

United Nations Development Programme, India
Lasting Solutions for Development Challenges



Climate Change

PERSPECTIVES FROM INDIA

SUNITA NARAIN • PRODIPTO GHOSH • NC SAXENA • JYOTI PARIKH • PREETI SONI

November 2009

Disclaimer: The views in the publication are those of the authors' and do not necessarily reflect those of the United Nations Development Programme.

Copyright©2009

by the United Nations Development Programme (UNDP)

The articles can be reproduced in whole or part with relevant acknowledge to UNDP and the authors in the following manner:

Name of Author, Name of Publication, Year of Publication, Published by UNDP India.



Climate Change

PERSPECTIVES FROM INDIA

SUNITA NARAIN • PRODIPTO GHOSH • NC SAXENA • JYOTI PARIKH • PREETI SONI





Contents

Pre-words

Chapter-1

Climate Change

A Just Climate Agreement: The Framework for an Effective Global Deal *Sunita Narain* / 7

Chapter-2

Climate Change

Is India a Solution to the Problem or a Problem to the Solution? *Prodipto Ghosh* / 17

Chapter-3

Climate Change

Food Security in India *N C Saxena* / 37

Chapter-4

Climate Change

Gender: The Ignored Other Half *Jyoti Parikh* / 47

Chapter-5

Climate Change

Small-scale Industries: Small yet Significant *Preeti Soni* / 55

About the Authors / 64





Pre-words

Climate Change

Perspectives from India

Climate change is no more an environmental concern. It has emerged as the biggest developmental challenge for the planet. Its economic impacts, particularly on the poor, make it a major governance issue as well. The debates and discussions building up for the next conference of parties (CoP) in Copenhagen and beyond are an indicator of this.

To dialogue, particularly from the perspective of the poor, is one of UNDP's contributions to overall development process. This collection of articles captures and disseminates some perspectives on climate change from the Indian context. Starting from an argument on a new climate deal to highlighting the importance of the small-scale industrial sector within climate change debates, some of India's best known environmentalists, economists and policy makers have put forward their concerns and convictions in this collection.

Sunita Narain argues: "There is not much difference between managing a local forest and the global climate. Both are common property resources. What is needed most of all is a property rights framework, which encourages cooperation." Prodipto Ghosh draws a line between facts and fictions by demystifying six myths built around India's stands on climate change. His analysis brings out that a country can have both growth and less carbon emissions. NC Saxena articulates on the impact of climate change on food security in India that is already under threat due to various other reasons. He strongly advocates adaptation to climate change through

soil and water conservation. Jyoti Parikh has identified the special vulnerabilities of women to climate change. She makes reasons for making gender an integral part of debates and discussions on climate change. Preeti Soni has brought into focus an important but ignored sector: the small-scale industries. The small-scale industries emit substantial greenhouse gases and have the potential for saving huge amount of energy. She has identified ways in which this sector can be made energy efficient.

We hope that this collection will ferment a debate that links climate change to overall development and will put a human face to the overall climate change debate. Because that is the way we can link economy to development.



IT IS IN OUR INTEREST not to first pollute, then to clean up; or first to be inefficient, then to save energy. But we also know that technologies that exist are costly.



Chapter 1

Climate Change

A Just Climate Agreement: The Framework for an Effective Global Deal

Sunita Narain

Equity is a prerequisite for an effective climate agreement

I remember how I first learned about global warming. It was in the late 1980s. My colleague Anil Agarwal and I were searching for policies and practices to regenerate wasted common lands. We quickly learned to look beyond trees for ways to deepen democracy that was conditional to regenerate the commons (in India government owns most of the forests but it is the poor who use them). It became clear to us that without community participation plantation was not possible. For people to be involved, the rules for engagement had to be respected. To be respected, the rules had to be fair.

In the same period, data released by a prestigious research institution in the United States of America (US) completely convinced our then environment minister that poor contributed substantially to global warming. Because, the report argued, they did 'unsustainable' things like growing rice and rearing livestock. The Government of India circulated an order asking state governments to prevent



people from keeping livestock. A flummoxed chief minister of a hill state, after receiving this circular, called us. "How do I do this?" he asked us. "Do the animals of the poor really disrupt the world's climate system?"

Anil and I were equally foxed. It seemed absurd. Our work told us that the poor were the victims of environmental degradation. Here they were being turned into villains.

How?

With this question we embarked on our climate research journey. We began to grasp climate change issues. We, quickly, learned that there was not much difference between managing a local forest and the global climate. Both were common property resources.

What we needed the most of all was a property rights framework that encouraged cooperation. We argued in the following way:

- First, the world needed to differentiate between the emissions of the poor – from subsistence paddy cultivation or animals rearing – and that of the rich – from, say, cars. Survival emissions were not equivalent to luxury emissions, anyway.
- Second, managing a global common resource required cooperation among countries. As a stray cattle or goat is likely to chew up saplings in the forest, any country could also blow up the agreement if it emitted beyond what the atmosphere could take. Cooperation was only possible – this is where our forest-related work experiences came in handy – if benefits were distributed equally. We then developed the concept of per capita entitlements – each nation's share of the atmosphere – and used the property rights of entitlement to set up rules of engagement that were fair and equitable. We said that countries using less than their share of the atmosphere could trade their unused quota and this would give them the incentive to invest in technologies that would not increase their emissions. But in all this, as we told climate negotiators, think of the local forest and learn that the issue of equity is not a luxury. It is a prerequisite.

This was in the 1990s. Today, in 2009, we have come a long way. But this is purely in term of our acceptance that climate change is the biggest existential crisis that the planet has ever faced. However, we remain weak in our commitment to bring change. We are big on words and low on action. This is where we must re-commit to another future in 2009. In change we can and must believe in.

The framework for this just and effective global climate deal is as follows.

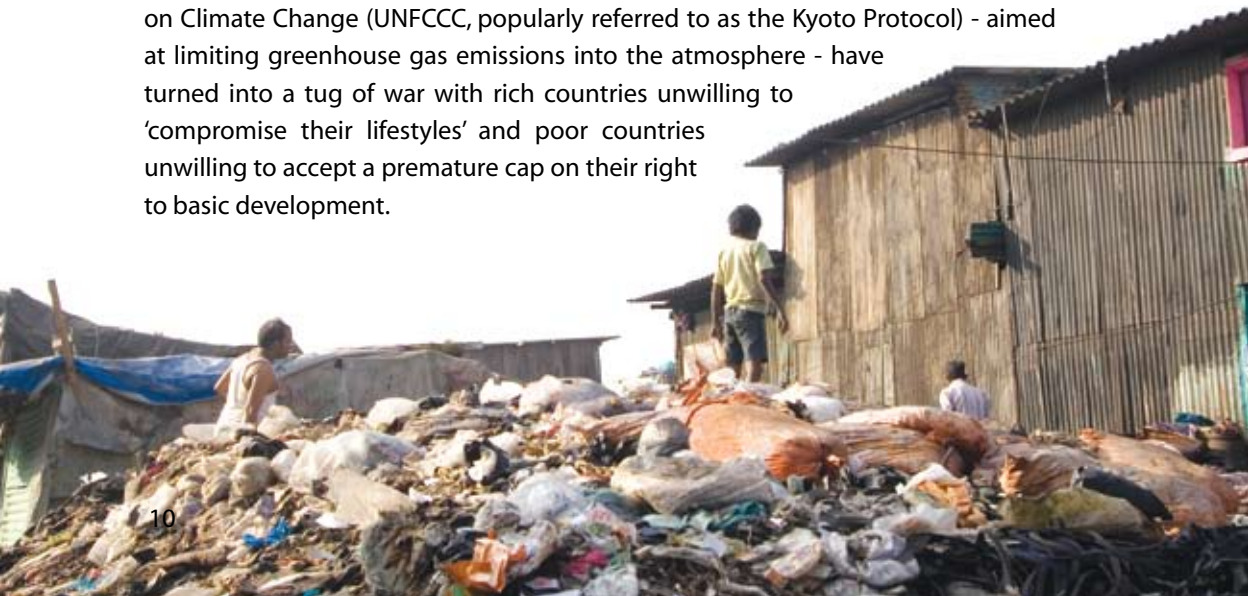
Climate change is about the economy

Industrialized countries have managed to de-link sulfur dioxide emissions from economic growth. In other words, emissions have fallen even as national income has risen. But they have failed to do the same with carbon dioxide (CO₂) emissions. Per capita CO₂ emissions remain closely related to a country's level of economic development, and thus standard of living. It is evident that as long as the world economy is carbon-based – driven by energy from coal, oil, and natural gas – growth cannot be de-linked substantially from CO₂ emissions.

The only way to avert climate change is to reduce emissions dramatically. But things are never quite this simple. The use of fossil fuels (the major reason for CO₂ emissions) is closely linked to economic growth and lifestyle. Every human being contributes to the CO₂ concentrations in the atmosphere. However, the person's lifestyle decides the amount that is emitted. The more prosperous a country's economy is higher is its fossil fuel consumption, resulting in higher greenhouse gas emissions.

Industrialized countries owe their current prosperity to years of 'historical' emissions, which have accumulated in the atmosphere since the start of the industrial revolution. They still emit more to sustain this growth. Developing countries have only recently set out on the path of industrialization. That is the reason why their per capita emissions are still comparatively low.

