Energy and Climate Change – A Global Challenge

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Abstract: **- Change in climate is raising alarms towards the usage of Energy globally. It is difficult to comprehend as to the certainty of how technological possibility will play out in the future to provide a balance for the need for survival vis-à-vis embracing the environmental concerns. Given the attention attained by the need for energy and the impact on environment due to pollution.**

In the coming years developing countries will face great challenges in development and its impact on environment. The path of development chosen by the region, upon which lies the future growth of energy and emission trajectories, would be greatly influenced by technological developments, economic cooperation between countries, and global cooperation in mitigation and adaptation of change in climate.

Environment and climate change is one of the most important global challenges, with implications for food production, water supply, health, energy, etc. Addressing climate change requires a good scientific understanding as well as coordinated action at national and global level. This paper addresses these challenges. Historically, the responsibility for greenhouse gas emissions' increase lies largely with the industrialized world, though the developing countries are likely to be the source of an increasing proportion of future emissions. The projected environmental and climate change under various scenarios is likely to have implications on food production, water supply, coastal settlements, forest ecosystems, health, energy security, etc. The adaptive capacity of communities likely to be impacted by climate change is low in developing countries.

Keywords: **Environment, Climate, Climate change, Energy, Greenhouse**

I. INTRODUCTION

The efforts made by the Kyoto Protocol provisions are clearly inadequate to address the climate change challenge. The most effective way to address climate change is to adopt environmentally sustainable technologies and promotion of energy efficiency, renewable energy, forest conservation, reforestation, water conservation, etc. The issue of highest importance to developing countries is reducing the vulnerability of their natural and socio-economic systems to the projected climate change. India and other developing countries will face the challenge of promoting mitigation and adaptation strategies, bearing the cost of such an effort, and its implications for economic development.

Effects of environmental changes are widely observable with the temperatures and sea levels on a steep rise with melting of ice and snow covers (Fralken mark, 2007). The consequences could be catastrophic for the natural world and society. Many scientific studies indicate that due to the release of green house gases (such as carbon dioxide and methane) and wars, the impact on atmosphere by human activity post 1920 has been the primary cause of the drastic climatic change. One cannot do away with the effect of war situations and bombings done in the last 2 decades contributing to temperature variations, seismic disc movements and ozone reduction. Increase in Air traffic and Airplanes travel at very high altitudes has also impacted on global warming. IATA predicts another 500 million passengers will take to the skies by 2010, with jet aircraft emitting 23 kg of CO_2 per 100 passengers per km, raising the risk to nature and mankind. Not only is the CO_2 emission a problem but also the Nitrogen dioxide from airline engines leads to increase of ozone leading to creation of cirrus clouds enhancing green-house effect causative to global warming. In Europe it-self it is estimated that emissions from air travel increased by 73% between 1990 and 2003 (Philip, 2007). We need to secure a profound change in the way we generate and use energy, and in other activities that release these gases.

Green Energy Technology for energy needs globally at the earliest possible is the only given solution to this complex problem. It is also important to note that Green Energy Technology (based on renewable sources) is cheaper and more labour intensive (both skilled and unskilled) in the long run than the non-renewable sources of energies in use. We believe that this would boost the employment and reduce the tense atmosphere due to Un-Employment and Aging Population as well (especially in the Developed regions of the World).

II. FACTORS CONTRIBUTING TO CLIMATE CHANGE – GHG EMISSIONS

The global carbon cycle involves interaction among the atmosphere, oceans, soils and vegetation and fossil fuel deposits. The oceans contain 39,000 giga tonnes of carbon (GtC), fossil fuel deposits about 16,000 GtC, soils and vegetation about 2500 GtC, and the atmosphere about 760 GtC2. Since 1850, land-use change is estimated to have released about 136 GtC and fossil fuel combustion, about 270 GtC. Of this, 180 GtC has ended up in the atmosphere, while 110 GtC has been absorbed by growing vegetation and the remainder by the oceans. It is the increasing concentration of atmospheric CO_2 that is the cause for concern about global climate change. The combustion of fossil fuels and other human activities are the primary reasons for increased concentrations of CO_2 and other greenhouse gases. Between

