Beyond Kyoto
- India in a Climate Perspective
Förord
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Denna rapport utgör en underlagsrapport till Naturvårdsverkets regeringsuppdrag att utreda lämpliga former för det framtida internationella klimatarbetet, ”Post Kyoto”. För att förstå viktiga länders agerande i klimatförhandlingarna har vi beställt bl a denna studie av Indien. Författare till rapporten är Matilda Palm. Författaren är ensam ansvarig för innehållet i rapporten.

Naturvårdsverket juni 2004
PART 1

1. India – short description

India, the largest democracy in the world, is a vast country in many terms, population, area, nature and resources are just a few of the features that make India a diversified country. India has an area of about 3.3 million square meters, including the Indian portion of Jammu and Kashmir, stretches from 8° to 33° 15’ N, and from 68° 5’ to 97° 25’ E (Farmer 2001). India is surrounded by natural borders with the Himalayas (over 6,100 m in height) in the north, the Arabian Sea in the west and the Bay of Bengal in the East.

The Indian climate is, shortly described, mainly affected by the yearly monsoon and in between the hot (or dry) season and cold season. Within these three specific seasons the climate can vary a great deal, from the dry deserts of Rajasthan with temperatures up to 48°C in the in the day to the verdant wetlands in north–eastern Deccan and of Kerala.

In May 2000 the population officially reached the 1,000 m. mark which means that India is currently the second most populated country in the world, exceeded only by China (Pachauri 2002). The population density varies a lot over the country, the density is high in the costal areas, in the river basins but on the other hand the population density is extremely low in the Himalayas, the deserts of Rajasthan and in dense forest areas.

India emits about 4% of the worlds total emission of CO2, which in real numbers is about 1000 Mt CO2, and the per capita CO2 emission averaged one-twelfth that of high-income countries in the 1990s. The per capita emission in India was approximately half of the mean emission of low and middle-income countries for the same period. Despite this fact India still ranks fifth in the world in carbon dioxide emissions, after the U.S., China, Russia and Japan. The figures of today reveals that Indias per capita emission is 1.06 tCO2/capita/year which can be compared to the mean global emission of 4 tCO2/capita/year and Sweden’s emission of 5.9 tCO2/capita/year. To be able to stabilize the amount of GHGs in the atmosphere to Sweden’s long-term goal of 450 ppm CO2, a reduction of the world mean emission by year 2100 to India’s level of today, about 1 tCO2/capita/year.

2. Socio-economical profile

The Republic of India was declared after the independence in 1947 and contains of 25 states, six union territories and one national capital territory. The President of India is the head of the Union and exercises all executive powers on the advice of the Council of Ministers responsible to the Parliament and the Legislature of the States. Each state has a governor at its head appointed by the president. The power of the governor is very similar
to the presidents, just in a smaller scale, and the governor always answers to the
president. Laws can be founded both on national level and applies to all (with exceptions)
and on state level. The Council of Ministers is led by the Prime Minister and consists of
36 ministries.

The first three years after the independency, India consciously sought to build a mixed
economy. One of the main objectives in the general economic policy was to level out the
weakness inherited in a developing economy with a poor capital and infrastructural base.
The economic policy was divided into “five year plans” with the start 1950. India has
experienced a steady acceleration of its national income growth, from near zero growth
between 1900-1950 to an annual rate of 4.0 % between 1950 and 1980. In the last two
decades the national income grew with an annual increase of between 5.5-7.0 %. The
year 2001 was the total Indian gross domestic product (GDP) estimated to be 515 billion
US $ and the GDP per capita was 480 US $, an increase from 42 U.S. $ 1998 (World
Bank). The majority of the GDP is derived in service, including India’s large system of
transport. Agricultural, although in decline, holds another significant portion of the
economy and the largest percentage of the country’s work force. Industries including
textiles, steel, aluminium, fertilizers, electronics, motor vehicles, and petrochemicals,
make up the reminder of the economy (Ramakrishna et al 2003).

The emerge of the middle class during the 1980s and the 1990s is a remarkable social
development. This group, of over 200 millions compared to 260 million poor people
(REDIFF 2003), composed of prosperous farming families and urban-based professional,
administrative, and business elites, and has driven the movement toward modernizing by
demanding loosening of governmental economic control, better education for children
and an improved living standard. Even though this middle class exist in India there is still
a need for improved living conditions for the rest of India’s population.

India holds a unique position as a nation that rushes towards development but still copes
with many of the struggles of a developing country. With significant portions of the
population lacking access to nutrition, clean water, sanitation, basic health care and
education benefits, India continues to strive toward improved quality of life for its
citizens. The United Nations Development Programme ranks India at a level of “medium
human development” number 115 on the list of 162 countries.

The future
In the coming years, India facing challenges in energy, environment and socio-economic
development. The development path chosen by India, upon which lies the future growth
of energy and emission trajectories, will be greatly influenced by cooperation between
countries, and global cooperation in limiting green house gas emissions. The government
of today holds therefore a great responsibility to take sustainable decisions on policies

By the year of 2047, India will probably have overtaken China’s place as the most
populated country, its urban population is estimated to have grown to 796 million,
comprising over 50% of the total population of 1569 million people. Over the period
1997-2047, India’s GDP (gross domestic product) is expected to grow nine fold. A large
part of this growth will be offset by population growth. The per capita income is estimated to increase fivefold, from over 480 US dollar in 2002 to over 2000 US dollar. The expected population GDP growth can be used to make assumptions and projections about the future. (Pachauri 2002)

3. Energy and CO₂ profile

3.1 History

India has seen an expansion in the total energy use for the past five decades; the primary energy use has increased by more than 5% annually from approximately 6 EJ in 1970 to 18 EJ in 2001. In the same time there has been a shift from non-commercial biomass use to commercial energy sources, although many people are dependent of non-commercial biomass for their daily energy use. Coal is the most abundant of the energy sources and has increased with an annual rate of 5.1% between years 1970-2001 (TERI 2003). Presently, coal account for nearly 55% of the primary fuel supply in the country (TERI 2003). The petroleum and natural gas sector have also had a robust increase in the domestic production and supply over the years, although India will continue to depend heavily on the import of crude oil.