Under these circumstances any limit on CO₂ emissions amounts to a limit on economic growth. This has turned climate change mitigation into an intensely political issue. International negotiations under the UN Framework Convention on Climate Change (UNFCCC, popularly referred to as the Kyoto Protocol) - aimed at limiting greenhouse gas emissions into the atmosphere - have turned into a tug of war with rich countries unwilling to 'compromise their lifestyles' and poor countries unwilling to accept a premature cap on their right to basic development.



Inaction of the rich world

As the call for action is becoming more strident and urgent (as it must), the world is looking for small answers and petty responses. On the one hand, there is a well-orchestrated media and civil society campaign to paint the China and India as the dirty villains on the block. If they 'cry' about their need to develop, the response is to tell them that they are most vulnerable. "We cannot afford to waste time in the blame-game. Even if in the past, the western world created the problem, you must in your interest take the lead in reparation." This hysteria is growing. But so is inaction.

In late 1997, after years of protracted negotiations, the world agreed to the Kyoto Protocol. Under this agreement, the industrialized world agreed to cut its emissions by just 5.2 percent of 1990 levels by 2008-2012. It is important to note that the world is nowhere close to achieving even this reduction. Not only has the world's largest polluter – the US - walked out of the global agreement but also the Europe is finding it difficult to reach to this small target.

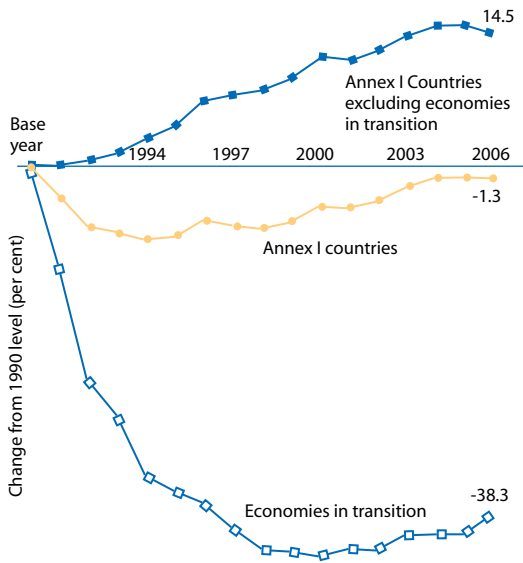
A review by the secretariat of the UNFCCC¹ has found that CO₂ emissions of all industrialized countries (classified as Annex 1 under the convention) declined by 1.3 percent during 1990-2006. This reduction was primarily due to the countries whose economies are in transition. The CO₂ emissions of the Annex 1 countries, excluding countries in transition, actually increased by 14.5 percent (see *Graph 1: CO₂ emissions of Annex I countries*).

During this period, CO₂ emissions of key polluters increased: the US registered 18 percent increase and Australia a whopping 40.5 percent. Even most European countries have seen an increase in their emissions. The only countries that have cut CO₂ emissions are Sweden, UK and Germany. But it is important to note that emissions in the UK and Germany are increasing again. The reason is simple: the UK partly gained its emission reduction by moving to natural gas from coal and this is beginning to change. Germany gained big time because of the reunification between the industrialized west and the economically depressed east. Now new answers have to be found for the current increase.

¹ 'Compilation and Synthesis of Fifth National Communication', note by Secretariat, policies, measures, past and projected future greenhouse gas emissions, FCCC/SBI/2007/INC.6/Add.1, UNFCCC 2007

Graph 1:

CO₂ emissions of Annex I countries under the UN Framework Convention on Climate Change, without land use, land-use change, and forestry (LULUCF)².



In other words, these emission cuts were nowhere close to what was needed, then or now, to avert the catastrophic climate change. They have reneged on their commitment. They have let us all down.

As yet, the rich world has found small answers to this existential problem. It does not only want to keep its coal power plants (even as it points fingers at China and India), it wants to build new ones. It believes it can keep polluting and keep fixing. This time, it has come up with the solution of carbon-capture and storage i.e. to store the emissions underground and hope the problem will just go away. In this way it can have its cake and eat it too.

It is ironical that despite scientific prescription for drastic reductions in emission, no country is talking about limiting their emissions. Every analysis proves that efficiency is part of the answer. But it is meaningless without sufficiency. Cars have become more fuel efficient but people have more cars now and they drive longer as well. It means emissions continue to grow.

² Ibid.



Energy is the key

It is the world's need for energy – to run everything from factories to cars – that is the cause of climate pain. It is also a fact that after years of talk no country has been able to de-link its growth from CO₂ emissions. No country, as yet, has demonstrated how to build a low carbon economy. No country has been able to re-invent its pathway to growth, as yet. This is the challenge.

After years of talk, the proportion of new renewable energy – wind, solar, geothermal, biofuels – comprises just about one percent of the world's primary energy supply in 2006³. It is misleading to say that renewable sources add more electricity than nuclear power. It is old renewable – hydroelectric power – which makes the world light up.

It is tragic that the world is hiding behind poverty of its people to fudge its climate mathematics. The renewable sector is made up of the biomass combustion that comprises the firewood, cow dung or leaves and twigs used by the desperately poor as primary energy sources. It is this that is providing the world its space to breathe.

³ *Renewable Information 2007*, International Energy Agency/OECD, Paris, 2007



We are the change

What is the way ahead? First, we must accept that the rich world must reduce emissions drastically. Let there be no disagreements or excuses on this matter. There is a stock of greenhouse gases in the atmosphere built up over centuries in the process of creating wealth of nations. It is a natural debt these countries owe to the planet. This has already made our climate unstable. Poorer nations will now add to this stock through their urge for economic growth. But that is not an excuse for the rich world not to take on binding emission reduction targets. The principle has to be: they must reduce so that we can grow.

Second, poor and emerging rich countries need to grow. Their engagement will not be legally binding but based on national targets and programmes. The challenge is to find low-carbon growth strategies for emerging countries that don't compromise their right to develop.

This can be done. It is clear that countries like India and China provide the world the opportunity to "avoid" additional emissions. The reason is that we are still in the process of building our energy, transport and industrial infrastructures. We can make investments in leapfrog technologies so that we can avoid pollution. In other words, we can build our cities on public transport; our energy security on local and distributed systems based on biofuels to renewables; our industries using the most energy efficient technologies.

We know it is in our interest not to first pollute, then to clean up; or first to be inefficient, then to save energy. But we also know that technologies that exist are costly. It is not as if China and India were bent on first investing in dirty and fuel-inefficient technologies. We invest in these, as the rich world has done now instead of taking the same polluting path they adopted centuries ago.

The 'just' deal: what does it mean?

It is clear that the emerging world can leapfrog to make the transition to cleaner technology regime. Why is this not happening? Why is it that the world talks big but makes small changes?

When the Kyoto Protocol was being negotiated, the world invented the Clean Development Mechanism (CDM) to pay the poorer world to make the transition. But the mechanism was designed to fail. The obsession was to get the cheapest emission reduction options for the rich world. As a result the price of CERs (the Certified Emission Reduction, unit used in this transaction) has never reflected the cost of renewable and other high technology options. It is a cheap and increasingly corrupt development mechanism. It is also a convoluted development mechanism in which rules bind governments not to consider big change. In fact, current CDM provides disincentives for developing countries governments to drive policies for clean energy or production. Any such policy which is already designed is bad in the CDM portfolio. It is not additional and it will not qualify for funding.

The world must realize the bitter truth. Equity is a prerequisite for an effective climate agreement. The fact is that without cooperation this global agreement will not work. It is for this reason that the world must seriously consider the concept of equal per capita emission entitlements so that the rich reduce and the poor do not go beyond their climate quota. We need climate responsible action. We need effective action.

THE WORLD is yet to delink growth from carbon emission. Per capita CO₂ emissions remain closely related to a country's level of economic development.



NO COUNTRY IN HISTORY has improved its level of human development without corresponding increase in per capita use of energy



Chapter 2

Climate Change

Is India a Solution to the Problem or a Problem to the Solution?

Prodipto Ghosh

India has made development and poverty eradication the axis of global climate debate

Debate on multilateral action on climate change between the developed and developing countries has been sharply polarized for a long-time. India has been in the eye of this storm since 1980s when this debate started. This is because India forcefully, and rightfully, made development and poverty eradication key issues within the climate change negotiation. India doesn't buy the argument of the developed countries that the concern for the planet's present climate must supersede the historical guilt of the formers as the major polluters or that the developing countries should adjust their growth prospect in consideration of climate change mitigation.

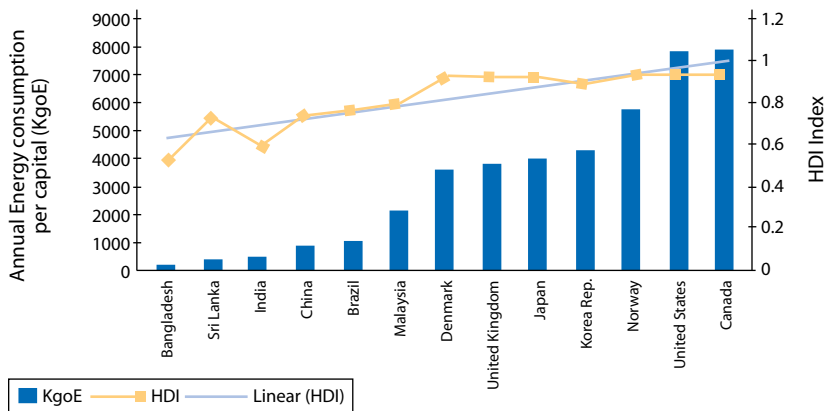
There are many myths being made of India's stands in the context of climate change negotiation and discussions. We need to dispel them.

