Integrated approach of regulate global temperature rises and climate changes for sustainable planet.

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Abstract. This study emphasis the requirement of integrated approach for regulate the global temperature rises to protect the planet from climate changes and other system changes. It is clear that effect of global temperature increases, have already affected many physical and biological and human systems. This unbalances of global systems is more rapid after 1950’s increases of using environmental polluting energy sources with releasing the pollutants to global systems together with extra solar energy accumulation. How ever as a solution it is require to reduce pollutants and balance the energy level to optimum within the caring capacity. To protect the planet as a sustainable system with controlling temperature rises and other unbalances it is important to keep and protect the interrelationship of each and every system with protecting mechanisms. Therefore it is require integrated approach to establish protective mechanisms for each and every sectors of badly effecting with considering regional, national, international and global level.

1. Introduction

Global warming increases atmospheric, ground and sea temperatures and alters precipitation quantity and patterns, resulting in the increase of global average sea level, risks of coastal erosion and an increase of the severity of weather-related natural disasters. Changing water level, temperatures and flow will in turn affect food supply, health, industries, and transport and ecosystem integrity. Climate change will lead to significant economic and social impacts with some regions and sectors likely to bear greater adverse affects. Certain sections of society (the elderly, disabled, low-income households) are also expected to suffer more. Addressing climate change require two types of responses. Firstly, and importantly, we must reduce our greenhouse gas emissions (GHG) taking mitigation actions and secondly we must take adaptation strategies to deal with the unavoidable impacts. The EU’s recently agreed climate change legislation puts in place the concrete measures to reduce emissions to 20% below till 1990 levels by 2020. However, even if the world succeeds in limiting and then reducing GHG emissions, our planet will take time to recover from the greenhouse gases already in the atmosphere. Thus we will be faced with the impact of climate change for at least the next 50 years. We need therefore to take measures to adaptation. [1]

Physical and biological systems on all continents and in most oceans are already being affected by recent climate changes, particularly regional temperature increases. Climatic effects on human systems, although more difficult to determine due to adaptation
and non-climatic drivers, are emerging. Global-scale assessment of observed changes show that it is likely that anthropogenic warming over the last three decades has had a visible influence on many physical and biological systems [2]

There is exciting evidence, as presented in the IPCC reports, that the climate change will seriously affect the sustainable development challenges that we face not only in environmental issues but also in other areas. The climate change is not going to be country-selective but the fact remains that some countries may suffer the most. Climate change will undermine the ability development goals and achieve sustainable development with all these negative impacts of climate change. The direct effects of the climate change will be through changes in temperature, rainfall, length of growing season and timing of extreme and critical threshold events relative to crop production. In the dry land of the tropics and subtropics, where crops are near their maximum temperature tolerance level, the yield will decline. In the regions where there is possibility of decreased rainfall, agriculture productivity will be seriously reduced. [3]

2. Review of Literature

Global temperature rising means the increase the average global temperature. It include air temperature, ocean temperature, earth surface temperature rising. Inter governmental panel of the climate change (IPCC) has identified it is as a result of the increasing green house gas concentration mainly because of the human activities like deforestation, fossil fuel burning, industries etc. It is more prominent since the middle of the 20th century. The IPCC further showed that it was contributed volcanic activities and solar energy as natural contributed factors. It is indicated that global surface temperature may rise 1.1 to 6.4 °C during 21st century. Most of the study identified global warming may continue beyond 2100 even if emission stop because of the large heat capacity of the ocean and long life time of carbon dioxide in the atmosphere. [4]

