# Design Summary and Implementation Document
# UNDP Climate Change Program in India

***-Proposed program and rationale***

In 2008, the Government of India (GoI) launched a National Climate Change Action Plan (NCCAP) with 8 national missions to address specific goals in eight sectors. The NCCAP is a substantial plan with broad acceptance in India. The Prime Minister, Dr Manmohan Singh has taken the lead in promoting the NCCAP and has established a National Climate Change Advisory Committee to advise on the roll out of the program. Getting the support and active engagement of State governments is critical to the national implementation of the NCCAP.

This activity will support national efforts to implement the NCCAP at state level, help reduce greenhouse gas emissions in the small scale steel rolling mills and support Disaster Risk Reduction (DRR) planning for climate change adaptation.

***-Selected partner***

AusAID has selected to work with UNDP because it has taken the lead in working with the Ministry of Environment and Forests (MoEF) in assisting with the implementation of the NCCAP.

UNDP in India works closely with the GoI through it designated nodal department, the Department of Economic Affairs (DEA) in the Ministry of Finance. All activities falling within the UNDP Country Action Plan are nationally owned. Implementation of the program activities are being carried out by implementing partners i.e. Government Ministries, State Governments, District Authorities, Civil Society Organisations, NGOs and other UN agencies including UNDP as appropriate under the overall oversight of DEA.

The present UNDP Country Action Plan (2008-12) was formulated in partnership with DEA, building on the UN Development Assistance Framework (UNDAF 2008-12). The program is in harmony with the eleventh five year plan of the Government of India and has benefitted from wide-ranging stakeholder consultations, including with the UN system and a comprehensive review of lessons from past cooperation.

***-Climate Change context in India***

India recognised the potentially significant impact that Climate Change may have on its people and in 2008 launched a National Climate Change Action Plan NCCAP). Responsibility for implementing the NCCAP rests primarily with the Ministry of Environment and Forests and the Minister, Jairam Ramesh has often said "**no country in the world is as vulnerable, on so many dimensions, to climate change as India.** Whether it is our long coastline of 7000kms, our Himalayas with their vast glaciers, our almost 70million hectares of forests (which incidentally house almost all of our key mineral reserves) – we are exposed to climate change on multiple fronts." The detailed analysis of the potential impacts and actions necessary as outlined in the NCCAP and summarised in Annex 1.

India's greenhouse gas emissions are growing rapidly, and are projected to more than double by 2020 in the absence of additional policy action. India has experienced strong economic and emissions growth rates – among the highest in the world – in the last 5 years, but the starting point for all indicators is low. Fastest emissions growth is occurring in the electricity, heating and cement sectors. From 1990 to 2004, emissions in these sectors grew by over 100 per cent

and the electricity and heating sector is the largest source of India's emissions.[1] However, India's per capita emissions are very low compared to most other countries, and will remain so in the short to medium term. India's per capita emissions were only 1.5t CO2-e (compared to 29t for Australia) in 2000, ranking 169th in the world on this measure.

In the Copenhagen Accord, following COP15, India pledged an emissions intensity target of reducing GHG emissions per unit of GDP by 20 to 25 percent between 2005 and 2020. India has subsequently established an *Expert Group on Low Carbon Strategy for Inclusive Growth*. This is a multi-stakeholder group with representation from industry, leading think tanks, research institutions, civil society and government. The Group has been given the mandate to develop a roadmap for India for low carbon development. It will recommend prioritized actions in sectors such as electricity, transport, industry, oil and gas, buildings, and forestry. The Group's recommendations will become a central part of India's Twelfth Five Year Plan which will come into effect in 2012.[2]

India's cabinet approved the *National Mission on Enhanced Energy Efficiency* (NMEEE) on 24th June, 2010. The Mission includes several new initiatives – the most important being the Perform, Achieve and Trade (PAT) Mechanism, which will cover facilities that account for more than 50% of the fossil fuel used in India, and help reduce carbon dioxide emissions by 25 million tons per year by 2014-15. About 700 of the most energy intensive industrial units and power stations in India would be mandated to reduce their energy consumption by a specified percentage. In order to enhance the cost effectiveness of this mechanism, facilities which achieve savings in excess of their mandated reduction would be issued Energy Savings Certificate (ESCerts) for the savings that are in excess of their mandated target. Energy efficiency ratings made mandatory for 4 key appliances — refrigerators, air conditioners, tubelights and transformers from January 7, 2010; more to follow through 2010-11.[3]