India's Development Challenges

India, one of the fastest economies of the world, faces the challenge of making available the energy needed to fuel this impressive economic growth. Of India's more than one billion population¹, more than 800 million people (79.9 percent of the population) still subsist on less than US \$ 2 per day. More than 700 million people still cook on traditional cook stoves using crop waste and animal residue. More than 400 million people still don't have access to electricity.

India stands at 128th position in the World Human Development Index. No country in history has improved its level of human development without corresponding increase in per capita use of energy (see Graph 1: An international comparison between Human Development Index and per-capita energy consumption). To expect India not to do so would be unrealistic.

Graph 1:
An international comparison between Human Development Index and per-capita energy consumption



Source: World Development Indicators Database

¹ Population in 2007: 1,123 million

Myth 1:

India has done nothing to promote clean energy and energy conservation

Fact:

Over several decades India has pursued policies and publicly funded programs focused on energy conservation and deployment of renewable energy technologies. This has been backed by legislation, regulation and tariffs arrangements. Some of these are:

- a) Reforming Energy Markets (Electricity Act 2005, Tariff Policy 2003, Petroleum & Natural Gas Regulatory Board Act, 2006, etc.) involving:
 - Removal of entry barriers in exploration, extraction, conversion, transmission and distribution of primary and secondary energy.
 - Instituting price reform and tax reforms to promote optimal fuel choices.
 - Providing feed in tariffs for renewable energy like solar, wind and biomass.
 - Strengthening or introducing independent regulation.
- b) New and Renewable Energy Policy, 2005: The policy promotes adoption of sustainable and renewable energy sources. It facilitates speedy deployment of renewable technology through indigenous design, development and manufacturing.
- c) Rural Electrification Policy, 2006: The policy promotes renewable energy technologies where grid connectivity is not possible or cost-effective.
- d) Biodiesel Purchase Policy: It mandates biodiesel procurement by petroleum companies.
- e) Ethanol Blending of Gasoline: The regulation mandates five percent blending of ethanol with gasoline from 1 January 2003 in nine states and four Union Territories.
- f) Energy Conservation Act, 2001: The legislation aims to reduce specific energy consumption in different sectors. It set up the specialized Bureau of Energy Efficiency (BEE).



- g) Energy Conservation Building Code, 2006: This regulatory code is designed to ensure energy efficiency in all buildings with above 500 kVA connected load or air-conditioned floor area over 1000 square metres.
- h) Bachat Lamp Yojana (Efficient Lamps Program): It is a country wide program for replacement of incandescent lamps by CFLs using clean development mechanism (CDM) credits to equate the respective purchase prices.
- i) 50,000 MW Hydroelectric Initiative, 2003: One hundred and sixty-two new hydro-electricity projects with 50,000 MW potential have been identified.
- j) Others programs: These include the promotion of solar thermal water heaters, solar PVs, wind power generation, biomass gasifiers, biogas and manure management, fuel cells, energy recovery from urban wastes and many similar energy saving activities. In addition, the Government of India adopted an Integrated Energy Policy as an overarching framework in 2008.

Myth 2:

India remains a profligate user of energy

Fact:

To dispel the impression that India is a profligate user of energy i.e. India uses more energy per unit of output, let's dissect the energy efficiency of a few prime energy intensive sectors. In integrated steel plants, one of the high energy intensive industrial sectors, the energy consumption has declined by more than 22 percent during 1990-2005. In another major energy using sector, cement, the annual decline in average specific energy consumption is 7.5 percent during 1996-2006. The fertilizer sector has witnessed on average 26% and 25% improvements in specific energy consumption in ammonia and urea plants, respectively, during 1988-2003. The trend is similar in other major energy using sectors like aluminum, paper, power plants and petroleum refining. Since mid-1980s, India's energy intensity (that is energy consumed per unit of GDP) has been declining steadily. Currently it is comparable to the European Union countries, according to data from the International Energy Agency based in Paris².

A World Bank study published in 2007 looked at the carbon dioxide emissions intensities of the world's 20 largest economies (see *Graph 2: Fossil Fuel CO₂ intensities and GDP per capita of the World's 20 Largest Economies*).

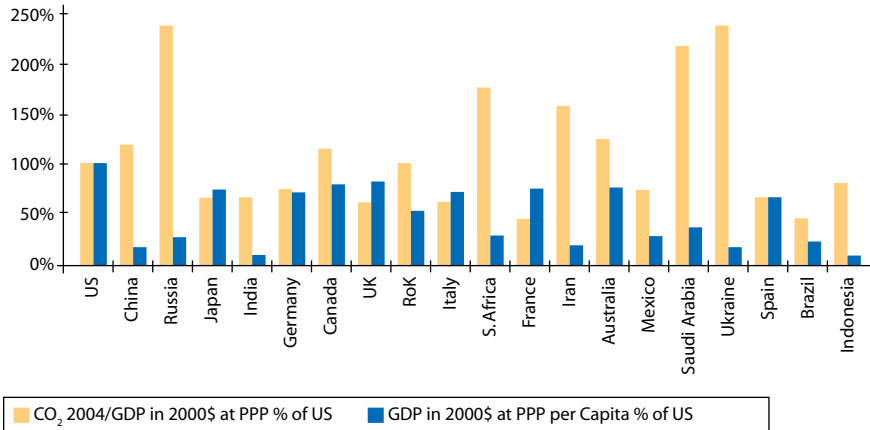
The data is scaled in respect of both CO₂ intensities and GDP per capita in terms of percentage of the corresponding United States of America (USA) figure. A brief

OVER SEVERAL DECADES INDIA has pursued policies and publicly funded programs focused on energy conservation and deployment of renewable energy technologies

² Indian policymakers assert that the IEA, in fact, overestimates India's energy intensity, by imputing to Indian coal the calorific value typical of European coals, while the Indian coal calorific values are significantly lower due to much higher ash content.

examination reveals that there is no basis for the common belief in developed countries that they have lower CO₂ intensities per unit of GDP than developing countries. The CO₂ intensity data for India is better than that of Germany and same as that of Japan that is universally cited as the world's most energy efficient economy!

Graph 2:
Fossil Fuel CO₂ intensities and GDP per capita of the World's 20 Largest Economies



Source: Data in "Growth and CO₂ Emissions – How do different countries fare?": Roger Bacon and Soma Bhattacharya: World Bank, 2007:

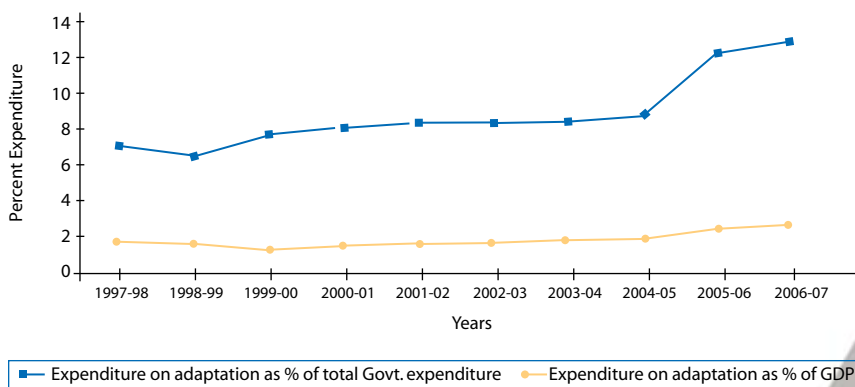
Myth 3:

India is not concerned over its vulnerability to climate change

Fact:

Traditionally India has been highly vulnerable to climate related events like floods, droughts and cyclones. India has many publicly funded programs to address the direct impacts and prevention and control of climate risks. In addition to these, the main objective of major anti-poverty and rural development programs is reduction of vulnerability to climate risks. At present, Government of India spends no less than 12 percent of its annual budget or 2.63 percent of the GDP on these programs (see Graph 3: Annual Federal Government Expenditures to Address Climate Variability). This is more than India's annual defense expenditure (see Graph 4: Where the Money Went?).

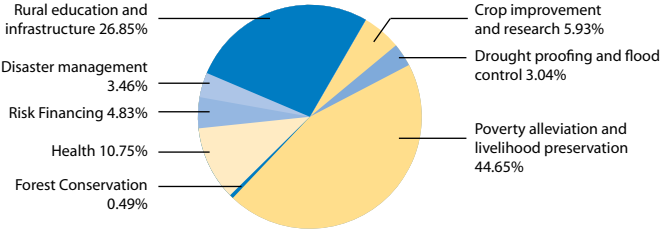
Graph 3:
Annual Central Government Expenditures to Address Climate Variability



Source: Data from Government of India Budget Documents, several years.



Graph 4:
Where the Money Went?



Source: Data from Government of India Budget Documents, 2007-08.

Myth 4:

India is an environmentally unsustainable economy

Fact:

Strong environmental ethic is embedded in India's culture. This remains unchanged despite increased prosperity.