Increasing global temperature is effecting to melt the glaciers and sea level rise and effecting to change the pattern and intensify of rainfall and happen to extreme weather events. The most common indication of global warming is the increasing trend in global average temperature near the earth surface. This temperature rose by 0.74°C ±0.18°C over the period 1906-2005. The rate of warming over the last 50 years of that period was almost double that for the period as a whole (0.13°C ±0.03°C ) per decade, versus 0.07°C ± 0.02°C per decade. Temperatures in the lower troposphere have increased between 0.12 and 0.22 °C (0.22 and 0.4 °F) per decade since 1979, according to satellite temperature measurements. Temperature changes vary over the globe. Since 1979, land temperatures have increased about twice as fast as ocean temperatures (0.25 °C per decade against 0.13 °C per decade). Ocean temperatures increase more slowly than land temperatures because of the larger effective heat capacity of the oceans and because the ocean loses more heat by evaporation. The Northern Hemisphere warms faster than the Southern Hemisphere because it has more land and because it has extensive areas of seasonal snow and sea-ice cover subject to the ice-albedo feedback. Although more greenhouse gases are emitted in the Northern than Southern Hemisphere this does not contribute to the difference in warming because the major greenhouse gases continue to long enough to mix between hemispheres. [5]
The greenhouse effect is the process by which absorption and emission of infrared radiation by gases in the atmosphere. The question is instead how the strength of the greenhouse effect changes when human activity increases the concentrations of greenhouse gases in the atmosphere. The major greenhouse gases are water vapor (not including clouds), which causes about 36–70 percent of the greenhouse effect; carbon dioxide (CO$_2$), which causes 9–26 percent; methane (CH$_4$), which causes 4–9 percent and ozone (O$_3$), which causes 3–7 percent. Human activity since the Industrial Revolution has increased the amount of greenhouse gases in the atmosphere, leading to increased irraditative forcing from CO$_2$, methane, troposphere ozone, CFCs and nitrous oxide. The concentrations of CO$_2$ and methane have increased by 36% and 148% respectively since the mid-1700s. These levels are considerably higher than at any time during the last 650,000 years, the period for which reliable data has been extracted from ice cores. Fossil fuel burning has produced about three-quarters of the increase in CO$_2$ from human activity over the past 20 years. Most of the rest is due to land-use changes, particularly deforestation. CO$_2$ concentrations are continuing to rise due to burning of fossil fuels and land-use change. The future rate of rise will depend on uncertain economic, sociological, technological, and natural factors. Accordingly, the IPCC Special Report on Emissions Scenarios gives a wide range of future CO$_2$ scenarios, ranging from 541 to 970 ppm by the year 2100. Fossil fuel reserves are sufficient to reach these levels and continue emissions past 2100 if coal, tar sands or methane are extensively exploited.[4,14]

In addition to the raised temperature, effect to rise seawater level, which will have critical implications for countries whose lands are at elevations similar to sea level. For example, nearly 1,800 km of land on the north coast of Egypt and the Nile delta will be under seawater if there is a rise of 50 cm in the sea level, affecting 3.8 million people. The change in precipitation is already occurring. Wet areas are likely to become more wetter and dry areas will become more drier, increasing water scarcity in these dry areas.[3]

Climate change is going to have a drastic impact on dry land ecosystems and its almost 2.5 billion inhabitants. All the climate models used by the IPCC suggest that the dry areas will become dryer and more water stressed. The dry land areas (40% of world land surface) are home to over 2 billion people, accounting for 35% of the world’s population. Some 55% of dry land inhabitants live in rural areas. More than 90% of dry land inhabitants are in the developing world and 70% in rural areas. Approximately half of the poorest people in the world live in the dry areas [3]

The Stern Review on the Economics of Climate Change states that climate change is the greatest and widest-ranging market failure ever seen, presenting a unique challenge for economics. The Review provides prescriptions including environmental taxes to minimize the economic and social disruptions. It’s main conclusion is that the benefits of strong, early action on climate change far more important than the costs of not acting. The Review points to the potential impacts of climate change on water resources, food production, health, and the environment. According to the Review, without action, the overall costs of climate change will be equivalent to losing at least 5% of global gross domestic product (GDP) each year, now and forever. Including a wider range of risks and impacts could increase this to
20% of GDP or more. The Review proposes that one percent of global GDP per annum is required to be invested in order to avoid the worst effects of climate change. [6]

3. Review of Regulatory Mechanisms

Climate Change Mitigation

Mitigation includes action taken to reducing the climate change. It need to reduce the radiative forces that effected on global warming with using regulatory mechanisms. It include reduce the concentration of green house gases that effected the energy level increases and improve the sinks that can absorb and capture the adequate energy to protect the global balance.[7] That need to reduce fossil fuel consumption as a energy source for industrial activities and electricity generation and need to move towards environmentally friendly energy sources such as wind power, solar energy, wave energy etc. Forest and marine plants can be used as good carbon sinks for reducing atmospheric carbon dioxide level. Further It is good path to improve emission friendly good and services market with low carbon technologies.[8]

Eventually mitigation appear effective only for preventing further warming, not at reversing existing warming. The Stern Review identifies several ways of mitigating climate change. These include reducing demand for emission-intensive goods and services, increasing use and development of low-carbon technologies, and reducing fossil fuel emissions.[6]

Stabilizing the green house gas concentration.

