the respective model runs are included in the different warming ranges*.⁸

* ARSCC, 2014: Impacts, Adaptation and Vulnerability, ipcc.ch/report/ar5/wg/2.

* Climate-Change risk analysis for world ecosystems proceedings of the National Academy of Science of the USA. Ed, Christopher B. Field, Carnegie Institute Washington, 2006.

⁸ "European Climate in the Late Twenty-First Century: Regional simulations with Two Driving Global Models and Two Forcing Scenarios", J. Raisanen, U. Hansson, A. Ullerstig, et. Al. *Climate Dynamics* vol.22, no.1 (2004): 13-31. "The Consistency of IPCC's SRES Scenarios to 1990-2000 Trends and Recent Projections", Detle P., Van Vuuren, Brian c., O'Neill, *Climate Change* vol.7S, no.1-2 (2006): 9-46.

Scientifically speaking, geographic patterns of risk are similar, but the magnitude of risk increases with the degree of Climate Change. The analysis of the implications of climate induced changes in ecosystems for human activities would be more complex and would include consideration of impacts on crop production, region specific information on social and economic drivers of land use, and demographic and economic trends. The climate-induced changes in ecosystems are likely to have a larger impact on ecosystems than climate only induced transitions.

The impact of the Climate Change could also non-linear. The extreme events of last 3 to 5 years witnessed around the world are visible reminders of ongoing changes.

Non-linear Impact of Climate Change

| Natural Hazard 2010-2019 | Causes of Change | Four-fold Increase in Damages |
|--|--|--|
| Heatwave in India (June 2019) | Temperature increase | 120 degree Fahrenheit 49 degree Celsius |
| Cyclone Idai Mozambique (March 2019) | Temperature increase | Deadliest storm ever to occur in the Southern Hemisphere |
| Amazon Fire 2019* | Natural or manmade | May releases billion of tons of stored carbon. Deforestation. |
| Bush fire/ Amazon fire | 1°C mean temperature increase Doubling of CO ² | 28% increase in wildfires 143% increase in catastrophic Wildfires. Deforestation |
| Greece-Japan (2018) | Wild Fire / Floods | Deforestation, Landfall |
| Hurricane Maria (2017) Puerto Rico, Dominica | Changes in the weather patterns | Strongest on record to make landfall |

* Scientists warn that if the forest loss passes a certain threshold, the Amazon may never recover and could become a savana. May lead to dieback “the death of rainforest that could blatantly releases billion of tons of stored carbon into the atmosphere, warming the planet even further. 2019 is the worst year since 2008 for Amazon deforestation in Brazil. Tony Juniper, Amazon: Lungs of the Planet, flim.bbc.com/future.

| | | |
|----------------------|--|---|
| Heat Waves in Russia | Temperature increase | 25% of the crop destroyed, 55,000 people suffered |
| Hurricane in USA | Doubling of Wind Speed | Increase of 5-10% in Hurricane Speed |
| Floods | 25% increase in 30 minute precipitation | Flooding return period reduced from 100 years to 17 years |
| Arctic Sea Ice | Drop sharply and abruptly Almost 50% below the long Standing average | Causing Sea levels rise faster than expected |

According to the data from the Centre for Research on the Epidemiology of Disasters, Belgium. The worst events have been storms and heat waves, with hundreds of people losing their lives in floods or due to extreme temperatures.

Disaster Risk Reduction

Climate Change and disaster risk are fundamental threats to sustainable development. Building resilient and sustainable societies means addressing both Climate and disaster risks and integrating these risks, as well as potential opportunities, into development planning and budgeting.

If we assess the disaster risk data, more than 226 million people globally are affected on average by disaster associated with natural hazards every year. These include geo physical events, hydro-meteorological events. Weather related disasters comprises about more than 80 percent of all events causing 72 percent of all economic losses and 23 percent of fatalities.

There are 10 the natural disasters in 2018, according to the data from the Centre for Research on the Epidemiology of Disasters.