In case of India and China, the CO₂ emissions from the food sector are below that of the developed countries. Most of the carbon emissions in food sector in developed countries come from packaging and processing. Indians prefer fresh produce to processed food. Irrespective of economic status Indians buy fresh produce every day thereby avoiding or minimizing refrigeration and packaging costs.

Recycling of municipal waste in India is well ahead of even Japan, the developed country with the most aggressive regulations to promote recycling. India has a long cultural tradition of recycling. Stripped bare of recyclables, the actually disposed municipal garbage consists mainly of kitchen waste, which too is largely made into compost rather than land-filled. Notwithstanding recent increase in ownership of private vehicles, public transport meets major share of transport demand (including the annual increase).

In choice of automobiles, there is a strong cultural preference for fuel-efficient vehicles³ wherein there is a rapid increase in vehicles powered by natural gas. Electric-driven two-wheelers are gaining acceptance. India's emissions per passenger-kilometer are less than one-seventh of EU-15 and just one-twelfth of the USA. The National Geographic's Greendex that evaluates developed and developing countries for environmental sustainability has ranked India as the world's most environmentally sustainable society in May 2009.⁴

A further demonstration of sustainability comes from a comparison of the so-called Environmental Kuznets Curve (EKC) of India and some other countries. The EKC reflects a

³ This may be seen in advertisements for cars and two-wheelers. Even luxury vehicle manufacturers are careful to point out the fuel mileage of vehicles.

⁴ The first edition of the Greendex, in 2008, jointly placed India and Brazil as the world's most environmentally sustainable societies.

near universal phenomenon: as countries grow, to begin with their environmental parameters worsen and then improve as higher incomes raise public environmental consciousness and also enable public resources to be spent on environmental management. For example, estimates of the EKC turning points for India and a set of 32 countries for two key municipal wastewater parameters, the receiving waters are much less than that for the set of 32 countries. The estimated EKC turning points for several key urban air quality parameters are much lower than for the other set of countries. In respect of energy intensity of the GDP of all countries, the turning point in respect of India was at the lowest per capita income level (*See Table 1: Energy Intensity of GDP: EKC turning points for India and several other countries*).⁵

Table 1:
Energy Intensity of GDP: EKC turning points for India and several other countries:

	Specification	Shape	Turning point	Current income*
Bangladesh	Quadratic	EKC	\$1,377	\$1,827
India	Country	EKC	\$501	\$3,072
Japan	Quadratic	U	\$22,675	\$27,817
Netherlands	Linear	Monotonically decreasing	-	\$29,078
Norway	Quadratic	EKC	\$10,274	\$36,849
Pakistan	Linear	Monotonically decreasing	-	\$2,109
Sri Lanka	Quadratic	U	\$4,092	\$4,088
Sweden	Linear	Monotonically decreasing	-	\$28,936
Switzerland	Quadratic	EKC	\$26,122	\$31,701
UK	Linear	Monotonically decreasing	-	\$29,571

*GDP per capita at constant 2000 international \$, PPP in 2005

Note: Where the EKC curve is stated to be “monotonically decreasing” sufficient past data has not been available to estimate the turning points.

Source: TERI Study, 2008

⁵ Sufficient past data was not available to estimate the turning points in respect of the other countries studied (Netherlands, Pakistan, Sweden, UK).

Myth 5:

India's GHG emissions will grow uncontrollably in the future

Fact:

India's energy intensity shows a rapid decline. Further, all modeling results show that it will continue to decline. This is the reason behind a GDP growth rate of 8 percent per annum being accomplished at no more than 3.7 percent increase in energy use.

A Computable General Equilibrium (CGE) modeling study by the National Council of Applied Economic Research (NCAER), New Delhi provides some interesting results. Till 2030-31, the GDP growth will remain in the range of 8.5 to nine percent per annum assuming that last decade's observed annual energy efficiency increase⁶ of 1.5 percent and overall efficiency of resource use⁷ at three percent per annum continues (see *Graph 5: Trend of GDP Growth Rate till 2030 (Illustrative Scenario): CGE Model Simulation*). Under these assumptions, the energy intensity of the GDP will continue to decline: from 0.11 kgoe/US\$ GDP⁸ in 2003-04 to 0.04 kgoe/US\$ GDP in 2030-31 (See *Graph 6: Trends in Energy Intensity of GDP till 2030: CGE Model Simulation*). The Indian per capita CO₂ emissions grow only modestly from one tonne per capita in 2004-05 to 2.77 tonnes per capita⁹ in 2030-31. It may be added that a recent World Bank study 'India- Low Carbon Growth' using a different model has arrived at similar results.

SINCE MID-1980S, India's energy intensity (that is energy consumed per unit of GDP at PPP) has declined continuously

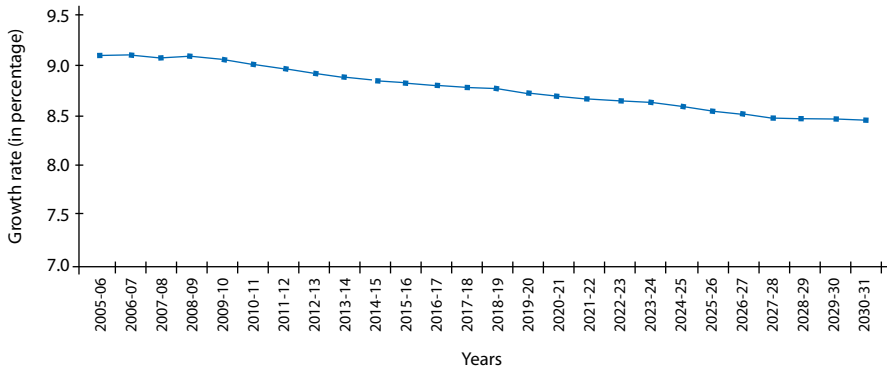
⁶ Called "Autonomous Energy Efficiency Improvement" (AEEI) parameter.

⁷ Called "Total Factor Productivity Growth" (TFPG) parameter.

⁸ The model uses the actual calorific values of Indian fuels, and accordingly, the energy intensity given by the model is somewhat lower than given by the IEA, which employs European norms.

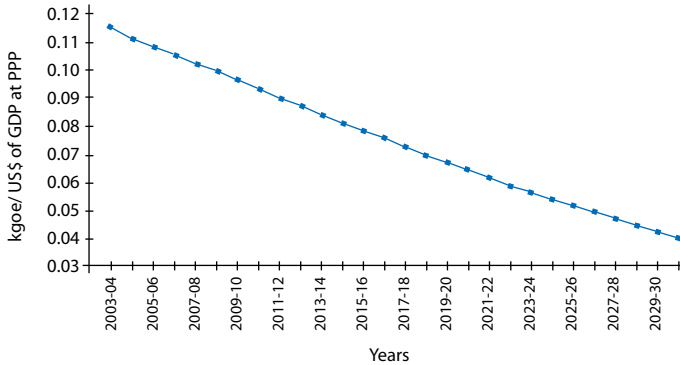
⁹ While India's population is large in absolute numbers, i.e. 1,123 million in 2007, the rate of increase is c. 1.4% per annum, a rate typical of Latin American countries which are much richer. The CGE model uses population growth projections of India's Registrar General of Census.

Graph 5:
Trend of GDP Growth Rate till 2030 (Illustrative Scenario): CGE Model Simulation



Source: NCAER Study, 2009

Graph 6:
Trends in Energy Intensity of GDP till 2030: CGE Model Simulation



Source: NCAER Study, 2009

Myth 6:

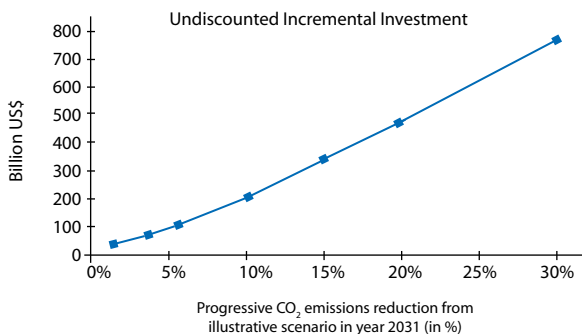
What is the fuss all about? Reducing GHG emissions pays for itself or, at best, is low cost

Fact:

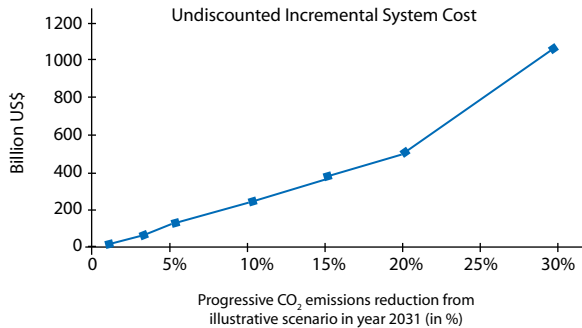
According to results of simulations of the MARKAL model to evaluate the costs of CO₂ emissions mitigation through capital investments in all relevant energy sectors, (assuming that GDP growth rates given by the CGE model for the illustrative scenario are maintained) the undiscounted incremental investment costs are \$ 800 billion and the undiscounted incremental energy system costs are in excess of \$ 1 trillion for CO₂ reduction of 30 percent (See Graph 7 and 8).