As part of the NCCAP, India has launched the *Jawaharlal Nehru National Solar Mission* (JNNSM), which aims to generate 20,000 mw of solar power by 2022. The Mission also has other targets: 2000 mw of off-grid solar plants, and 20 million sq meters of solar collectors to be installed. In addition, 20 million solar lighting systems will be distributed in rural areas, saving about 1 billion litres of kerosene every year. On January 11, 2010 a Solar Energy conclave was held in New Delhi where the details of the Mission implementation, investment and financing opportunities, technical aspects (technology, R&D, human resources) were discussed.

***-Opportunities for Australia***

While the UNDP Climate Change program addresses a broader range of issues, AusAID has selected three components to support. The three components cover both policy and program development on climate change: (1) state level institutional strengthening to mainstream climate change considerations into planning; (2) practical support for the scaling out of energy efficiency interventions in the small scale but labour intensive SME steel rolling mills, and (3) support for adaptation measures through improved DRR.

[1] Factors underpinning future action – 2007 update, Ecofys, 7 May 2007
[2] http://moef.nic.in/downloads/public-information/India%20Taking%20on%20Climate%20Change.pdf.
[3] http://moef.nic.in/downloads/public-information/India%20Taking%20on%20Climate%20Change.pdf.

The institutional strengthening component will provide an opportunity for AusAID to engage with State Governments through partnership with UNDP. Two of the initial six states targeted are in the poorer eastern India region where AusAID is considering focusing its program. This component also offers Australia an opportunity to contribute to capacity building for senior government officers in climate change issues through a partnership between Australian universities and the Lal Bahadul Shastri National Academy of Administration (LBSNAA).

The steel sector was selected because it is a critical resource sector for economic growth in India, especially in building and manufacturing; three-quarters of steel re-rolling in India is done in small and medium scale rolling mills; there are high energy efficiency gains (30-50%) to be made through improved efficiency in SME steel rolling mills; and the mills are significant employers of labour providing income to many families in poorer and rural areas.

Through engagement in the DRR work of UNDP, AusAID will be able to establish valuable linkages with the Comprehensive Disaster Management Program (CDMP) that AusAID supports in Bangladesh. The CDMP is managed by UNDP and there are significant opportunities for cross monitoring and comparative assessments/evaluations. The focus of the DRR component on community based management of water resources will also link to the AusAID-ACIAR conservation agriculture activity in the East India Plateau in West Bengal and also with ACIARs; water cluster projects in Andhra Pradesh. AusAID will ensure there are opportunities for linkages between the UNDP program and other AusAID funded activities in water resource management.

***-Rationale AusAID funding***

By working in partnership with UNDP, AusAID will contribute to increased harmonisation of donor involvement in India. UNDP works closely with the Government of India through its designated nodal department, the Department of Economic Affairs in the Ministry of Finance. All activities falling within the UNDP Country Action Plan are nationally owned. Implementation of the program activities are being carried out by implementing partners i.e. Government Ministries, State Governments, District Authorities, Civil Society Organisations, NGOs and other UN agencies under the overall oversight of DEA. The three subsectors in the AusAID-UNDP program provide an opportunity for Australia to engage with activities led by three GOI Ministries: Ministry of Environment and Forests, Ministry of Steel, and Ministry of Home Affairs.

AusAID has chosen to work with UNDP because it has well established working relationships with the Government. The UN system in India develops its five year strategies through active dialogue with the Government and ensures the UN agencies' program priorities reflect the Government's Five Year Plans. The UNDP Climate Change program is an active program and AusAID will be enhancing the resources available to the program. By supporting an existing program, AusAID will gain 'a seat at the table' in discussions with Government on implementation of the National Climate Change Action Plan and in specific programs for mitigation and adaptation. By becoming partners in a broad based program, AusAID will gain insights into a broader range of GOI policy objectives and be able to assess the capacity for implementation of several key players in the climate change sector. This will enable AusAID to make a more informed choice when planning to increase investments in climate change as well as providing the opportunities to build relations with individuals in a number of Government Ministries.