The power sector in India has developed from an installed capacity of 1.3 GW after the independence in 1947 to a capacity of 107 GW today (TERI 2003). The annual gross generation has grown with a rate of 7.7% annually between the years 1975-2001. Thermal power accounted for 70% of installed capacity in 2001, while hydro accounted for 25%, nuclear 3% and wind 2%. Of the total installed capacity were 90% owned by the public sector (60% by the state government and 30% under the central government) and the balance of about 10% by the private sector.

Renewable energy options like wind, solar, commercial biomass and small hydro power, etc are emerging in India mostly due to the depleting national oil and gas resources but also as a way to come to terms with the air pollution and climate change. There exists a vast possibility to expanding the use of RETs (Renewable Energy Technologies), see Table 1.

Table 1. Energy potentials and use of fossil fuels and renewable energy in India (MNES http://mnes.nic.in/ach1.htm, Persson and Azar, 2003)

<table>
<thead>
<tr>
<th>Source/technology</th>
<th>Potential</th>
<th>Presently in use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>5900 EJ</td>
<td>10 EJ/yr</td>
</tr>
<tr>
<td>Oil</td>
<td>34 EJ</td>
<td>4.5 EJ/yr</td>
</tr>
<tr>
<td>Natural gas</td>
<td>27 EJ</td>
<td>1 EJ/yr</td>
</tr>
<tr>
<td>Wind</td>
<td>0.4 EJ/yr</td>
<td>4%</td>
</tr>
<tr>
<td>Hydropower</td>
<td>1.7 EJ/yr</td>
<td>20%</td>
</tr>
<tr>
<td>Modern biomass</td>
<td>10 EJ/yr</td>
<td></td>
</tr>
<tr>
<td>Solar</td>
<td>200 W/m²</td>
<td></td>
</tr>
</tbody>
</table>
3.3 Energy scenarios

Energy
Fossil fuels will most likely continue to dominate the energy mix, Coal being a domestic relatively inexpensive source of energy compared to oil and gas, would probably continue as a dominant fuel in power generation (TERI 2003). Since the economy striving at an ambitious growth rate the mobility in the country is expected to increase. Oil is the most favoured fuel for land, sea and air transportation, and the demand for oil is hence expected to grow with an annual rate of 3.6% over the next five years and thereby remain above the 2.1% average growth of the global energy demand. (Planning Commission 2002).

The India Hydrocarbon Vision 2025 of the government identifies natural gas as the fuel of the future, mostly because of the recent findings of natural gas in the Krishna Godavari (KG) basin. Proposals to carry natural gas from the Middle-East and also Central Asia to India and Pakistan have been pursued at governmental level as well as multinational companies. The further demand of natural gas in India will finally depend on the success of exploration ventures or on import of gas. The import from the Middle-East is economical feasible (Sen 1999), although these projects all depend on the cooperation between India and Pakistan. The main reason for the cooperation would be the economic benefits for both countries. Unfortunately for India, India is more dependent on imported gas than Pakistan; Pakistan may not need to import gas the coming decades. This together with the economics of alternative supply routes gives India a weak position in negotiations with Pakistan. Although India could stimulate the need for imported gas in Pakistan by importing power from Pakistan, but and integrated view needs to be taken by India on gas/power imports as the latter not need to be limited to the surplus power.

Even renewable energy sources have a mass appeal. The problem for Indian as developing countries to include a large part of renewables as a viable energy source in their energy budget is the high initial capital cost and skewed distribution across the country (for example is 77% of the hydro potential in the north and the north-east region). Besides harnessing the traditional wind, solar, and hydro energy, the Ministry of Non-conventional Energy Sources (MNES) is implementing programmes on chemical sources of energy, hydrogen energy, and alternative/biofuels for surface transportation, geothermal energy and ocean energy. There also exist potential for generating about 1500 MW of power form urban and municipal wastes and about 1000 MW from industrial waste (MNES 2003).

3.4 India’s greenhouse gas emissions
India figures are among the top ten contributors to the current GHG emissions, although the emission per capita is very low. Eventually the emission from developing countries, particularly due to expected increase of emissions in India and China, may exceed those of the developed countries in a near future, although not when it comes to per capita emission. Indian CO$_2$ (956 Mt), methane (18.63 Mt) and nitrous oxide emissions (0.31 Mt) contributed less that 3 % to the global GHG emissions in 2000 (Shukla et al 2003). The consumption of coal (46 %) and oil products (15 %) contributed together above 60 % of the total emissions. Agricultural and livestock contribute together to 29 %.

![Sector distribution of CO2 emission](image)

Figure 1 Sector wise distribution of CO$_2$ emission from 1995. (Garg et al 2000)

The CO$_2$ emissions has increased with a high growth rate during the last decade, with an annual rate of 5 %, mostly depending on the increased use of fossil fuel by major energy intensive sectors (Garg & Shukla 2002). The methane emission have grown at slower rate, 1.8 % per annum, due to the enteric fermentation and rice cultivation dominance, which also had a slower growth of only 1 % per annum. Although nitrous oxide emission also have agriculture dominance (over 90 %), the annual increase in N$_2$O emission has increased with 5 % due to fast growth of the key driving forces, the synthetic fertilizer. The emission in India comes predominantly from urban cities even though the majority of the Indian population (70 %) lives is villages, where agriculture is the main economy (Shukla 2003). For a more detailed image of the source of emissions in India, see table 2.