Graph 7:

Undiscounted Incremental Investment Costs for GHG Reductions from Illustrative Scenario: 2011-2031: MARKAL Model Simulations



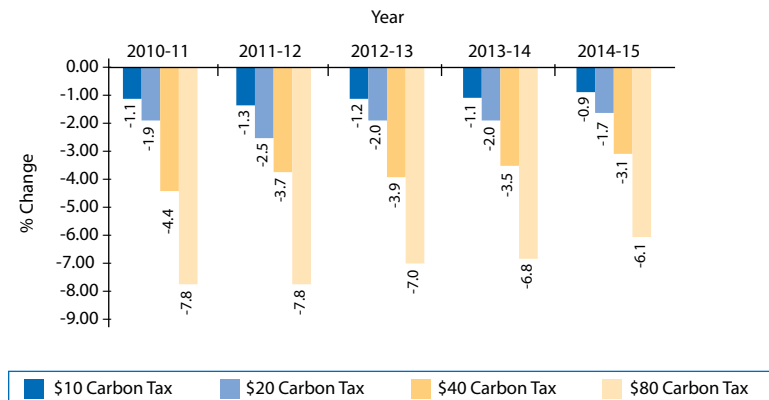
Graph 8:
Undiscounted Incremental Energy System Cost for CO₂ Reductions from Illustrative Scenario: 2011-2031: MARKAL Model Simulations.



However, the shifting of resources towards CO₂ mitigation from other physical and social infrastructure and production sectors would definitely lead to a reduction in GDP growth. These are captured in CGE model simulations involving the use of economy-wide carbon taxes (both revenue positive and revenue neutral) up to \$ 80 per tonne of CO₂ tax (See Graph 9, 10 and 11).

Graph 9:
Percent change from in CO₂ emissions from Illustrative Scenario through imposition of revenue positive carbon tax, 2011-2031, NCAER-CGE Model simulations

%Change in CO₂e Emission (Revenue Positive)



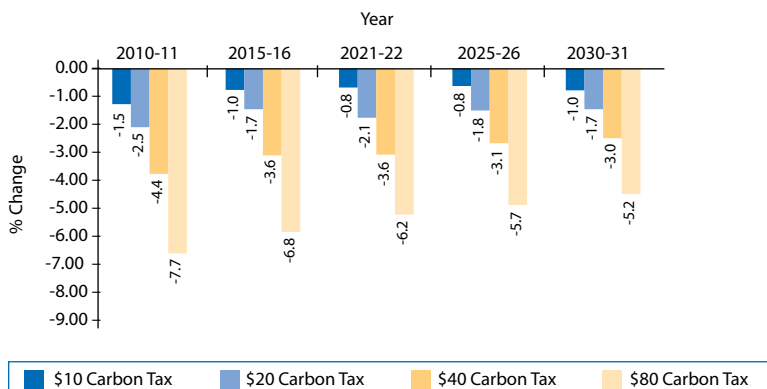
Is India a Solution to the Problem or a Problem to the Solution?

Even a draconian carbon tax of \$ 80 per tonne CO₂ does not result in more than 6.1% CO₂ reduction (revenue positive case) or more than 5.2 % (revenue neutral case) from the Illustrative Scenario in each instance!

The cumulative GDP for the modest levels of CO₂ reductions given above involve cumulative undiscounted GDP losses exceeding \$ 19 trillion and \$ 17 trillion in the revenue positive and revenue neutral cases respectively during 2011-2031.

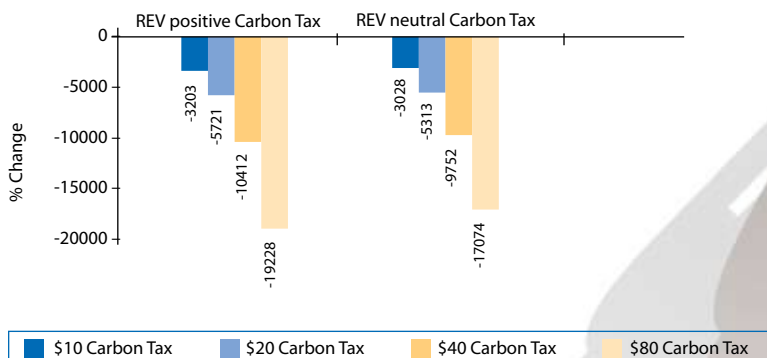
Graph 10:
Percent change from in CO₂ emissions from Illustrative Scenario through imposition of revenue neutral carbon tax: 2011-2031: NCAER-CGE Model simulations

%Change in CO₂e Emission (Revenue Neutral)



Graph 11:
Cumulative Undiscounted GDP losses 2011-2031 from imposition of carbon tax, NCAER-CGE model simulations.

Cumulative GDP Loss (Billion US\$)



The Way Forward

In the above context, the following discussion examines India's proposals for moving forward on the global climate change agenda¹⁰. In terms of the 'building blocks' and some other key elements of the Bali Action Plan (BAP), they are:

- **GHG Mitigation:** Significant mitigation actions by developing countries, beyond the current efforts, will lead to major diversion of their resources away from development and poverty eradication efforts, unless these are adequately compensated and the necessary technology is provided at low cost. Development challenges for key developing countries are typical of other developing countries. They cannot be penalized by abridging their development on the sole argument of 'size'.
- **Sector Targets:** Externally imposed sector targets are an inefficient and impractical mean of GHG mitigation. They are primarily intended to gain market access and are not permissible under the Bali Action Plan (Para 1(b) (iv)) that speaks only of enhancing implementation of Para 4.1(c) of the UNFCCC. On the other hand UNFCCC speaks only of promotion and cooperation in development, application and diffusion of technologies, practices and process for mitigation of GHG in relevant sectors.

INDIA'S ENERGY intensity shows a rapid decline and all modeling results show that it will continue to decline. This is the reason behind a GDP growth rate of 8% per annum being accomplished at no more than 3.7% increase in energy use

¹⁰ In fact, India's approach to the global regime is entirely consistent with the UNFCCC, the Kyoto Protocol and the Bali Action Plan. Most elements also have the endorsement of the G-77 and China.

- **Nationally Appropriate Mitigation Actions:** The BAP requires developing countries to formulate and implement Nationally Appropriate Mitigation Actions (NAMAs) supported and enabled by finance, technology and capacity building that are 'monitorable, verifiable and reportable (MRV)'. In India's view, nationally appropriate signifies that the plans must be prepared by the countries themselves without external dictation or 'adjustment of ambition'.¹¹

Mitigation actions by developing countries supported by finance, technology and capacity building as well as the support provided are accountable in the MRV terms. Actions carried out by developing countries on their own, without support, cannot be subject to the MRV accountability regime.

- **Financing:** In India's view financial support for NAMAs of developing countries is not 'aid' but a discharge of responsibility by developed countries. This is scaled both by their historical responsibilities for climate change and the capabilities they have acquired thereby.

The responsibility-based approach, on the other hand, signifies that the resources must be 'new and additional' (that is not diverted from 'aid'), assessed and not discretionary and be administered by a financial mechanism answerable to the parties (CMP) with a unique governance structure. Financial resources amounting to 0.5-one percent of aggregate GDP of developed countries are necessary to address GHG mitigation in developing countries.

- **Technology:** In India's view, technology is the key to both mitigating and adapting to climate change. It comprises of three elements.

First, a global collaborative effort on research and development (R&D), including adaptive R&D, to enable deployment of available technologies in developing countries as well as to develop new and cost effective clean technologies.

¹¹ Developed country policymakers sometimes argue that without such external oversight, a developing country's supported NAMA actions may be negated by actions outside the supported NAMAs. This demand is unreasonable on three counts. First, a country's public policies, legislations, regulations and budgets are always public knowledge. Second, it would be irrational for a developing country to deviate from a baseline action to an economically sub-optimal action outside the supported NAMAs. Third, would any developed country accept such external oversight in respect of its own policies, legislation, regulations and budget? Sauce for the gander must be sauce for the goose!



Second, existing and new clean technologies must be made available to developing countries for their climate change actions on non-commercial terms. Third, a network of regional technology innovation centers should be set up in developing countries to catalyze collaborative R&D, provide reliable information on available technologies, their costs and performance and enable capacity building on deployment of clean technologies and their further innovation.

- **Adaptation:** India's experience has been that the resource and technology needs for adaptation are of the same order as for mitigation. 'Mainstreaming' adaptation actions into development programs must not involve a diversion of development resources to adaptation, whether the country's own or externally provided.

- **Sustainable Production and Consumption:** High per capita GHG emissions in developed countries are the inevitable outcome of unsustainable lifestyles comprising unsustainable patterns of production and consumption. These need to be addressed in the future climate change arrangements and it must be recognized that human well-being is not conditional on unsustainable lifestyles¹², and on other hand the argument that the present lifestyles of certain countries are sacrosanct is untenable.

Conclusion

The author expects the above description will persuade the reader of four things:

First, India was not a part of the climate problem, is not till now and will not be so in future.

Second, India's (and for that matter all developing countries) concerns about economic growth and poverty eradication are legitimate and must be fully respected in any global climate regime, as indeed stated unequivocally in the UNFCCC and the Bali Action Plan.

Third, the cause of climate change is the unsustainable emission of developed countries. They have to take leadership to drastically reduce their emissions and this will involve modification of their lifestyles but no one is suggesting that they become poor.

Fourth, the proposals made by India (and other developing countries) in respect of the future climate regime are constructive and must be given serious consideration in any discussions on global climate action.