AusAID has deliberately chosen to work in the three sectors of this program: policy development and implementation, mitigation and adaptation because of the uncertainties surrounding future Australian funding of Climate Change activities in India. By engaging in the three sectors AusAID is making a strategic choice to ensure that the program can readily scale up in any of these three sectors if funding becomes available.
The proposed program is consistent with the direction of the India Country Situation Analysis (CSA) currently under development, and reflects the high priority given to climate change and energy efficiency in the Strategic Partnership between GoI and GoA signed in November 2009. In the development of the India CSA, AusAID is focusing on enhanced technical cooperation in renewable energy and energy efficiency in response to climate change. In the CSA development, AusAID is also exploring how to strengthen our assistance to India on water resource management and food security, including in response to climate change. Support for cooperation on climate change – both mitigation and adaptation – is a niche area where Australian support can add significant value to assist to develop on a low emissions, climate-resilient pathway.

AusAID plans to commit at least $3 million over three years commencing in 2010-11. If additional funds become available, the UNDP program can readily be scaled-up. The funding will initially be allocated evenly between the three components. The first year's contribution is from AusAID country program funds, and could be supported by additional climate change budget measure support in subsequent years. The UNDP proposal outlines the detailed break-up of the budget in Annex 2.

***-Implementation arrangements***
Payment of the annual grant will be made to a specific UNDP New York account following signing of a standard UNDP-AusAID Grant Agreement. A Program Advisory Committee (PAC) will be established provide overall direction to the AusAID-UNDP program. The PAC will be chaired by the UNDP Country Director and will include representatives from AusAID, UNDP, the Indian government and subject experts. A Projects Steering Committee (PSC) will oversee each of the programs within the AusAID-UNDP partnership. AusAID New Delhi will participate in the relevant committees, with assistance from AusAID Canberra as necessary, and will monitor progress on the implementation of the program.

The UNDP proposal outlines further details on management arrangements for each of the components in paragraph 4.

***-Monitoring arrangements***
A Monitoring and Evaluation system is outlined within the overall Log Frame Analysis in Annex 1 of the UNDP proposal. On a quarterly basis, a quality assessment will record as per established criteria and methods towards the completion of key results. UNDP will provide an Annual Review Report to AusAID New Delhi on progress. Field visits will also be arranged periodically to each project site. AusAID will participate in these field visits as circumstances permit. An independent mid-term review funded by AusAID and with AusAID participation will be undertaken towards the end of the second year of funding in conjunction with the Annual Review. A terminal evaluation will be commissioned by the Project Steering Committee.

***-Risk management***
The demand for increased electricity generation for the growing India economy, may lead the GoI to increase the use of fossil fuels and reduce its commitment to the NCCAP. To mitigate

this risk UNDP will maintain a strong communication flow with the Ministry and key decision makers and stakeholders.

Another risk is that State Governments will not see climate change as a priority and leave the implementation of the NCCAP to the National Government. To mitigate this threat UNDP will provide sustained high quality information on the state of climate change predictions and their likely impact in each of the States where the program is focussed.

***-Cross Cutting issues***

Gender and disability will be carefully considered and integrated in the program design. Component 3 (adaptation), will focus in particular on gender issues, with high priority given to addressing the needs of women and disabled people in the preparation of Disaster Risk Reduction planning. AusAID will monitor approaches and methodology through its participation in the PAC and PSC to ensure inclusive approaches where appropriate.