1990 and 1999, an estimated 6.3 GtC/year was released due to the combustion of fossil fuels, and another 1.6 GtC/year was released due to the burning of forest vegetation. This was offset by the absorption of 2.3 GtC/year each by growing vegetation and the oceans. This left a balance of 3.3 GtC/year in the atmosphere. Controlling the release of greenhouse gases from fossil fuel combustion, land-use change and the burning of vegetation are therefore obvious opportunities for reducing greenhouse gas emissions. Reducing greenhouse gas emissions can lessen the projected rate and magnitude of warming and sea level rise. The greater the reductions in emissions and the earlier they are introduced, the smaller and slower the projected warming and the rise in sea levels. Future climate change is thus determined by historic, current and future emissions.

III. GLOBAL GHG EMISSIONS AND CONTRIBUTION OF INDIA

India has increasingly incorporated measurable goals for enhancement of human well being, beyond mere expansion of production of goods and services and the consequent growth of per capita income. Many developmental targets are directly or indirectly linked to energy and therefore to GHG emissions.

India holds over 1 billion people, i.e. over 16% of global population. Endowed with coal, India's energy system has evolved around coal. India's share in global CO_2 emissions is still very small.

The contribution of India to the cumulative global CO_2 emissions from 1980 to 2003 is only 3.11%. Thus historically and at present India's share in the carbon stock in the atmosphere is relatively very small when compared to the population. India's carbon emissions per person are twentieth of those of the US and a tenth of most Western Europe and Japan..

The endogenous responses generated to achieve the 'development goals' are the key factors shaping the economic growth, endogenous technological change and consumption preferences that drive the energy and emissions trends. The goal of providing universal access to electricity, for instance, from the present fifty-five per cent coverage, has vital implications for development and greenhouse gas emissions. In India's case the recent history and the trends show that the economic reforms are enlarging choices that are delivering double dividends, as is evident from the declining trend of energy, electricity and carbon intensities of the Indian economy.

In the long run, the results of the modeling exercises show that India, between 2005 and 2035, could supply cumulative 5 billion tonne of carbon equivalent mitigation from the energy options at price below $10 per tonne of carbon equivalent (Figure 3). The low mitigation cost potential is also evident from the sizable CDM projects being proposed from India in recent times.

IV. GLOBAL TRENDS AND INITIATIVES

The recent International Energy Agency (IEA)'s 2006 report projects that emissions of CO_2 (a main GHG) would be more than double by 2050. According to the IEA report, the developing countries would account for almost 70% of this increase. It is important to understand that most of the developing countries are gearing at benefit of technology transfers from large western organizations having growth within these countries. The shifting up of base of most European or American firms is not only based on a lookout for cheap raw-material and labour, but is more of a conglomerate factor of regulatory restrictions in home countries, environmental restrictions and market access, which most major industries and energy organizations are subjected to. This is specifically there due to stagnation of population growth and aging population in these regions of the world.

Moreover, the costs of damage as well as the required adaptation and mitigation efforts will be unevenly distributed both among and within countries. There is also the risk towards further erosion of social capital and increase in the vulnerability of social values and institutions, already weakened by technological changes. Inequity in due course could undermine social cohesion and exacerbate conflicts over scarce resources. Advances in underground storage of CO_2, battery technology (for plug-in hybrid cars), bio-energy, traditional renewable sources of energy and nuclear power is expected to alter energy economics (Brown, 2006). What IEA needs to work on is how to utilize and bring into functionality the best available green technologies like the use of more solar, wind and biomass through more-efficient cares, appliances and buildings and not basing primarily on Nuclear for energy needs.