¹² For example, an assertion that commuting to work everyday in a SUV with single occupancy, facing traffic congestion arising from everybody else doing the same, as opposed to commuting by safe and efficient mass transport that enhances well-being.



INDIA'S AGRICULTURE is witnessing less and less productive investments thus threatening the food security of the country.



Chapter 3

Climate Change

Climate Change and Food Security in India

NC Saxena

Climate change has critical ramification for the country's food security

Knowledge about the impact of climate change on current water and crop production is limited. At the same time mitigating and bringing a halt to climate change is not within the capability of one country alone. Thus adaptation strategies seem to be the most immediate needs to save livelihoods and ensure food security.

India has to maintain the sustainability of its ecosystems to meet the food and non-food needs of a growing population. The main thrust of the programmes to combat the impact of climate change on food security should be on activities relating to rainwater harvesting and soil conservation.



A deep crisis

Despite fast economic growth and piling food stocks in the government godowns, India is home to the largest number of hungry and deprived people in the world – to be precise 360 million undernourished and 300 million poor people. Sustaining supply of food itself is emerging as a critical issue. Growth in foodgrain production is slow, rather decreasing over the last few decades. During 1996-2008 it increased by just 1.2 percent per annum: from 199 to 230 million tons (mT), as against an annual rate of growth of 3.5 percent achieved during the 1980s.

On top of it, the poor lack purchasing power. This led to artificial surpluses in foodgrain stock and enabled government to export an average of about seven mT foodgrains annually during 2002-08. The net foodgrain availability has declined from 510 grams per day per capita in 1991 to 443 grams in 2007. It affects the poor the most as they have little access to the more expensive fruits, vegetables, poultry, and meat products. They need food but don't have purchasing power. This situation is more pronounced in central and eastern India.

The policy approach to agriculture since 1990s has been to secure increased production through subsidies on inputs such as power, water and fertilizer and by increasing the minimum support price (MSP) rather than through building new capital assets in surface irrigation, power and rural infrastructure or through improving credit for small farmers and evolving new drought resistant technologies. This has shifted the production base from low-cost regions to high-cost ones, causing an increase in the cost of production, regional imbalance and an increase in the burden of storage and transport of foodgrains.

The equity, efficiency and sustainability of the current approach are questionable. Subsidies do not improve income distribution or the demand for labour. The boost in output from subsidy-stimulated use of fertilizer, pesticides and water has the potential to damage aquifers and soils – an environmentally unsustainable approach that may partly explain the rising costs and slowing growth and productivity in agriculture, notably in Punjab and Haryana states. Although private investment in agriculture has increased, this has often involved macro-economic inefficiencies (such as private investment in diesel generating sets instead of public investment in electricity supply).

Public investment in agriculture has fallen dramatically since 1980s. This coincides with declining share of agriculture in the total gross capital formation (GCF). Instead of promoting low-cost labour intensive options that have a higher capital-output ratio, present policies have resulted in excessive use of capital on the farms such as too many tubewells in water-scarce regions.

Another big change in the last three decades is the dominant use of groundwater as opposed to surface and sub-soil (through shallow wells). Groundwater has become the main source of irrigation. Surface irrigation systems already created are lying wasted because canals or other systems are hardly maintained. Because of inefficiency of large water irrigation systems, people have been forced to exploit groundwater. Thus bulk of Indian agriculture not only remains rainfed but also depends on groundwater, not surface water. This is worrisome in the current context of increasingly variable rainfall.

Due to excessive withdrawal of groundwater, groundwater use exceeds the rate of groundwater recharge. As a result Government has classified nearly 30 percent of the development blocks in the country as semi-critical, critical or overexploited (mostly in 'green revolution' areas) in term of groundwater depletion. As there is no effective control over digging of tubewells in water-scarce regions, farmers are borrowing money from informal sources at high interest rates for it. Many such borings fail due to non-availability of groundwater leading to indebtedness, and even suicides.

Since sinking a bore well involves heavy upfront investment, only the affluent farmers go for it. Small farmers continue to depend on the shallow dug well that has been in existence for decades. Bore wells drain much larger quantities of water and it is usually from the same aquifers that feed the dug wells. So in a village the small farmer is adversely affected due to water withdrawal by richer farmers. The affluent farmers, owning bore wells and electric motors, corner most of the benefits of electricity subsidy too. Ironically, they in turn sell their surplus water to the adjacent small farmers at commercial rates. The built-in biases of the Green Revolution strategy now stand exposed.

Climate change, a crisis catalyst

The existing problems of poor farmers, if not addressed in time, will become more acute due to global warming induced climate change. The prediction so far suggests an upward trend in mean monthly temperature and average rainfall. However, the prediction indicates downward trend in the number of wet days in a year. The impact of climate change would be seen in terms of increased sub-regional variations and more extreme rain events. In a country that gets rain for less than 100 hours in a year (a year has 8,760 hours), this would be disastrous.

The rate of CO₂ release into the atmosphere has increased by 30 times in the last three-four decades. It is estimated that a 0.5 degree Celsius rise in winter temperature would reduce wheat yield by 0.45 tonne per hectare. A recent World Bank report studied two drought prone regions in Andhra Pradesh and Maharashtra and one flood prone region in Orissa on climate change impacts. It found that climate change could have the following serious impacts:

- In Andhra Pradesh, dryland farmers may see their incomes plunge by 20 percent.
- In Maharashtra, sugarcane yields may fall dramatically by 25-30 percent.
- In Orissa, flooding will rise dramatically leading to a drop in rice yields by as much as 12 percent in some districts.

Other effects of climate change are more pronounced. For instance, rise in sea levels, say about a meter by the next century, may displace millions of people. Sea level rise would lead to ingress of saline water and salination of ground water and surface water in coastal areas. Salt water intrusion in low-lying agricultural plains could lead to food insecurity, further spread of water-related diseases and reduced freshwater supplies.

With melting glaciers, flood risks would increase in the near future. In the long term, there can be no replacement for the water provided by glaciers that could result in water shortages on an unparalleled scale. Floods and drought are thus projected to multiply as a consequence of climate change. This will lead to huge crop loss and leave large patches of arable land unfit for cultivation. To sum up it will threaten food security.

Adapting strategies

While knowledge about the impact of climate change on current water and crop production is still nascent, mitigating and bringing a halt to climate change is not within the capability of one country alone. Hence adaptation strategies by Indian government are more likely to save livelihoods and ensure food security than mitigation strategies.

At the outset we need to maintain the sustainability of water-based ecosystems by ensuring adequate water supplies to meet the food and non-food needs of a growing population. As agriculture is the largest user of water in India (using more than 80 percent of usable freshwater) and a large proportion of the population derives its livelihood directly or indirectly from it, we need to build efficient irrigation systems and adopt water conservation strategies. This we need to do more in semi-arid regions through conjunctive use of surface and groundwater in India.

The main thrust of the programmes to combat the impact of climate change in the rainfed areas should be on activities relating to rainwater harvesting, soil conservation, land shaping, pasture development, vegetative bunding and water resources conservation on the basis of the entire compact micro-watershed which would include both cultivated and uncultivated lands. In the preparation of the watershed development plans, for which the National Rural Employment Guarantee Scheme (NREGS) funds can also be used, user groups and other people depending directly on the watershed should be actively involved. However, there are strong social and political constraints why so far success has been modest.



Although the ministries of agriculture and rural development have been implementing watershed projects for more than a decade, evaluation reports show that these projects cannot succeed without full participation of project beneficiaries and careful attention to issues of social organisation. This is because success depends on consensus among a large number of users. Moreover, collective capability is required for management of commons and for new structures created during the project. Then the costs and benefits of watershed interventions are location-specific and unevenly distributed among the people affected. Unfortunately most projects have become unsustainable because of the failure of government agencies to involve the people and build their social capital. Finally, there is political reluctance to control water hungry crops in low rainfall regions, such as sugarcane in Maharashtra and paddy in Punjab. One would need stricter implementation of environmentally sound cropping patterns and regulation of use of groundwater. Incentives should be given to farmers to move away from crops that tempt them to 'steal' water from their neighbours (*See box: How real is the water famine?*).

How real is the water famine?

During the summer months of April-May 2000, the Maharashtra Government was supplying drinking water through tankers in about 3000 villages. However, many of these had a standing and well-irrigated sugarcane crop. Thus groundwater that should have been a community resource was being monopolized by a few rich farmers, who also took advantage of the easy availability of two other scarce resources – electric power and capital. The responsibility to provide drinking water was then transferred to the State.

Mid-Term Appraisal of the Ninth Five-Year Plan, Planning Commission

In view of the impending threats caused by climate change, regulating the unrestrained exploitation of groundwater and aggressive pursuit of water conservation should become a national priority. Drip irrigation and water sprinkler approach, mulching and bed plantation, construction of tanks and check-dams should be promoted for water harvesting and conservation. Its impact is visible in Alwar region of Rajasthan wherein barren lands were converted into lush fields. Dried up rivers got rejuvenated by making Johads, small earthen check dams.

Forest is a natural carbon sink. A programme for massive tree plantation and control on open grazing will help in the regeneration of forests and slow down the process of desertification. Agro-forestry is the answer. For instance, trees may fertilise the soil for agricultural crops or may provide shade from sun or shelter from wind. Complementary relationship between trees and crops may also be in labour use, especially when the two outputs draw labour resources at different time of a year.