***Attachments***

1. Extract from the Government of India, NCCAP
2. Proposed Budget for AusAID-UNDP Partnership

## Budget break up for the components under the Aus Aid funding - April 2011

| S.No | Activity | Total (Australian $) | |
|---|---|---|---|
| **I. Supporting Climate Change Planning and Implementation Processess** | | | |
| 1 | Capacity development for Climate Change | 298067 | |
| 2 | Knowledge Products | 308712 | |
| 3 | Knowledge Management Centre in Madhya Pradesh | 180969 | |
| 4 | Project Management costs | 73452 | **861199.8** |
| **II. Development of Centre for Climate Change and Environment** | | | |
| 1 | Development of Knowledge Products and Curicullum | 180952 | |
| 2 | Knowledge & Training events | 171429 | |

| | | | |
|---|---|---|---|
| 3 | Domestic & International travel for academic exchange | 64286 | |
| 4 | Academic & Administrative staff | 85714 | |
| 5 | Overheads | 35714 | **538095.2** |

**III. Energy Efficiency in Small and Medium Enterprises in the Steel Rerolling sector**

| | | | |
|---|---|---|---|
| 1 | Awareness creation & capacity building | 75581 | |
| 2 | Technology demonstration in at least 5 model units | 447100 | |
| 3 | Documentation | 159679 | |
| 4 | Project Management costs | 69194 | |
| 5 | UNDP Quality assurance | 51629 | **803183.2** |

**IV. Reducing Vulnerabilities to Climate Change and Disaster Risk**

| | | | |
|---|---|---|---|
| 1 | Technical Officers | 102194 | |
| 2 | Shelter | 266131 | |
| 3 | Livelihood | 159679 | |
| 4 | Workshops, dissemination & KM | 170324 | |
| 5 | Project Management costs | 102194 | |
| 6 | UNDP Quality assurance | 6387 | **806909** |
| | TOTAL | | 3009387 |

## 1. Background to India's National Action Plan on Climate Change

The Fourth Assessment report of the Intergovernmental Panel on Climate Change (IPCCAR4) concluded from direct observations of changes in temperature, sea level, and snow cover in the northern hemisphere during 1850 to the present, that the warming of the earth's climate system is unequivocal. The global atmospheric concentration of carbon dioxide has increased from a pre-industrial value of about 280 ppm to 379 ppm in 2005. Multi-model averages show that the temperature increases during 2090-2099 relative to 1980-1999 may range from 1.1 to 6.4°C and sea level rise from 0.18 to 0.59 meters. These could lead to impacts on freshwater availability, oceanic acidification, food production, flooding of coastal areas and increased burden of vector borne and water borne diseases associated with extreme weather events.

The Prime Minister's Council on Climate Change, in its first meeting on 13th July, 2007, had decided that *"A National Document compiling action taken by India for addressing the challenge of Climate Change, and the action it proposes to take"* be prepared.

The National Action Plan for Climate Change responds to the decision of the PM's Council, as well as updates India's national programmes relevant to addressing climate change. It identifies measures that promote our development objectives, while also yielding co-benefits for addressing climate change effectively. It lists specific opportunities to simultaneously advance India's development and climate related objectives of both adaptation as well as greenhouse gas (GHG) mitigation.

India's development agenda focuses on the need for rapid economic growth as an essential precondition to poverty eradication and improved standards of living. Meeting this agenda, which will also reduce climate —related vulnerability, requires large-scale investment of resources in infrastructure, technology and access to energy. Developing countries may lack the necessary financial and technological resources needed for this and thus have very low coping capacity to meet threats from climate changes. Only rapid and sustained development can generate the required financial, technological and human resources. In view of the large uncertainties concerning the spatial and temporal magnitude of climate change impacts, it is not desirable to design strategies exclusively for responding to climate change. Rather, the need is to identify and prioritize strategies that promote development goals while also serving specific climate change objectives.

It is imperative to identify measures that promote our development objectives, while also yielding co-benefits for addressing climate change effects. Cost-effective energy efficiency and energy conservation measures are of particular importance in this connection. Similarly, development of clean energy technologies, though primarily designed to promote energy security, can also generate large benefits in terms of reducing carbon emissions. Many health — related local pollution controls can also generate significant co-benefits in terms of reduced greenhouse gas emissions. This document identifies specific opportunities to simultaneously advance India's development and climate related objectives of adaptation and GHG mitigation.

It also describes India's willingness and desire, as a responsible member of the global community, to do all that is possible for pragmatic and practical solutions for all, in accordance with the principle of common but differentiated responsibilities and respective capabilities. The purpose of this document is also to create awareness among representatives of the public at large, different agencies of the government, scientists, industry — in short, the community as a whole — on the threat posed by climate change and the proposed steps to counter it.