<table>
<thead>
<tr>
<th>Source categories</th>
<th>Main emissions</th>
<th>Share (%)</th>
<th>Emission (Mt-CO$_2$ eq)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal based electricity</td>
<td>CO$_2$</td>
<td>29.9</td>
<td>431.6</td>
</tr>
<tr>
<td>Steel industry</td>
<td>CO$_2$</td>
<td>8.8</td>
<td>127.0</td>
</tr>
<tr>
<td>Cement industry</td>
<td>CO$_2$</td>
<td>5.1</td>
<td>73.6</td>
</tr>
<tr>
<td>Livestock related</td>
<td>CH$_4$, N$_2$O</td>
<td>12.6</td>
<td>181.8</td>
</tr>
<tr>
<td>Paddy (rice) cultivation</td>
<td>CH$_4$</td>
<td>6.6</td>
<td>96.1</td>
</tr>
<tr>
<td>Biomass consumption</td>
<td>CH$_4$, N$_2$O</td>
<td>5.2</td>
<td>75.0</td>
</tr>
<tr>
<td>Synthetic fertilizer use</td>
<td>N$_2$O</td>
<td>4.1</td>
<td>59.2</td>
</tr>
<tr>
<td>Transport sector</td>
<td>CO$_2$</td>
<td>9.5</td>
<td>137.1</td>
</tr>
</tbody>
</table>
3.5 Future emission scenarios

India’s future GHG emissions depend on the development pathways the Indian society choose to follow in terms of economic, demographic, land use, agricultural, technological and energy profile changes (Shukla 2003). The IPCC describes four different scenarios depending on the interaction between these different key driving forces. Each scenario is an alternate image on how the future may occur and is an appropriate tool that can be used to analyse how driving forces may influence future emission outcomes and to assess the associated uncertainties. These scenarios are also an important tool when to define better strategies for adaptation and as baselines for comparison with stabilisation scenarios in order to calculate the required mitigation effort. The different scenarios applied on India are published in Climate Change and India – Vulnerability Assessment and Adaptation (2003) and are shortly described below:

**IA1** – This scenario indicates *high growth*, with an assumed GDP growth of 8% annually. The development of energy sources will be more carbon intensive consistent with the current development strategy with abundant domestic coal resources changing with time towards oil and natural gas.

**IA2** – The *business as usual* (BAU) scenario. This scenario reflects the current policies and assumes a GDP growth of between 5-5.5%. With this economic development, the share of commercial energy sources increases, both due to the shifting from traditional energy towards commercial energy and increase in the availability in commercial energy, whereas the traditional energy supply is limited.

**IB1** – The *sustainable development* scenario. This scenario includes a high level of environmental and social consciousness as well as increased emphasis on environment damage prevention and long-term sustainability of socio-economic development.

**IB2** – Self-reliance scenario which indicates *low growth* with an increased decentralization in governance and insulation in economy, a higher emphasis on localization of resources and decentralized resource-sharing and economic development.

*Future CO₂ emissions*

In the future the CO₂ is estimated to continue to dominate the emission of GHGs; the share will rise from 65% in 2000 to 74% in 2030 (Shukla 2003). The major contributor is the coal used in the electricity generation. The carbon emissions grow from 261 million tonnes carbon (Mt-C) in 2000 to 841 Mt-C by the year 2030 in the IA1 scenario (figure 1). The IB1 scenario shows the lowest emission increase to a level of 560 Mt-C, this due to the adaptation of sustainable development policies. The BAU (IA2) scenarios show that the energy use will grow three times and carbon emission from energy will grow 2.7
times. The energy system will continue to depend on fossil fuels, primarily on domestic coal.

The national carbon emission is closely linked with energy use, which in turn is linked with economy growth of India. In 1975 India’s carbon intensity was 68 tons/million Rs and increased to 85 tons/million Rs in 1995. This number is expected to decline due to mainly efficiency improvements. During the years of 2000-2030 the carbon intensity of GDP is projected to decline with 1.9% per year, even though the carbon emission is projected to grow at a rate of 3.4% per year.

![Figure 1. Growth in carbon emissions](image)

**Future emission scenarios for methane and nitrous oxide**

The agricultural sector contributes above 65% of the Indian methane emission today, although this is a declining trend. The emissions from methane is continuing to rise (figure 2) although source of is changing, from the former major emitter, agricultural and livestock to emissions from municipal solid waste (MSW) and coal bed mining. The future methane emission is mainly depends upon the macro-economic structure, agricultural sector reforms, irrigation development and improved technology penetration.

Agricultural sector is and will continue to be the main emitter of nitrous oxide emissions, contributing to over 90% of the emission 2003. The major components of N₂O emissions are the extensive use of synthetic fertilizers, emissions from livestock excretions, field burning from agricultural residues and indirect soil emissions.
4. India’s climate politics

India is highly vulnerable to climate change, as most developing countries are. India’s economy is heavily reliant on climate-sensitive sectors such as agricultural and forestry, and has a heavily populated low-lying cost line which is threatened by a potential rise in sea level. India’s strategy in contributing to global efforts to reduce the risk of climate change has been to develop the institutional capacity to formulate, assess, and implement economic and technical responses to climate change issues; focus on the transfer and adaptation of technology; and integrate sustainable development with national development programmes (TERI 2003).