It is important to stabilizing the green house gas concentration of the atmosphere to optimum level that eco system can function well, agricultural production and climate change can adopt. The United Nations Framework Convention on Climate Change (UNFCC) has emphasized this requirement. The most prominent green house gas (GHG) emitted by human activities is carbon dioxide (CO$_2$). Stabilizing emissions of CO$_2$ at current levels would not lead to a stabilization in the atmospheric concentration of CO$_2$. In fact, stabilizing emissions at current levels would result in the atmospheric concentration of CO$_2$ continuing to rise over the 21st century and beyond. The reason for this is that human activities are adding CO$_2$ to the atmosphere faster than natural processes can remove it. Stabilizing the atmospheric concentration of the other greenhouse gases humans emit also depends on how fast their emissions are added to the atmosphere, and how fast the GHGs are removed. [9,10,11]

Reforestation and protecting existing forests

Trees capture and store atmospheric carbon. Stern reports indicate that deforestation has resulted to increasing atmospheric carbon dioxide level remarkably. Stern reviews 20% of total green house gas emission were from deforestation in 2007. Reforestation will help to reduce the atmospheric carbon level. It is showed that natural forest can capture sixty percent more carbon than forest plantation. Hence protection of existing forest is more important as a regulatory mechanism for control the global warming. [6,12]
Carbon capture and storage

Carbon capture and storage (CCS) is a system to mitigate climate change by capturing carbon dioxide (CO$_2$) from point sources such as power plants and subsequently storing it away safely instead of releasing it into the atmosphere. The Intergovernmental Panel on Climate Change says CCS could contribute between 10% and 55% of the cumulative worldwide carbon-mitigation effort over the next 90 years. The CCS is the most important single new technology for CO$_2$ savings in power generation and industry. Though it requires up to 40% more energy to run a CCS coal power plant than a regular coal plant, CCS could potentially capture about 90% of all the carbon emitted by the plant. [13]

Energy conservation technologies

Reducing energy use is seen as a key solution to the problem of reducing greenhouse gas emissions. Need to apply energy conservation technologies in sectors such as transport, housing and urban planning, building construction are important. [14,15]

Eliminating methane releasing

Methane is a significantly more powerful greenhouse gas than carbon dioxide. Methane can release to atmosphere form coal mines, oil wells, waste treatment plants, paddy fields etc. However, reducing the amount of waste methane produced in the first place and has an even greater beneficial impact.

Geological storage

This procedure important to capture the CO$_2$ without releasing to the atmosphere. Capture and geological storage of CO$_2$ provide a way to avoid emitting CO$_2$ into the atmosphere, by capturing CO$_2$ from the sources and transporting it by pipeline and injecting it into suitable deep rock formations. [16]

Adoption

Adoption include develop the capacity, strength and establishing mechanisms to face the global warming and climate change effects on global physical and biological systems. It is clear that need of adoption because of mitigation mechanisms need proper time to reduce the global temperature level and green house gases to tolerable optimum level to physical and biological systems.

Geo engineering

Geo engineering include large scale intervention for control of global warming. It is proposed solar radiation management techniques such as space sun shades, spaced based solar power generation techniques by using orbiting satellites to reduce the entering solar energy to the atmosphere. Hydrological geo engineering techniques such as diverting rivers
to keep warm water away form the sea ice and control the melting the ice bergs adjusting thermohaline circulation. [15,16]

Flexible mechanisms

This include emission trading system, joint implementation of projects, clean development mechanism etc.

4. Conclusion and Recommendation

Global warming has been increased to global threatening level in past 5 decades because of industrial revolution with high rate of fossil fuel burning. At present it is clearly indicate the bad consequences of the past action. But however it cannot go back and have sudden changes in to the global systems. It require to steps to take precautions to regulate the further increasing of global warming as well as reduce the excess levels of green house gases in atmosphere. As a regulatory mechanisms we can use mitigation, geo engineering and flexible techniques appropriately. Presently it is clear global warming and energy level of the atmosphere is increasing. Energy balance of the sub systems are changing. Therefore we need to apply regulatory technologies appropriately balance the energy levels of the atmosphere, hydrosphere, biosphere and lithosphere. Effects of climate changes are harsh than we think and effects are more rapid. A requirement of action is clear as local, regional, national and international level. But bad effects will not recover soon. According to our remedial action it will take time to come back to optimum level. Hence adoption techniques are needed to tolerate and develop the strength to face the bad effects. It is now needed to integrated approach to including all the mechanisms of mitigation, geo engineering and flexible mechanisms with adoption strategies to protect the sustainability of the planet. Further it is our responsibility to regulate protecting mechanisms appropriate level.

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