### *1.1. The Imperative of Poverty Alleviation*

Economic reforms, implemented since 1991, have resulted in faster growth of the Indian economy. GDP growth rates have averaged roughly 8% during 2004-2008. However, 27.5% of the population still lived below the poverty line in 2004-05 and 44% are still without access to electricity. The Approach Paper to the Eleventh Plan emphasizes that rapid economic growth is an essential prerequisite to reduce poverty. The poor are the most vulnerable to climate change. The former Prime Minister, late Smt. Indira Gandhi, had stated: *'poverty is the worst polluter'*. Therefore, development and poverty eradication will be the best form of adaptation to climate change.

The impacts of climate change could prove particularly severe for women. With climate change, there would be increasing scarcity of water, reduction in yields of forest biomass, and increased risks to human health with children, women and the elderly in a household becoming the most vulnerable. With the possibility of decline in availability of foodgrains, the threat of malnutrition may also increase. All these would add to deprivations that women already encounter and so in each of the Adaptation programmes, special attention should be paid to the aspects of gender.

### *1.2 Relationship between Human Development Index and Energy Consumption*

The strong positive correlation between energy use and human development is well recognized (Figure 1.2.1). It is obvious that India needs to substantially increase its per capita energy consumption to provide a minimally acceptable level of well being to its people.

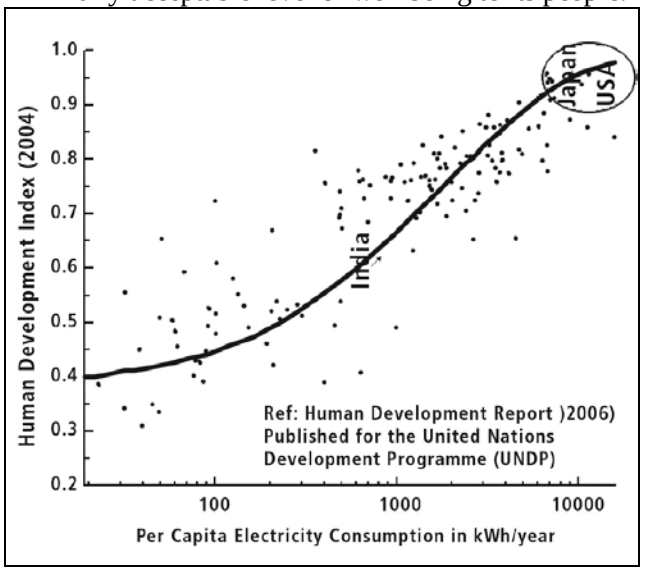


**Figure 1.2.1:** Human Development Index versus per capita electricity consumption

### *1.3 Current Carbon Dioxide Emissions in India*

India's $CO_2$ emissions per capita are well below the world's average[2]. Per capita carbon dioxide emissions of some regions in the world in 2004 are as follows:

| Country | Per-Capita Carbon-dioxide emissions (metric tons) |
|---|---|
| | |
| USA | 20.01 |
| EU | 9.40 |
| Japan | 9.87 |
| China | 3.60 |
| Russia | 11.71 |
| *India* | *1.02* |
| **World Average** | **4.25** |

**Table 1.3.1:** A comparison of India's per capita GHG emissions with some other countries

India has a well-developed policy, legislative, regulatory, and programmatic regime for promotion of energy efficiency, renewable energy, nuclear power, fuel switching, energy pricing reform, and addressing GHG emissions in the energy sector. As a consequence of these measures, India's energy intensity of the economy has come down sharply since the 1980s and compares favourably with the least energy intensive developed countries.