India has done several actions towards the goals in the UNFCCC, and India’s development plan strives for a balance between both economic development and taking the responsibilities for the environment. Jointly for both these goals is the sustainable development. Initiatives have been taken both from the Government and the private sector, together with reforms in the energy sector to accelerate the economic development and increase the energy efficiency in the energy use. In the last few years several measures relating to environmental issues have been introduced by the government. They have targeted increasing significantly, the capacity of renewable energy installations; improving the air quality in major cities (the world's largest fleet of vehicles fuelled by compressed natural gas has been introduced in New Delhi); and enhancing afforestation. Other similar measures have been implemented by committing additional resources and realigning new investments, thus putting economic development on a more climate-friendly path.
4.1 Institutional structure for climate issues

India signed the UNFCCC in 1992 and ratified it the next year and acceded to the Kyoto Protocol on 26 August 2002. The Ministry of Environment and Forest (MoEF) has constituted a “Working group on the UNFCCC” with the purpose to handle the measures and position that should be taken regarding the different issues that might emerge in the climate change negotiations. A separate group on the Kyoto Mechanisms has also been constituted. The international climate negotiations are led by the Minister of Environment and Forest with help from the Secretary on the same ministry. The core group in the negotiation process consists of representatives from MoEF, Ministry of Non-Conventional Energy Sources (MNES), Ministry of External Affairs and scientists.

To further study India’s emission levels, the Government of India has currently undertaken the task of preparing its first national communication to the UNFCCC, funded by the Global Environment Facility (GEF) and implemented by Winrock International India. The project which has to be known as NATCOM will provide a more comprehensive estimation of emissions of GHGs from five major sectors in the country: Energy, Industrial Processes, Agriculture, Land use, land use change and forestry and Waste. Beside this, activities under the project will also include uncertainty reduction in GHG estimations, vulnerability assessments and adaptation strategies, setting up of a data centre, and targeted research and capacity building initiatives. The Ministry of Environment and Forest (MoEF) is the project’s implementing and executing agency and has allotted different components of the project to different national institutions (figure 3).

Figure 3. The implementation of the NATCOM project (NATCOM 2004-02-18)
Nineteen institutes are involved for the preparation of greenhouse gas emission inventories of carbon dioxide, methane and nitrous oxide emitted from activities in various sectors including energy and infrastructure sector, industrial processes, agricultural sectors, Land Use, Land Use Change and Forestry and waste disposal activities (figure 4). In order to make the inventories comparable and transparent, IPCC methodologies have been used.

![Diagram of Ministry of Environment & Forests and institutions involved in the NATCOM project](image)

**Figure 4.** A schematic picture of the institutions involved in the NATCOM project (NATCOM 2004-02-18)

### 4.2 NGOs

The number of environment- and development-oriented NGOs in India has had a large increase in the last 10-15 years. Supported by judicial activism, the frequency of public protests and public interest legal actions has also risen. Internationally, powerful campaigns have forced several multinational corporations to initiate corrective actions and revise their corporate strategy towards the environment.

Over the years there has been not only a growing public and financial accountability but also a gradual tightening of pollution limits. Such trends will continue as environmental stresses and associated public pressure increases. (Green India) Problems with continuing these trends lie in weak enforcement, especially in the small and medium sector. Past trends in other countries shows that enforcement only improves as environmental stresses and public pressure ascend.
Indian has several NGOs admitted\(^1\) to the UNFCCC, which mean that they may be represented at sessions of the Convention bodies. NGOs have since the beginning been actively involved in the Convention attending sessions and exchanging views. This involvement allows vital experience, expertise, information and perspectives from civil society to be brought into the process to generate new insights and approaches.

The NGOs studied in more detail are not all admitted to the UNFCCC but still holds a great experience in climate change issues and are important influences to the climate change debate.

**The Energy research Institute (TERI)**
TERI was established in 1974 and the focus in the initial was period was mainly on documentation and information dissemination activities, research activities in the fields of energy, environment, and sustainable development were initiated towards the end of 1982. The start of these activities lay in TERI’s firm belief that efficient utilization of energy, sustainable use of natural resources, large-scale adoption of renewable energy technologies, and reduction of all forms of waste would move the process of development towards the goal of sustainability.

**Development Alternatives (DA)**
The mission of the Development Alternatives Group is to promote sustainable national development and the corporate objectives are to innovate and disseminate the means for creating sustainable livelihoods on a large scale, and thus to mobilise widespread action to eradicate poverty and regenerate the environment.

The corporate strategy is to
- Innovation, through design, development and dissemination of
  - Appropriate technologies
  - Effective institutional systems
  - Environmental and resource management methods
- Sustainability, through commercially viable approaches
- Scalability, through partner organizations and networks

**The Centre for Environmental Education (CEE)**
CEEis a national institute involved in developing programmes and material to create awareness about the environment. CEE was established in 1984, the Centre is supported by the Ministry of Environment & Forests, Government of India and associated with Nehru Foundation for Development. CEE's primary objective is to improve public awareness and understanding of environmental issues with a view to promote the conservation and wide use of nature and natural resources. To this end, CEE not only creates knowledge in the field of environmental education, but also develops innovative programmes and educational materials, testing them for validity and effectiveness. These

\(^1\) List presented in the end of the report
programmes and materials are designed flexibly to permit suitable adaptation for use across the country and abroad.