The Fifth Assessment Report of IPCC outlined both slow-onset events and related impacts of Climate Change on sustainable development. Climate Change represents one of the biggest threats to food security in the 21st Century. Its impacts are already disrupting livelihoods in many parts of the

world, particularly those that are dependent on predictable temperature, rain fall, clean water availability and arable land.⁹

Natural disasters always bring destruction usually have long-term effects for human and economic development. The detrimental impacts of the consequences on development have been seen over and over. So both hazards and Climate Change are increasingly being considered and integrated as part of a development continuum, instead of as isolated phenomena.

The research indicated that poor policies and practices in land use planning, bad governance, urbanization, resource management increasing poverty levels are current drivers of risk. The major factor is unsustainable use of essential ecosystems, thereby reducing their capacities as natural buffers to provide protection against hazards. Risk is only increasing. By 2050, 70 percent of the world's population is expected to live in urban areas, two and thirds of this in low and middle income nations. Interestingly much of this growth is taking place in the areas prone to natural disasters.

The risk whether posed by both hazards and slow-onset process will have great impact on poor and marginalized.

The link between more heat and more poverty is robust. Scientist find that for each 1 °C rise in the average temperature of a country, it's GDP per head is 8.5% lower. Another Study of poor countries alone showed that being 1 °C warmer in any given year reduces income per head by 1.4%. We must not be surprised as Montesquieu in 1748 claimed that hot climates were adverse to the material conditions of a good life. There is a collation between heat and poverty but there might exist some third factor like disease. If it is possible to change that factor, temperature might cease to matter. Recently, tropical regions from Southern China to Rwanda* have been among the worlds most economically successful.

⁹ IPCC Working Group I, 5th Assessment Report on Climate Change - The Physical Science (Cambridge: Cambridge University Press, 2013), 1535. "Working groups II and III not found yet and a synthesis report of 5th assessment 2013 will be published in Copenhagen and Denmark on (27-31) Oct. 2014".

* This year, Rwanda moved up seven spots on the World Economic Forum competitiveness index to number 63 out of more than 140 countries. It has posted average, annual GDP Growth of more than 7%.

The latest literature suggests that strong and extreme weather is directly dragging down countries growth rates like natural disasters wreak a lot of damage and pushed down the world's annual GDP Growth by 1.3 in 1970-2008. The analysis of the world bank finds heterogenous effects on a variety of dimensions. The effects of natural disasters are stronger on developing than on rich countries.

The regression results indicated that short and long term effects of natural disasters are determined by countries, income level, population and the type of disasters. On the whole, it was found that the effects of disasters on GDP growth rate varied from 0.9% decrease to 0.6% increase depending on the disaster type.¹⁰

Secondly, high temperature and drought tend to reduce farm yields. This hurts poor and middle income countries most because agriculture has a bigger share in their GDP. Interestingly it is often assumed that the economic effects of Climate Change will be confined mainly to poor countries. That may be wrong. A Study and time-use survey in USA indicated the fact that high temperatures drastically effect the labour supply in farming, forestry, construction and utilities.¹¹ So, the weather influences basic conditions of life and factor of production.

Tackling climate change is widely recognized as crucial to achieving long-term, sustainable poverty alleviation. Poverty alleviation and climate change are intimately linked; the poorest people tend to be worst affected by climate impacts and will have the least capacity to adapt to climate change. Without appropriate interventions, climate change could create a vicious circle of growing vulnerability and impact. This risk is high on the political agenda. The high level panel on the post-2015 Development Agenda of May 2013 stated that without tackling climate change, we will not succeed in eradicating extreme poverty.

The only way to limit future climate change is to substantially reduce GHG emissions suggested by UN climate action report 2019. But the world is already committed to future climate change over at least the next 30 years

¹⁰ Thomas Fomby, The Growth Aftermath of Natural Disasters 2009, Policy Research Working Paper.

¹¹ Free exchange, The Weather Report, The Economist, January 18th-24th 2014, London, p.72.

due to past emission. Adaptation is the only option to safeguard development gains from the effects of this un-avoidable climate change.

Reflections and Recommendations

It is observed that there is a general lack of forward-looking pro-active development projects, which anticipate future risks and act to reduce them ahead of time.

