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A review on global comparison of climate scenario of India in 2030

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INTRODUCTION

The most important concern over the current generation is the unwanted changes occurring in the earth atmosphere –ocean system due to over exploitation of the nature. Pressure on the climate system due to the land overuse, deforestation, tapping of vulnerable water sources, destruction of the ecosystems, environmental pollutions etc. also causes changes on regional sectors in the short time scale and on the whole global climate in the long run. This second category of adverse impacts on the climate system is more dangerous, since the recovery procedure may take much more time. Also the corrective majors for the environmental damages made so far are more complicated than those for the GHG abatement. Issues related to environmental degradation are local and for their remedies the direct involvement of the natives is very essential. Large scale mass movements are necessary to tackle this second cause of climate change. No Government alone can solve the problem by formulating laws alone. These arguments are more applicable to India than to any other country in the world because of the wide diversity in the socio-economic bases in our country.

The Global Framework for Climate Services aims to enable society to manage the risks and opportunities arising from climate variability and change, especially for those who are most vulnerable. A climate service is considered as the provision of climate information in such a way as to assist decision-making by individuals and/or organizations. Effective climate services will fa-

cilitate climate-smart decisions that will, for example, better reduce the impact of climate-related disasters, improve food security and health outcomes, and enhance water resources management. All countries will benefit, but priority shall go to building the capacity of developing countries which are vulnerable to the impacts of climate change and variability. The Framework will be built upon five components; namely, User Interface Platform, Climate Service Information System, Observations and Monitoring, Research, Modelling and Prediction, and Capacity Building. The Framework's priority areas are closely aligned to the needs and goals addressed by the Millennium Development Goals, the Hyogo Framework for Action and the United Nations Framework Convention on Climate Change. At the 2012 UN Climate Change Conference in Doha, Qatar governments consolidated the gains of the last three years of international climate change negotiations and opened a gateway to necessary greater ambition and action on all levels. Among the many decisions taken Strengthened their resolve and set out a timetable to adopt a universal climate agreement by 2015, which will come into effect in 2020 and emphasized the need to increase their ambition to cut greenhouse gases (GHGs) and to help vulnerable countries to adapt.

Some of the impacts of climate change highlighted by the IPCC include:

- By 2020, In some parts of Africa, yields from rain-fed agriculture (the dominant Method) could reduce by up to 50 percent;
- Approximately 20-30 percent of plant and ani-

mal species are likely to be at increased risk of extinction, if increase in global average temperature exceeds 1.5-2.5°C;

- Widespread melting of glaciers and snow cover will reduce melt water from major mountain ranges (e.g. Hindu Kush, Himalaya, Andes) where more than one billion people currently live;
- More than 20 million people were displaced by sudden climate-related disasters in 2008 alone. An estimated 200 million people could be displaced as a result of climate impacts by 2050.

RISE OF CO₂ CONCENTRATIONS AND EMISSIONS

It is seen that India's CO₂ emissions are less than one fifth that of USA and China. In per capita terms India emits 1.18 tonnes of CO₂, China emits four times as much and US 16 times as much. Our emission intensity is 0.28 kg of CO₂/\$ of GDP in Purchasing Power Parity (PPP) terms, China's is more than twice as high, and USA's is higher than the world average and 1.8 times of India. In fact, developed countries account for two-third of global energy consumption and similar levels of CO₂ emissions. On the other hand, per capita energy consumption and emissions for India are amongst the lowest in the world. Since GHGs are estimated to stay in the atmosphere for 100 years or so, a country's responsibility is related to its emissions over a long period of time. Accelerated, and then again from 1990 when preparations for the Rio conference began and all countries became aware of the threat of climate change.

Currently implemented policies in India are projected to lead to an emission level of 3,308 MtCO₂e in 2020 and 3,626 MtCO₂e in 2030. Land use change constituted a sink in 2007 and reduced emissions from non-land use sectors by 9%. Total emissions have been growing steadily since 1990. The overall growth slowed down around the year 2000 as land use moved from being a small source of emissions in the first inventory year, 14 MtCO₂e in 1994, to a large sink, with removals of 223 MtCO₂e in 2000. This sink effect has since reduced somewhat; in the last available inventory land

use represented removals of 175 MtCO₂e. Scientific information from the IPCC suggests that to avoid the most catastrophic impacts of climate change, greenhouse gas emissions need to reduce to 50-80 percent below 1990 levels by 2050.

On a per-capita basis, India is one of the lowest Greenhouse Gas (GHG) emitters in the world. Its emission of 1.18 tonnes of CO₂ equivalent per capita in 2008 was nearly one-fourth of the corresponding global average of 4.38 tonnes. However, India is highly vulnerable to climate change, and has a strong interest in having a fair and equitable global agreement for minimizing the risk of climate change. The first step, to limit temperature rise to 2 degrees celsius, would therefore be to reduce the level of GHG emissions. This would require collective and cooperative global action.