4.3 Science centre

*Centre for Science and Environment (CSE)*
Centre for Science and Environment (CSE) is an independent, public interest organisation which aims to increase public awareness on science, technology, environment and development. The Centre was started in 1980 and for more than two decades, CSE has been creating awareness about the environmental challenges facing our nation. CSE are searching for solutions that people and communities can implement themselves and tries to challenge India to confront its problems. The CSE campaigns for equal rights as the basis for climate negotiations, which will form a model for sharing common property resources in future.

*Indira Gandhi Institute of Development Research (IGIDR)*
The aims and objectives of the Institute are to promote and conduct research on development (in its economic, technological, social, political and ecological aspects) from a broad inter-disciplinary perspective; to gain insights into the process of development and alternative policy options and to disseminate the knowledge so gained.

4.4 Bi and multilateral cooperation

India has been a part of the UNFCCC for over ten years, and cooperates in the international climate change work. Under UNFCCC, India is classified as a non-annex 1 country. Other important parts in India’s multilateral cooperation are United Nation Development Program (UNDP), World Bank, Asia Least-cost Greenhouse Gas Abatement Strategy (ALGAS), Global Environmental Fund (GEF), and USAID.

*The U.S. Agency for International Development (USAID)*
USAID has in many ways been a driving part in the climate change work in India. The cooperation (U.S.- India Climate Change Partnership) started in the 1960s and was mainly in the energy sector, later on the work has continued in several sectors such as urban environment, air quality and transport, sustainable forestry practices, sensitivities and adaptation, science and research. The cooperation and the activities that make up the partnership have been divided into categories of:

- Research
- Technology transfer
- Carbon sequestration
- Market-based and institutional approaches
- Adaptation
This cooperation has resulted in a reduction of GHG emissions, largely through efficiency gains in the thermal power sector and through investments in bioenergy. The U.S. is committed to continue this partnership with India to promote marked-based approaches, technology transfer, and research related to the greenhouse gas emission reduction.

<table>
<thead>
<tr>
<th>India</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of Environment and Forest (MOEF)</td>
<td>U.S. department of State (DOS)</td>
</tr>
<tr>
<td>Department of Science and Technology (DST)</td>
<td>National Oceanic and Atmospheric Administration (NOAA)</td>
</tr>
<tr>
<td>Indian Meteorological Department (IMD)</td>
<td>U.S. Agency for International Development (USAID)</td>
</tr>
<tr>
<td>Ministry of Agricultural (MOA)</td>
<td>U.S. Department of Energy (DOE)</td>
</tr>
<tr>
<td>Ministry of Power (MOP)</td>
<td>U.S. Environmental Protection Agency</td>
</tr>
<tr>
<td>Ministry of Non-Conventional Energy Sources (MNES)</td>
<td></td>
</tr>
<tr>
<td>National Thermal Power cooperation (NTPC)</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 U.S. - India Climate Change Principal Partners

*Asia Least-cost Greenhouse Gas Abatement Strategy (ALGAS)*

This is a regional UNDP/GEF project that is being implemented by the Asian Development Bank (ADB). The project objectives are to build capacity and to conduct studies to assess the present level of GHGs emissions, to review options to reduce GHGs emissions, and to identify technologies that could be cost-effective for reducing GHGs. The project will also develop implementation strategies for GHGs reduction.

*The Global Environmental Facility (GEF)*

UNDP, which is the UN's global development network, is the lead implementing agency for the Global Environment Facility (GEF) in India. With nearly 15 on-going projects, India is the second largest recipient of GEF funding. Biodiversity and Climate Change are the key focal areas for UNDP-GEF with an emphasis mainly on technical assistance and capacity building. Apart from global environmental considerations, GEF projects strongly reflect national priorities, and are implemented in close collaboration with the Government. GEF and UNDP is partnering with MoEF in preparing this submission. India is the second highest recipient of GEF funding, and there have so far been 7 operational projects, 5 Project Preparation and Development Facility (PDF) projects and 7 pipeline/approved projects covering the focal areas of biodiversity and climate change. As regards the distribution by focal areas, 10 projects fall under the climate change and 5 projects are covered under biodiversity.
Part 2

1. Methods

The methods used in this study are based on qualitative information gathering together with analysis of the results. The qualitative information can in turns be separated into two different parts where the literature research lies as a foundation to the interview part. The literature research goes through relevant material both printed and unprinted together with official material from the UNFCCC and IPCC. The webpage of the Indian Government has been really informative as well as information from several NGOs located in India. Further information of different sources used lies in the references part of the study.

The aim was to, through interviews with key informants in different sectors in the society; get a wider meaning of the literature research. The different sectors were chosen because of their important part in the climate change research, negotiation and decision-making. The different sectors were representatives from the government, scientists involved with the subject, representatives from the industry and representatives from NGOs. All important to receive the whole image of the climate change works in India.

This research can not insure that these answers and analyses is the common opinion among the Indian people, nor can it show all specific opinions of the informants. To broaden the analytic ground information from another study made by National Strategy Studies as a part of a workshop (held in Sigriswil, Switzerland in 2002) report with the title Capacity Building for the Kyoto Protocol. The aim of the study was to discuss the future capacity building needs and the way of their meeting, experts from among others India were invited by the World Bank to discuss how to best meet their capacity building needs associated with the implementation of the project-based Kyoto mechanisms (clean development mechanism, CDM, and joint implementation, JI) and to develop strategic priorities on this basis.

2. Analysis

The final analyses of the interviews are not completed yet; it will follow in the forthcoming version. Although there were several thoughts reveled through the interviews that felt important to understand the Indian spirit of climate negotiations. These thoughts were reveled first when the question about targets were raised and also when the interview came to the point of discussion technology transfer and capacity building. I just want to point out that in this stage of
the report these thoughts are not the final analysis, still there exist some material to go through, but just the major thoughts of the author, based on the interviews.