With unpredictable weather in future, farmers will have to change crop management practices, grow tougher plant varieties and be prepared for constant innovation in the way they operate. One adaptive measure in changed climate to sustain wheat productivity is introduction of longer duration and one week early planting varieties. In some areas one may consider developing strategies for crop substitution that is to replace wheat with millets, tubers like potato, yams and cassava.

As occurrence of flood is likely to increase in many parts of India, one needs better systems for detection and forecasting of floods and popularise rainfall tolerant and short duration varieties or shift cropping pattern to the rabi (winter crop) season by increasing access to irrigation in those months. Income diversification provides a robust way of mitigating flood risks. In coastal areas aquaculture holds considerable potential if the supply chain and marketing are improved.



Summing up

It should be kept in mind that the most vulnerable to climate change are the poor in India. Unfortunately their assets and livelihoods are tied to climate-sensitive factors of production. Therefore greater political and bureaucratic attention is needed to diversify their livelihoods and reduce their vulnerability. This would need investments in sectors other than crop production too. We need to have a significant increase of targeted investments in nutrition programs, clinics, disease control, irrigation, rural electrification, rural roads and other basic investments, especially in central and eastern India.

Lastly, we need to build administrative capacities for designing climate proof investments, such as conservation of wetlands, wastewater reclamation, equitable access and regulatory structures for basin level management. In addition, resource mobilization, promoting insurance and agri-business are other major strategies to protect against risk of production loss due to calamities caused by climate change. Greater and imaginative governmental intervention would also need an efficient and professional administration that is tuned to the emerging but uncertain crises caused by global warming and climate change. However, these new problems cannot be cracked without addressing the long term and often neglected issues afflicting India's smallholder agriculture described in the first part of this paper.

THE MAIN THRUST OF THE PROGRAMMES to combat the impact of climate change in the rainfed areas should be on activities relating to rainwater harvesting and soil conservation

References

'Climate Change Impacts in Drought and Flood Affected Areas: Case Studies in India', Report No. 43946-IN, World Bank, New Delhi, 2008

Agrawal, K P, *'Climate change and its impact on agriculture and food security'*, LEISA (Low External Input and Sustainable Agriculture), India, December 2008

Sahai, Dr Suman, accessed from <http://www.cbd.int/doc/external/mop-04/gc-en.pdf>, *'India can beat the food crisis'*

TERI, *'Adapting to climate change – strategies for water and food security in India'*

Chaudhary, Dr. Anita, *'Climate Change And Food Security in India'* at http://www.whoindia.org/LinkFiles/Health_&_Environment_Nat_Wrksp_Climate_Change_Lonavala_p09.pdf

Down to Earth, *'It's raining GDP'*, Centre for Environmental Communication, New Delhi, 31 July 2009

Saxena, NC, *'Integrating the Rural Poor into Markets'*, Academic Foundation, New Delhi, 2004



CLIMATE CHANGE will impact women differently and severely



Chapter 4

Climate Change

Gender: The Ignored Other Half

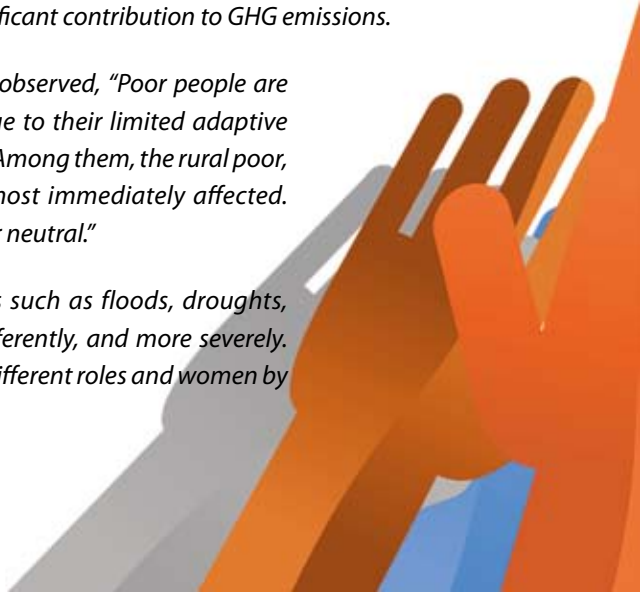
Jyoti Parikh

Climate change is not gender neutral

Climate change will dramatically alter the natural balance of local and global ecosystems and will infringe on human settlements. Consequently, vulnerable groups such as poor will face food insecurity, loss of livelihood, hardships due to environmental degradation and extreme events such as drought, floods, storms and cyclones. These extreme events will also lead to displacement and a whole host of potentially devastating economic and social consequences. It is the poor women who are more vulnerable and will bear the adaptation burden despite their insignificant contribution to GHG emissions.

As Dr Gro Harlem Brundtland in 2007 observed, "Poor people are more vulnerable to climate change due to their limited adaptive capacities to a changing environment. Among them, the rural poor, rural women and girls are the ones most immediately affected. Climate change impacts are not gender neutral."

Climate change and natural disasters such as floods, droughts, cyclones and storms affect women differently, and more severely. This is because men and women have different roles and women by





social defaults face discrimination in various forums. This also brings down the capacity of women to adapt.

Gender-disaggregated approach is required in order to shed more light on the levels of vulnerability and coping mechanisms of different social groups and effectiveness of measures. These findings should feed into the climate negotiation as well as national debates to enable decision makers to have a better understanding of how different groups of people are affected and what kind of capacity and support is needed. Analysis needs to include vulnerability and adaptation, mitigation and a way forward, especially in a manner in which engagement can take place.

Vulnerability and adaptation

J. Parikh and Denton (2003) emphasized that in climate related decision making, gender concern is absent institutionally, in semantics and in financial allocations and budgets. This is despite the fact that climate change poses a bigger challenge to women in terms of vulnerability and impacts. Climate change may exacerbate existing shortages of water. Women, largely responsible for water collection in their communities, are more sensitive to the changes in seasons and climatic conditions that affect water quantity and accessibility. This brings in more burdens for women.

Climate change induced sea level rise affects the fishermen and fisherwomen not only in terms of fish-catch but also in term of water scarcity. Sea ingression turns local water bodies saline thus pushing women to search more for fresh water. Moreover, women face threat to their livelihoods as fishing may also be affected by sea level rise and intrusion of saline water into freshwater systems. Besides, large-scale migration from inundated areas is expected. Migration again leads to extra hardships for women. Due to extreme events and disasters, men migrate more often than women do. In dry land areas, the female-headed households left behind are often the poorest. To manage the house women put in significantly extra efforts.

As climate change intensifies natural disasters, more women will be affected if proper measures are not taken. Women accounted for 55-70 percent of Banda Aceh tsunami deaths; 70 percent of the deaths during the 2003 European heat wave were women. Ulrike Rohr points out that when Bangladesh was hit by a devastating cyclone and flood in 1991, the death rate was reportedly five times higher among women. In disasters such as intense rainfalls, floods, cyclones and storms, women suffer more due to their restricted mobility, inability to swim or run, pressures from family and household responsibilities and less exposure to trainings and information such as early warning signals (*See Table 1: Impacts on Gender: Poverty, Wellbeing and the MDGs*).

Table 1: Impacts on Gender: Poverty, Wellbeing and the MDGs

Climate Change	Impacts on gender, livelihood, poverty, wellbeing and the MDGs
<p>Forest</p> <p>Degradation of forests</p>	<ul style="list-style-type: none"> - More drudgery for women for fuel and water - Less time for income generating activities - Less time for children education - Reduction of income and due to Non-timber forests Products (NTFPs)) - Loss of eco-tourism opportunities.
<p>Food and Agriculture</p> <ul style="list-style-type: none"> - Less yield from crops - Increased food prices - Change in food patterns - Depleting livestock 	<ul style="list-style-type: none"> - Reduced calories intake for women and girl children - Higher food insecurity for women - Less milk/nutrition for children, livelihood
<p>Water</p> <ul style="list-style-type: none"> - Reduction in water availability - More dependence on unsafe water 	<ul style="list-style-type: none"> - Longer distances for fetching water - Impacts on mother and child nutrition
<p>Biodiversity</p> <ul style="list-style-type: none"> - Loss of species (flora and fauna) - Loss of medicinal plants/herbs - Loss of mangroves and corals. - Loss of gene pool. 	<ul style="list-style-type: none"> - Loss of indigenous practices - Loss of livelihood - Reduced income - Increased vulnerability
<p>Health</p> <ul style="list-style-type: none"> - Water borne diseases - Increase of diseases like dengue, malaria, etc. - Respiratory diseases due to indoor air pollution and other emissions 	<ul style="list-style-type: none"> - Women and children more vulnerable - Infant mortality - Disease sensitivity


Gender involvement in mitigation

It is estimated that \$125 billion was invested on renewable energy technology in 2006 to address climate change. Involving women in such initiatives will make this investment effective. Engaging in income-earning activities that are climate compatible could be the way to ensure that women can afford to purchase labour – saving energy technologies for their household chores (WEDO, 2004) and thus contribute towards mitigating climate change. Women have proven themselves capable of operating and also constructing renewable energy applications on their own, when provided with appropriate training and support.