India pledged and communicated to UNFCCC that it will endeavor to reduce the emissions intensity of its GDP by 20–25 per cent by 2020 compared with the 2005 level. It added that emissions from the agriculture sector would not form part of the assessment of its emissions intensity. All-India mean annual temperature shows a significant warming trend during 1901-2007. Mean annual maximum temperature shows significant warming trends during the periods 1901-2007. However, in the recent decade 1998-2007, the maximum temperature shows stagnation in trend. Mean annual minimum temperature has significantly increased by 0.27°C per 100 years during the period 1901-2007. Number of heavy rainfall events (those exceeding 99th percentile) are increasing almost over the entire landmass. Also the frequency and intensity of extreme events defined as 1-day maximum precipitation shows increasing trend everywhere except some northern parts of the count. In the framework of the UNFCCC, many countries have put proposals on the table about how much they intend to reduce their greenhouse-gas emissions in both the near and the long term. Emissions reduction targets are mandatory for many of the world's leading economies for the first commitment period of the Kyoto Protocol. The Climate Action Tracker reveals major differences between the ambition levels of countries when it comes to reducing greenhouse gas emissions. In the lead are the Maldives, who have proposed to become climate-neutral by 2020.

Also at the high end of the scale are Bhutan, which

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proposes to stay carbon neutral and Costa Rica, which proposes to become carbon neutral by 2021 if international support is provided. They are followed by Japan, Norway, Papua New Guinea and South Korea, all of whom are proposing to reduce their emissions significantly.

In the 'medium' range are developing countries such as Brazil, Chile, India, Indonesia, Mexico and South Africa. Many of them propose to reduce the growth of their emissions by the 2020's.

India pledged to reduce the emission intensity of its GDP by 20 to 25% by 2020 in comparison to the 2005 level. The national estimation of India of the quantified target will be in line with current policies, although the BAU range is large and economic growth uncertain.

Under United Nations Framework Convention on Climate Change Worldwide systematic observation of the climate system is a key prerequisite for advancing scientific knowledge on climate change. The Convention calls on Parties to promote and cooperate in systematic observation of the climate system, including through support to existing international programmes

CURRENT TREND DESCRIPTION INDIA

Currently implemented policies are projected to lead to an emission level of 3,308 MtCO₂e in 2020 and 3,626 MtCO₂e in 2030, including emissions from LULUCF according to our estimation. Land use change constituted a sink in 2007 and reduced emissions from non-land use sectors by 9%. We assume this share will remain constant until 2020.

Total emissions have been growing steadily since 1990. The overall growth slowed down around the year 2000 as land use moved from being a small source of emissions in the first inventory year, 14 MtCO₂e in 1994, to a large sink, with removals of 223 MtCO₂e in 2000. This sink effect has since reduced somewhat; in the last available inventory land use represented removals of 175 MtCO₂e.

The Five Year Plans provide the basic direction for government activities and address all sectors and policy areas in India. Since last year, the government has been working on the implementation of the 12th Five Year Plan, which will also focus on climate change ac-

tivities. However, since details are not clear yet, we focus the analysis on existing instruments that were implemented in the course of the 11th Five Year Plan.

The Changing Debate on the Global Climate Mitigation efforts have made significant progress at country level in the past 15 years in areas such as emissions regulations and financial incentives – for example, the US\$ 3.4 billion made available to match private sector investment funds in the US Smart Grid Investment Grant program.⁸

Nonetheless, in today's increasingly multi-polar geopolitics, it has become harder to reach and effectively implement international agreements on climate change mitigation. Pledges made in the run-up to the 2009 Copenhagen climate change negotiations, which were intended to limit global warming to 2 degrees Celsius, now appear collectively insufficient to meet this target of 2 degrees.

Recent scenario projections based on existing government policies and declared policy intentions predict that a long-term increase of more than 3.5 degrees Celsius is probable. The more pessimistic scenario assuming no change in government policies and measures beyond those adopted or enacted by mid-2011 talks of a conceivable increase of 6 degrees Celsius or more.¹⁰ If the current mitigation commitments remain unmet, a global mean temperature increase of 4 degrees Celsius could occur as early as the 2060s. This would likely lead to negative impacts including an increase in the frequency of high-intensity tropical cyclones, inundation of coastal cities as sea levels rise, and increased drought severity in several regions. Together, the effects would not only mean significant economic losses but also mass displacement of populations, rising food insecurity and aggravated water scarcity.

PROJECTED CHANGES IN 2030S

As per the Indian Network for Climate Change Assessment (INCCA) studies

Coupled model simulations from IPCC AR4 show large uncertainty in simulating Indian summer monsoon rainfall, however a MME of 10 selected models give reasonably good representation of monsoon though with a dry bias.

MME projects around 10% increase in the Indian monsoon rainfall over central and peninsular India in 2030s. The expected change in the rainfall is within the current monsoon variability and there are large model to model differences making these projected changes to be lesser confident.

MME projects 1.5-2°C warming in the annual mean temperature over the Indian landmass while winter (Jan-Feb) and spring (Mar-Apr-May) seasons show higher warming.

High resolution regional climate model 'PRECIS' shows good skill in representing smaller scale features of monsoon.

The projections of PRECIS in 2030s indicate 3-7% increase in all-India summer monsoon rainfall. The annual mean surface air temperature may rise from 1.7°C to 2°C by 2030s as indicated by the three simulations. The regional climate model simulations indicate that the cyclonic disturbances over Indian Oceans during summer monsoon are likely to be more intense and the systems may form slightly to the south of normal locations.

The ensemble mean changes in the monsoon rainfall are in the range of 2 to 12% while the annual temperature changes are of the order of 1.4 to 1.9° C; however the individual simulations show large differences.

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