2.1 India and negotiations

All respondents agree that the climate change negotiation and the international cooperation are necessary and works as a good foundation for continues climate change work. The international community and cooperation has a good knowledge of the climate issue and the work is lying on a foundation of good understanding of principles. The next step that needs to be taken is to transform the principles into action, and at this point there might become a bit more problematic. There are much indifference’s that needs to be solved at this point and there exist a need for a moor cooperative for of architecture. An opinion from the NGOs were that the climate change issue should be addressed both with a top-down and a bottom-up approach, both climate change abatement policies, internalizing climate change in the country’s development progress but also directly address the poverty eradication in developing countries.

All the respondents agree that India has played a dominant role in the climate change negotiations ever since the World Summit in Rio 1992. The G77 and China does a lot of negotiation together and several of the respondents are of the opinion that India has a leading role in that cooperation as well. One respondent from a NGO thinks that India should take a more proactive stand in what they do, especially in the adaptation question and the showcases that India are doing, but also to do better in the world forums. He continues, India has a very good scientific capacity in various fields and has been able to be a cutting edge internationally and this could be build upon.

Several of the respondents take up the complexity in the question of the global responsible, the fact that the developing countries drag around a bad conscience over the role they got in UNFCCC. All agrees on that the developed countries should take the leading role in the climate change work, but at the same time there exist an underlying request for developing countries to accept target, binding or non-binding. There are a constant feeling of not doing their part in the global work, while at the same time the developing countries knows that the forthcoming development will demand further emissions and that binding targets is no option. India is well aware that they maybe should contribute to the mitigation work but also that they shouldn’t be the first one to react. It is hard to balance between the eventual willingness to mitigate and the responsibility India holds against the rest of the developing world and its cooperation partners.

2.2 Targets

In the Kyoto Protocol the developing countries were not given any commitments under the first commitment period, although with the technical and financial assistance from the developed countries, such as GEF (Global Environmental Facility) and CDM (Clean Development Mechanism), the developing countries would move towards a less carbon-intensive future path. Maybe in the long term there will be a demand for India and other
large developing countries to undertake commitments or targets to reduce emission (Pachauri 2001).

When looking at the emission figures from 1990 and eventual targets are discussed. It’s very clear that India would do best with a per capita target. The per capita target means in effect that everyone has the same right to the atmosphere and the equity argument is strong when per capita emission are the basis for defining commitments (Kyoto and Beyond 2002). In India’s case, the per capita emission target would give India great benefits because of their large population, only exceeded by China. With a population of 1.027 billion and present rather limited emissions, India could use their emission advantages to continue their development both economically and socially. The disadvantages of this way of defining commitments are that it does not take into account historical or future emissions (Kyoto and Beyond 2002). The left out historical emissions will affect India in a negative way, although the exclusion of further emissions would, if India’s development continues to grow, only be beneficial.

**Development first**

"Climate change mitigation will bring additional strain to the already fragile economies of the developing countries and will affect our efforts to achieve higher GDP growth rates to eradicate poverty speedily."

Indian Prime Minister AB Vajpayee during CoP8 in New Delhi 2002

The Delhi Ministerial Declaration (2002) emphasis that climate change related policies and adaptation measures should be appropriately interleaved with national development programs of each party, considering that economic development is essential for adopting measures to address climate change. In other words, a country shouldn’t be forced to take on binding commitment is the result from the commitment would interfere with the development plan for the country. This matches the general opinion in India, which is; India shouldn’t be enforced targets that would prevent the progressing economic development. One argument reappears in the discussion; if the US can’t afford binding targets, how can India? Binding targets seem to be the wrong way to approach the problem. A developing country on its way to development of any kind needs to increase the emissions. Binding targets at that point would result in maybe a lowering in emission but would also make the development stop or at least to slow down. Developing countries want a lowering in the emission, but also a better economic growth and better equity for the people. A different, more bottom up, approach would give the same result in the long run, a country with a more stable development, lower poverty and lower emission. The lowering in emission can be done in so many other ways, ways like; technology transfer and CDM. If the economic growth can continue without interference the growth will be more sustainable and the same goes for the development.

**2.3 Capacity Building**

The survey objective was to identify the priority capacity building (CB) needs in developing countries, in this case India, and mechanisms for implementing the CB needs.
According to the National Strategy Studies (2003) the NAP is seen as an effective approach to address CB in India but would have to be a decentralized process, though coordinated with the central government institutions, to be effective. The state administration and private sector decision makers were seen as the most important target groups for CB, but mass media was also seen as another important group to create a greater impact. The government respondents were of the view that NGO and academia experts should also be included, since a very limited group among them had the requisite capacity and they were key players in providing capacity building services.

Capacity to identify and prepare CDM projects as well as to implement National CDM Authority was considered as a priority CB requirements. Public and CSO respondents shared the view that further research on key issues of CDM, (especially baseline and additionality) in-country operational entities and capacity of in-country financial sources to support CDM were the other important priorities. Whereas private sector respondents were of the view that capacity to maximize local benefits and legal system to ensure property rights too should be given priority.

The perception on the providers of the CDM CB services varied greatly among the respondents. The government respondents thought that possible providers would be intergovernmental organizations, regional development banks, NGOs and expert centers. The private respondent had the opinion that bilateral funding agencies, academic institutions and private sectors were likely providers, whereas others also possible could provide the service. The Civil Society Organizations (CSO) thought that bilateral and regional development banks were most likely to be providers of CB services but more in the way of financing than delivering the services.