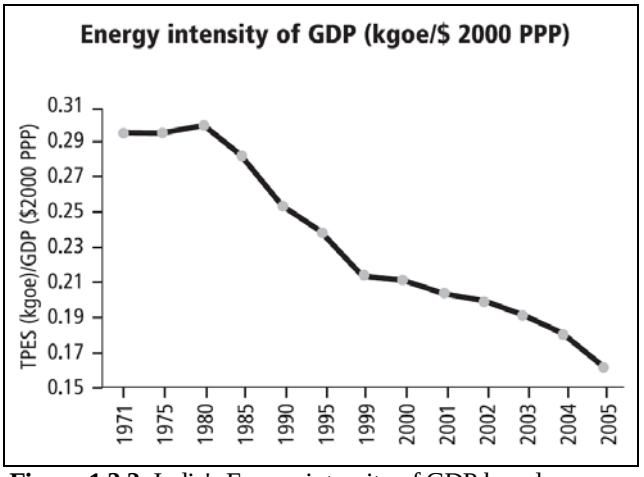


**Figure 1.3.2:** India's Energy intensity of GDP based on International Energy Agency data

### *1.4. Observed Changes in Climate and Weather Events in India*

There are some observed changes in climate parameters in India. India's Initial National Communication, 2004 (NATCOM 1)5 to UNFCCC has consolidated some of these. Some highlights from NATCOM I and others are listed here. No firm link between the documented changes described below and warming due to anthropogenic climate change has yet been established.

#### *1.4.1 Surface Temperature*

At the national level, increase of — 0.4° C has been observed in surface air temperatures over the past century. A warming trend has been observed along the west coast, in central India, the interior peninsula, and north-eastern India. However, cooling trends have been observed in north-west India and parts of south India.

#### *1.4.2 Rainfall*

While the observed monsoon rainfall at the all-India level does not show any significant trend, regional monsoon variations have been recorded. A trend of increasing monsoon seasonal rainfall has been found along the west coast, northern Andhra Pradesh, and north-western India (+10% to +12% of the normal over the last 100 years) while a trend of decreasing monsoon seasonal rainfall has been observed over eastern Madhya Pradesh, north-eastern India, and some parts of Gujarat and Kerala (-6% to —8% of the normal over the last 100 years).

#### *1.4.3 Extreme Weather Events*

Instrument records over the past 130 years do not indicate any marked long-term trend in the frequencies of large-scale droughts and floods. Trends are however observed in multi-decadal periods of more frequent droughts, followed by less severe droughts. There has been an overall increasing trend in severe storm incidence along the coast at the rate of 0.011 events per year. While the states of West Bengal and Gujarat have reported increasing trends, a decline has been observed in Orissa. Goswami6 et al, by analysing a daily rainfall data set, have shown (i) a rising trend in the frequency of heavy rain events,and (ii) a significant decrease in the frequency of moderate events over central India from 1951 to 2000.

#### *1.4.4 Rise in Sea Level*

Using the records of coastal tide gauges in the north Indian Ocean for more than 40 years, Unnikrishnan and Shankar7 have estimated, that sea level rise was between 1.06-1.75 mm per year. These rates are consistent with 1-2 mm per year global sea level rise estimates of IPCC.

Impacts on Himalayan Glaciers

The Himalayas possess one of the largest resources of snow and ice and its glaciers form a source of water for the perennial rivers such as the Indus, the Ganga, and the Brahmaputra. Glacial melt may impact their long-term lean-season flows, with adverse impacts on the economy in terms of water availability and hydropower generation.

The available monitoring data on Himalayan glaciers indicates that while recession of some glaciers has occurred in some Himalayan regions in recent years, the trend is not consistent across the entire mountain chain. It is accordingly, too early to establish long-term trends, or their causation, in respect of which there are several hypotheses.

Under the National Action Plan, these data will be updated and refined continuously and additional reliable data will be collected.

### *1.5. Some Projections of Climate Change over India for the 21st Century*

Some modelling and other studies have projected the following changes due to increase in atmospheric GHG concentrations arising from increased global anthropogenic emissions:

Annual mean surface temperature rise by the end of century, ranging from 3 to 5° C under A2 scenario and 2.5 to 4° C under B2 scenario of IPCC, with warming more pronounced in the northern parts of India, from simulations by Indian Institute of Tropical Meteorology (IITM), Pune.• Indian summer monsoon (ISM) is a manifestation of complex interactions between land, ocean and atmosphere. The simulation of ISM's mean pattern as well as variability on interannual and intraseasonal scales has been a challenging ongoing problem. Some simulations by IITM, Pune, have indicated that summer monsoon intensity may increase beginning from 2040 and by 10% by 2100 under A2 scenario of IPCC.