Frame for common action around shared goals demands commitment to integrate adaptation into development co-operation. This commitment is now reflected in the goals of many development organizations like DFID in his Business Plan of 2011-2015 committed to making programmes more climate-smart.

The integration of stand-alone adaptation means where now activities are formulated with the expressed goal of addressing climate change risk like investment in climate change prediction or climate specific capacity building activities.

It is quite evident the without concrete action on climate change, the world may experience 4°C warmer by the end of this century. It means increase in temperature would threaten to roll back decades of development progress. So we are at make it or break it point in time.

The first hypothesis is Climate Change is an urgent issue and requires immediate action that Climate related events effects men's and women's well-being and assets differently. The second hypothesis is that Climate related shocks effects women more negatively then men. With limited evidence from developing countries.

Women seems to suffer more negative impacts or Climate Change in terms of their assets and well-being because of cultural and social norms regarding gender role and their lack of access to control of assets, although there some exceptions. Empirical evidence in this area is limited, patchy, varied and highly contextual in nature, which makes it difficult to draw strong conclusions. Findings here are indicative of the complexities in the field of gender and climate change and signal that multi disciplinary research is needed to further enhance the knowledge lease on the differential climate impacts on women's and men's asserts and well being in every settings

including agriculture and rural settings and to understand what mechanism work best to help women and men in poor communities become more climate resilient.

Climate Change is a huge threat to civilization. If we do nothing more to reduce it, but the costs are very affordable if we start now, IPCC won Noble-Prize.

The report on mitigation how can we slow down Climate Change, found that the costs of keeping global warming under the dangerous level of 2 °C will only reduce "consumption growth" of the global economy by 0.06% per year if we start immediately and act strongly.

The meeting with researcher from France and Germany in 2009 at the Final meeting of CLIMA project supported the IPCC predictions regarding average global temperature rise. There was a consensus on faster Sea level rise and it rose faster than expected especially I must mention Prof. Zorita of the institute or Coastal Research in Germany*, she addressed climate reconstruction and prediction, the "butterfly effects" was the heart of discussion.

According to Guardian report it is time not only to think the unthinkable, but to speak it, the world economy, civilization, and may be our survival as a species are on the line. Realms as diverse and distant as Siberia, Amazonia, Indonesia, Australia and California are aflame. The advert of "the age of fire" is the bleakest warning yet that humans have breached boundaries we were never meant to cross.¹²

It is an avalanche of human chemical emissions poisoning our air, water, food, cities and farms staying nine million a year.

It is the drift of billions of tones of soil from lands that feed us into the blind depth of the ocean, placing food security on a knife edge as farming system fail amid a turbulent climate and degraded landscapes.

* According to Prof. Zorita: Climate research still has to deal with many unknowns. Today's model are more sophisticated and provide more resolution, but it is frustrating to see that the uncertainty remains the same.

¹² The Guardian, 29th November 2019.

2020 is the year when we will see if the Paris Climate deal can deliver. It would be the first true test of the 2015 deal when 196 signatories are show their willingness to meet their promises related to climate benefited activities and to scale up ambition in line with scientists. The focus of the Paris was Nationally Determined Contributions (NDCs) driven by nation centric approach, now all researchers across UK, Australia and US are sharing “Climate Pledge” that have been made by nations, cities, policymakers and others.

EU President Ursula von der Leyen has promised a Green New Deal and a climate law for Europe to be “a climate-neutral continent in 2050”.

The Madrid Conference 2019 declared a climate emergency and consider it as a massive ecological and humanitarian crisis and can not be avoided without a global shift away from fossil fuel dependency.

The policymakers needs a real commitment, zero tolerance for any degradation activities, deforestation and subsequent widespread arson.

The subject of climate change adaptation is in a transitional phase, gradually increasing its pace and focus. These measures are based on reducing vulnerability to the effects of (CCM).

The developing and the developed one addressing and planning framework for massaging future climate risk, prioritising and coordinating actions to reduce the future economic, environmental and social costs plus evolve into a more desirable configurations that improve the sustainability.