The sectors considered important for capacity building according to the government respondents, were for energy efficiency in service and commercial sector, transport and forestry. The types of CB to best meet the priority was training amongst private sector to develop projects, institutional design for implementing CDM, and information dissemination for wider impact. Institutional capacity building was considered as the most critical as this was thought to facilitate the other two. The other two, systemic and individual were thought to be of equal importance. There was no consensus of what was most difficult capacity building effort to fund. From analysis of responses in decreasing order, activities difficult to fund are networking, methodologies, education, information and public awareness, human resources and finally the institution capacities.

India is country of continental dimensions and, hence, addressing CB needs in India would require a much bigger and wider program. Also unlike other countries there are certain levels of systems in place that can aid implementation of program. To ensure efficient use of resources a national plan should be developed, out of which should flow the implementation of various components. Second, the effort should be implemented through central coordination but at regional level. Targeting of the various groups should be through group association. The private sector capacity building could be channeled through industry associations. The major aspect is monitoring the program and centrally available information on funding various components of the program. To enable the
monitoring and centralized collection of information on various efforts the National CDM authority should become the focal point for CB, though the implementation of efforts should be through non-government/private bodies.

2.4 Technology transfer

The general attitude in India today is that they are looking forward to technology transfer. Most people think that technology transfer would benefit India in many areas, not only in environmental friendly energy and energy efficiency, but also in India’s strive for development. With technology transfer India could more easily develop in a socio-economic way without being pressured into quantitative emission reduction work, work that in India’s opinion would stop or at least halt the development.

Although there are several voices heard assess that technology transfer is not what India need. In their opinion India is self-sufficient in technology and science, that’s not the problem. The problem lies instead in the society, the different layers of knowledge and education in this large country. The gap is too large between the educated and the uneducated. The science is there, but the problems of sufficient management still exist. What India need from the rest of the world today is help to develop a functional work line, from the scientist to the uneducated. A way to implement the research made in the country and a way to educate people in environmental and sustainable development. Other ways to go could be to change the way of manage, for example a power plant, to receive the far most output, both in energy efficiency but also in ways to manage it for the benefit of the employees. The development strived for, will happen if the gap between the unemployed and the employed is getting narrower. Energy education is needed in all layers of the society. The lowest developed layer in the country need to be educated in the possibilities of non-conventional energy sources and the risk of not being aware of the effects of luxury emission and the effect these emission have on the nature. There can also be a risk in not involving the people in the climate change negotiation. The sectors involved in CDM also need to be educated. NSS shows that the public and private sectors knowledge and understanding of issues related to CDM is low. Almost all respondents thought understanding of basic structure of Kyoto markets, key variables affecting international prices, and price scenarios was low.

2.5 CDM

India is currently the world leader in the overall number of CDM projects in the official pipeline, up to now 67 projects. Of these projects are 26 in renewable energy, 16 in energy efficiency, 11 in the waste sector and 4 in the thermal power sector. The majority of the projects are small scale and although the majority of the projects types are within
biomass, the Indian portfolio is broad, large and at the moment unrivalled. India continues to be the leading country when it comes to large scale projects as well. The second HFC23 project is in preparation, and a PFC reduction from a large aluminium smelter has been announced. The government of India has show a support for CDM, first in a cabinet decision prior to the COP6 but also further in the practice of CDM. The government has initiated activities to institutionalize CDM in the country and since the MoEF is the agency that handles climate change issues, CDM is their concern. In may 2004 issued the Indian government the notification letter to the UNFCCC of the Indian DNA (designated national authority), during the waiting time the Indian DNA has approved 27 projects with another 9 only lacking clarification of minor issues.

Why is CDM so important for India? One answer can be that this is the only way India can be involved in the KP for at this moment. The informants in this study all felt that CDM is one way of keep up the climate change work even though there are no actual commitments. The respondents in this study all agreed on that there are some things missing in the CDM discussion. One of these problems is the low prices on carbon in CER trading. Although the opinion is that this price will go up as soon as the Kyoto Protocol is ratified, this is a huge problem to enforce CDM in India. Without a decent price of CERs there is no motivation for nor the government, nor the industry to go for CDM. With a better price on the CERs along with education for the industry, and with some advice from the government the CDM business will be better of. Another way to get the CER prices up according to the scientists were to be part of agreements with other developing countries, like China for example, and agree on a joint policy when it comes to trading with CERs. At the same time as the prices of the CERs need to rise, no one wants the CER market to be flooded. To prevent this can some of the CERs be kept within the country, and discuss the same within G77, this doesn’t need to be a general understanding, although many countries could benefit from this idea.

The NGOs has basically the same opinion, they think that the industry is ready for CDM since they have been discussing these questions for more or less five years; at this point they are only looking for some results. They need the final financial kick to get started. There are already several good projects but maybe there should be something that were putting projects together, since there is a need for bigger projects, maybe some gas line projects, a natural gas plant or maybe projects in hydropower. These kind of large projects have often initial and financial problems and might not arise if they weren’t CDM project. With international regimes that are becoming more open, more comparative and more prompt in taking up these projects, comes a need to compete for those projects and that leads to an upgrading of the industry. The Indian industry need to compete in the international market with their products, the international competition for the projects acts as an incentive for improve productivity and efficiency. They all agree that CDM is a good mechanism that can be very helpful to the developing countries.

The respondents from the government are aware of the problem with low carbon prices, but focus more on which sectors that can be involved in CDM. In their opinion can all sectors be involved, but CDM would be best fitted for renewables, energy efficiency, solid waste, biomass and cogeneration.
The representative from the industry is very clear about CDM. In his opinion there is nothing to gain for the industry in CDM today. The certification, validation, verification and transaction costs are too high and can’t be weight up by the CER prices today. At this point CDM can be a useful tool in education, where are there possibilities for reductions, what are the existing knowledge and capacity on how to gather information and to draw baseline and additionality criteria.