V. KYOTO PROTOCOL

The UN Conference of Parties held in Kyoto in 1997 adopted the Kyoto Protocol as the first step towards addressing climate change. The Protocol shares the Convention's objective, principles and institutions, but significantly strengthens the Convention by committing Annex-I Parties to individual, legally-binding targets to limit or reduce their GHG emissions. To achieve the goals of the Climate Convention, the Kyoto Protocol broke new ground by defining three innovative 'flexibility mechanisms' to lower the overall costs of achieving its emissions targets. These mechanisms enable Parties to access cost-effective opportunities to reduce emissions or to remove carbon from the atmosphere in other countries. While the cost of limiting emissions varies considerably from region to region, the benefit for the atmosphere is the same, wherever the action is taken. Much of the negotiations on the mechanisms have been concerned with ensuring their integrity.

The three Kyoto mechanisms are as follows:

1. Joint Implementation (JI) under Article 6 provides for Annex I Parties to implement projects that reduce emissions, or remove carbon from the atmosphere, in other Annex I Parties, in return for emission reduction units (ERUs).
2. Clean Development Mechanism (CDM) defined in Article 12 provides for Annex I Parties to implement projects that reduce emissions in non-Annex I Parties, or absorb carbon through afforestation or reforestation activities, in return for certified emission reductions (CERs) and assist the host Parties in achieving sustainable development and contributing to the ultimate objective of the Convention.
3. Emissions Trading (ET), as set out in Article 17, provides for Annex I Parties to acquire certified emission reduction units from other Annex I Parties.

Among the above three mechanisms, only CDM is relevant to developing countries such as India. Developing countries could view CDM as an opportunity not only to attract investment capital and Environmentally Sustainable Technologies (ESTs) but also to implement innovative technical, institutional and financial interventions to promote energy efficiency, renewable energy and forestry activities that contribute to sustainable development. Projects specially designed and implemented in developing countries under CDM, leading to carbon emission reduction or sequestration will receive payments from institutions and agencies in Annex B (Annex I countries with commitment to reduce GHG emissions) countries for every tonne of carbon emission avoided or sequestered.

VI. CONCLUSIONS

Energy is a vital input needed to fuel the engine of economic growth and to fulfill the basic needs of national societies. Empirical evidence suggests that lack of energy can whittle down the pace of economic development while its abundance can stimulate the development. Data show that on an average a developed nation civilian consumes approximately 40 percent more energy than some one from the developing region. Stark gap in consumption levels like these may safely be attributed to the government's failure to maintain an appropriate ratio of Renewable (Hydel, Solar, bio-mass) and Non-Renewable (Thermal & Nuclear) power and not properly harnessing hydro/green power which is possible only through the construction of large green projects.

Energy is one of the critical inputs for agricultural, industrial production, IT & telecommunications and raising the quality of life of people. Government's statements worldwide confirm that it is well aware that the "marginal productivity" of energy is far greater than the cost of energy. This means that clean energy development ought to be the top most economic priority of the State. It also means that there is an opportunity for deficit financing of energy/power projects, so that the required additions to capacity (due to change from non-renewable to renewable source) to match demand need not suffer for want of resources. Only a dogmatic monetarist position would insist on identifying the finances for power development with required savings or creative energy financing for the economy as a whole.

The introduction of new power policy in India and other parts of the world and the vertical split up of the business of generation, transmission and distribution signify that the governments would provide for fresh impetus to river valley projects. In the new regime the governments globally should be ready to rearrange everything so that necessary finance could be put in place for the construction and running of green renewable energy projects.

Globalization has altered the economic frameworks of both developed and developing nations in ways that are difficult to comprehend. Also the emergence of unregulated global markets appears to have moved towards a more stable and growth oriented economic globe. What is needed today is to develop sensitivity sensor systems to promote green technology within the financial framework as an integrated approach to keep markets from busting and causing socio-economic environmental panics.

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