Changes in frequency and/ or magnitude of extreme temperature and precipitation events. Some results show that fine-scale snow albedo influence the response of both hot and cold events and that peak increase in extreme hot events are amplified by surface moisture feedbacks.

### *1.6. Possible Impacts of Projected Climate Change*

#### *1.6.1. Impacts on Water Resources*

Changes in key climate variables, namely temperature, precipitation, and humidity, may have signifi-

cant long-term implications for the quality and quantity of water. River systems of the Brahmaputra, the Ganga, and the Indus, which benefit from melting snow in the lean season, are likely to be particularly affected by the decrease in snow cover. A decline in total run-off for all river basins, except Narmada and Tapti, is projected in India's NATCOM I. A decline in run-off by more than two-thirds is also anticipated for the Sabarmati and Luni basins. Due to sea level rise, the fresh water sources near the coastal regions will suffer salt intrusion.

***1.6.2. Impacts on Agriculture and Food Production***

Food production in India is sensitive to climate changes such as variability in monsoon rainfall and temperature changes within a season. Studies by Indian Agricultural Research Institute (IARI) and others indicate greater expected loss in the Rabi crop. Every 1 °C rise in temperature reduces wheat production by 4-5 Million Tonnes. Small changes in temperature and rainfall have significant effects on the qual-
ity of fruits, vegetables, tea, coffee, aromatic and medicinal plants, and basmati rice. Pathogens and insect populations are strongly dependent upon temperature and humidity, and changes in these parameters may change their population dynamics. Other impacts on agricultural and related sectors include lower yields from dairy cattle and decline in fish breeding, migration, and harvests. Global reports indicate a loss of 10-40% in crop production by 2100.

***1.6.3. Impacts on Health***

Changes in climate may alter the distribution of important vector species (for example, malarial mosquitoes) and may increase the spread of such diseases to new areas. If there is an increase of 3.8 °C in temperature and a 7% increase in relative humidity the transmission windows i.e., months during which mosquitoes are active, will be open for all 12 months in 9 states in India. The transmission windows in Jammu and Kashmir and in Rajasthan may increase by 3-5 months. However, in Orissa and some southern states, a further increase in temperature is likely to shorten the transmission window by 2-3 months.

***1.6.4. Impacts on Forests***

Based on future climate projections of Regional Climate Model of the Hadley Centre (HadRM3) using A2 and B2 scenarios and the BIOME4 vegetation response model, Ravindranath et. al.8 show that 77% and 68% of the forest areas in the country are likely to experience shift in forest types, respectively under the two scenarios, by the end of the century, with consequent changes in forests produce, and, in turn, livelihoods based on those products. Correspondingly, the associated biodiversity is likely to be adversely impacted. India's NATCOM I projects an increase in the area under xeric scrublands and xeric woodlands in central India at the cost of dry savannah in these regions.

***1.6.5. Vulnerability to Extreme Events***

Heavily populated regions such as coastal areas are exposed to climatic events,such as cyclones, floods, and drought, and large declines in sown areas in arid
and semi-arid zones occur during climate extremes. Large areas in Rajasthan, Andhra Pradesh, Gujarat, and Maharashtra and comparatively small areas in Karnataka, Orissa, Madhya Pradesh, Tamil Nadu, Bihar, West Bengal, and Uttar Pradesh are frequented by drought. About 40 million hectares of land is flood-prone, including most of the river basins in the north and the north-eastern belt, affecting about 30 million people on an average each year. Such vulnerable regions may be particularly impacted by climate change

***1.6.6. Impacts on Coastal Areas***

A mean Sea Level Rise (SLR) of 15-38 cm is projected along India's coast by the mid 21st century and of 46-59 cm by 2100. India's NATCOM I assessed the vulnerability of coastal districts based on physical exposure to SLR, social exposure based on population affected, and economic impacts. In addition, a projected increase in the intensity of tropical cyclones poses a threat to the heavily populated coastal zones in the country (NATCOM, 2004).