At this moment, according to the scientists, with the current prices and a weak architecture there will hardly be any desire to start any large CER trading and nobody will do anything at all, since the treaty is not yet in business everybody is discussing imaginary dollars.

The studies made by the National Strategy Study shows that the general consensus is that all sectors accept agricultural has good potential for CDM projects. In industry the bigger and organized industry sector alone has the potential. Other important area indicated was municipal solid waste (MSW) and, energy efficiency of appliances and in buildings. The private sector view was that clarity on additionality issue is critical to estimating the potential.

2.5 India and adaptation

It’s impossible to discuss climate change and India without discussion the matter of adaptation. In India, climate change and adaptation is very linked together, and there is a frustration in many cases that the international debate is so differentiated in these two issues. India has reasons to be concerned about climate change and how to adapt to it. Vast population depends on climate-sensitive sectors like agricultural and forestry for livelihood. The capacity to adapt varies among regions and socio-economic groups and will vary over time. The adaptive capacity is a function of wealth, scientific and technical knowledge, information, skills, infrastructure, institutions and equity and any group or region that is limited among any of these are more vulnerable to climate change. When sustainable development is promoted the activities for enhancement of adaptive capacity is just as essential.

The climate changes that are taking place today is a result of historical emission and the affect present and future emission will have are hard to predict. Although the logic tells us that the affect will be greater than today since the emissions are greater today. The future climate changes and the connected adaptation will demand a lot of investments from among others the Government in India. Already a lot of adaptation work is going on in India. Ever since the independence 56 years ago, the government of India has taken many policy decisions that reduce risk and enhance adaptive capacity of the most vulnerable groups by promoting sustainable development.

The climate change is expected to change the rainfall pattern over India and increase temperature. This would seriously affect the human population, infrastructure and the
marine ecosystem along India’s long coastline. It might also lead to high instances of water-borne diseases such as malaria, loss of soil fertility and a decline in agricultural productivity. For a country as dependent of agricultural and aquaculture this would be an adverse setback. Preliminary studies undertaken in India indicate increases in the occurrence of extreme weather events such as floods, droughts and cyclones. The impacts of climate extremes have so far fallen most heavily on the poor, which suggests that the impact of future climate extremes would also fall disproportionately on the poor (IPCC, 1998)

The adaptation work needed for India is among others infrastructure support and agriculture support like irrigation. A larger financial security for poor farmer is also desirable, a system with a kind of climate change insurance for farmers with low creditability. But the adaptation work needs to be both national and international. People in India feel like the adaptation debate has been overrun by the mitigation debate and the Indian debate are trying to link these two issues closer together. The economy of climate change can be divided into these two parts, which are both strongly connected. If the majority of the resources are spent on mitigation, the adaptation cost will be high in the beginning. The adaptation costs will go down with a lowering of emission, although as a delayed reaction of the climate change and since the developing countries, i.e. India, will suffer a great deal from adaptation costs maybe this should be a higher priority in the international negotiation. The only international financing under UNFCCC at this point is the adaptation fund, which receive 2 % of the proceeds from CDM projects. This fund implies that there will be no funding for adaptation work before CDM will be initiated, which is hard to predict since the Kyoto Protocol not yet has come into force.

2.6 Possible cooperation between India and Sweden

Sweden and India have already a good relationship; a good foundation for continues work. Sometimes it seems like Sweden is a bit afraid to be differentiated from the EU position in climate change work. Sweden could benefit from a bit more unique identity, otherwise it will be the large countries in EU will be the only ones that show and maybe take the credit for your work. If Sweden would show our own identity we could get great advantages. Maybe this could be hard in the negotiations, but maybe this could be possible bilateral.

Sweden has good possibilities to help with capacity building, renewable energy like biomass, maybe a more aggressive approach. Sweden might (because of the good foundation build) have an easier way to help with capacity building since no one will doubt their good intention. In the technology side India don’t need that much of the technology “know how”, but instead how to educate and improve the management of the people involved. India needs to put the house in order, good synchronised policies, implementation framework and good monitoring facilitations. This is where the cooperation would be best both for India and Sweden.

India could be interested in capacity building in a non direct climate change approach. Sweden has a “good” way of doing things, the equity and welfare system would suit India well. Even education in the climate change area could be interesting. It’s a bit unclear what
Sweden’s adaptation skills are and how they could benefit India, although your knowledge in agriculture and energy could be very useful in the adaptation work.

The people in the study think that Sweden should invest a lot in Indian CDM projects and take an active part in the projects; all the processes are already there. India is a vast country and can take projects in any field, that there is no specific field that would be better than another, so where ever Sweden would like to invest, they can come forward.

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The Other Media
TOXICS LINK
Winrock International India

Abbreviation

DA  Development Alternatives
CLRI  Central Leather Research Institute
CFRI  Central Fuel Research Institute
CMRI  Central Mining Research Institute
CGCRI  Central Glass and Ceramic Research Institute
CFRI  Central Fuel Research Institute
CMA  Cement Manufacturers' Association
CRRI  Central Road Research Institute
FRI  Forest Research Institute
FSI  Forest Survey of India
IISc  Indian Institute of Science
IIM  Indian Institute of Management
IRPE  Institute of Radio Physics and Electronics
NPL  National Physical Laboratory
NCL  National Chemical Laboratory
NEERI  National Environment Engineering Research Institute
RRL  Regional Research Laboratory
TERI  The Energy and Resources Institute
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