Efficient fuels and technologies will penetrate only if the income generated from women's time saved exceeds the cost of the fuels and technologies. Urban women's role can be significant to implement energy efficiency programmes at the household level dealing with lighting, heating and cooling appliances while rural women are already playing crucial roles in using biomass, biogas and solar devices. Capacity building and information campaigns can result in substantial gains. J. Parikh (2002) highlighted the possible role of women in Clean Development Mechanism (CDM) as women are engaged in a number of activities such as brick making, charcoal making, waste management, afforestation and reforestation and energy projects such as biofuels production. In this energy efficiency can lead to CO₂ mitigation. CDM, through carbon sequestration from afforestation and reforestation, can also be done by poor rural women.

Women's role in recycling and waste management within the households includes a variety of opportunities to make women an important agent in resource conservation. Moreover, rag-picking women serve useful purpose and reduce municipality budget for garbage collection. In Mexico poor women have set up a profitable recycling company using municipal solid wastes. Also women in rural areas can source gas from local wastes.

**WOMEN SHOULD PARTICIPATE IN ALL DIALOGUE
on the generation of solutions for disaster risk
management and conflict prevention**

A stylized illustration in the bottom right corner of the page shows several hands of different colors (shades of grey and blue) reaching up to hold a globe. The hands are positioned as if supporting the globe from below, symbolizing collective effort and care for the planet.

Adaptation Strategies

Capacity development can strengthen resilience to climate change by strengthening the capacity of national and local institutions. Poverty reduction mechanisms can also strengthen linkages between climate change risk management and poverty reduction by mainstreaming this into poverty reduction strategy and assistance to developing countries can help them to choose the right energy paths that provide low carbon sources of power (Lorena Aguilar, 2009).

Mainstreaming climate change into environment and energy services and crisis prevention and recovery work is needed to support mitigation and adaptation action on the global, regional, national and provincial and community levels. Some of the strategies are: pursuing policy and agenda setting, experience-sharing and training activities, establishing a system of experts to assist countries to access, integrate and sequence different sources of financing and it will evaluate alternative mitigation and adaptation options. It needs focus on policy change and institutional strengthening through activities such as training for policy makers and national assessments of policy options and also on market development and transformation for lower carbon technologies and sustainable land management.

Gender inclusion and change mitigation may need to support policy for climate change mitigation and adaptation (WEDO, 2007). At the community level we need to focus on gender related activities such as increasing access to sustainable sources of energy and water in rural areas and developing the capacities of communities to make their livelihoods more resilient in the face of climate change. Women should participate in all dialogue on the generation of solutions for disaster risk management and conflict prevention. National capacities need to be strengthened for crisis-related gender analysis including the incorporation of gender statistics into assessments of disaster risks, impacts and needs.

International Action

International efforts are needed for policy negotiations on how to integrate gender in the climate change mechanisms. International treaties like the United Nations Framework Convention for Climate Change, Kyoto Protocol, CDM and Marakesh Accords have impact on women. The Inter-governmental Panel on Climate Change (IPCC) also has a role in assessing latest scientific, technical and socio-economic literature produced worldwide relevant to the understanding of the risk of human induced climate change and its observed and projected impacts and options for women.

Conclusion

Strategies must be evolved for long-, medium- and short-term policies needed for substantial involvement of women not only in terms of beneficiaries but also in their say in decision making. Climate change strategy needs to focus on supporting design of policies and action plans, promoting early adaptation as well as long-term strategies like directing investment towards low carbon technologies and practices and finally integrating climate change broadly into development assistance at the global, regional and national levels. The nexus between climate change and gender equality needs to be intensified so that the capacity of the national and local institutions can be strengthened in terms of resilience to climate change by involving wide range of stakeholders. Prime Minister's Climate Change Council has proposed eight missions that cover areas such as agriculture, water, forests, sustainable habitat, solar energy and energy efficiency and strategic knowledge. These missions need to integrate greater concerns for gender- inclusive agenda.

References:

H.E. Mrs. Gro Harlem Brundtland, 'Keynote Address: Levers of global security: examining how a changing climate impacts women', 2007

IPCC, '*Fourth Assessment Report – Synthesis Report*', WMO and UNEP, 2007

J. Parikh, '*Gender and Climate change: Framework for Analysis, Policy and Action*', www.undp.org., 2008

J. Parikh and Denton F., 'Gender and climate exchange', *Tiempo* 47, March 2003.

J.Parikh and F. Denton, '*Gender and Climate Change: Vulnerability, Adaptation, Mitigation and Financial Mechanisms: Proceedings and Thematic Paper Prepared for COP8*', 2002.

Lorena Aguilar, '*Women and Climate Change: Vulnerabilities and Adaptation, State of the World 2009*', World Watch Institute, Washington DC, 2009

WEDO, '*Changing the climate change: Why women's perspectives matter?*', http://www.wedo.org/files/climate_change_orange2ebook.pdf, 2007



SMALL-SCALE INDUSTRIES THROW A CHALLENGE:
they contribute substantially to economy and generate
livelihoods as well as are emitters of GHGs



Chapter 5

Climate Change

Small-scale Industries: Small yet Significant

Preeti Soni

Do the international climate change policies and policy instruments influence actions at local level?

Over 15 years of intense debates and discussion at global level led to formulation and introduction of different strategies, policies and policy instruments on climate change. Though these are determined at the global level, their effectiveness is measured at the national and more specifically at the local levels. A pertinent question is whether these instruments positively influence local activities that contribute to climate change. It is in this context that this paper examines the small-scale industries in India. They may be small in scale but are significant energy users having considerable saving potentials. This paper looks at the link between the international climate change policy with focus on policy instruments and local level small-scale industrial activities.¹

¹ The paper is based on the work: Soni, P (2007). *Global Solutions Meeting Local Needs: Climate Change Policy Instruments For Diffusion Of Cleaner Technologies In Small-scale Industries in India*. New Delhi



INDIA'S SHIFT TO A LOW CARBON DEVELOPMENT mode will not be complete without making the SSIs energy efficient

Referred as the engines of growth, small-scale industries (SSIs) play a very big role in industrial output, exports and employment generation in the country. Around 13 million SSIs employ 42 million people. Together, they account for 45 percent of manufacturing output and 40 percent of the total exports of the country.² At the same time they are also known for inefficient production and management processes leading to adverse environmental impacts, especially at the local level. Being energy intensive, inefficiency in production and management processes leads to greenhouse gases (GHG) emissions.

Given their small size and scale of operations, their GHG contribution (and energy saving potential), though considerable, is often ignored. At the unit level the emissions may be small but the collective emissions in SSI clusters are quite high. So these emissions are significant from climate change perspective. For example, the brick industry that comprises of 100,000 small kiln units. They account for over eight percent of total coal consumption of the country, besides using a large quantity of biomass fuels and topsoil. The total CO₂ emissions from these kilns are estimated at 42 million tonnes per annum. This is about 4.5 percent of total GHG emissions from India. Similarly, the steel re-rolling SSI comprising around 1200 units have a potential of reducing 36 million tonnes of CO₂ over a period of 20 years by introducing technology changes. Other such energy-intensive SSIs include metal foundries and forges, glass factories, pottery, ceramics and mini-cement plants.

² Government of India (2009). Annual Report 2008-2009: Ministry of Micro, Small and Medium Enterprises. New Delhi.

Small is beautiful?

As the country moves towards a low carbon development path, availability of cleaner technologies will reduce GHG emissions from the SSI sector. It will also enable them to meet the environmental which are increasingly becoming stringent. Anyway, cleaner technology will help them to face the competition better in a liberalised economy. These are important for the sustainability of the sector. The Mission on Energy Efficiency within the National Action Plan on Climate Change has identified small-scale industries as one of the focal areas for improving energy efficiency and also reducing the transaction cost.³ However, much of the emerging performance and trade mechanism focuses on large industrial units. It is in this context that the SSIs can view climate change policies and policy instruments not as a limitation but also as opportunities for accessing technology, finances and know-how. Some key questions are: Can these opportunities help the SSIs? Can they use these opportunities and contribute to GHG reduction efforts?

International policy instruments such as financial mechanisms, market instruments and direct international transfers of financial and technological resources aim at sustainable development at global and national levels. They are designed to provide access to technology, finance and capacity building. From the developing countries perspective, these will be more effective when they are embedded within their broader national development strategies and policies. It is important that correct and adequate 'signals' and information about their incentives and objectives are transmitted to various stakeholders involved for the desired impact.

In India, the interest in climate policy instruments, particularly the Global Environment Facility (GEF) and the market-based instruments like the Clean Development Mechanism (CDM), has been significant. Emphasis is also on smaller projects as in small-scale CDM. India, in fact, is a leading host country for CDM projects and has a large GEF project portfolio. However, many of the projects are still considered to be driven by investors or consultants. Thus they are motivated more by their interests and less by national development priorities.

³ Government of India (2008). National Action Plan on Climate Change. Prime Minister's Council on Climate Change. New Delhi.



SSIs fare strongly on two accounts. First, as has been discussed above, they have huge ramifications for national and local benefits and their sustainability is of critical importance. Second, the SSIs constitute a sector where there is inactivity on its own in terms of pollution control and climate change and needs an external impetus. Broadly the technological change towards efficient process in most energy intensive SSIs has been limited over a long period of time. One of the reasons has been the perverse incentive created by the national policy that takes a protective approach to the SSI due to social (and political) motivations. Add to it the end-of-pipe solutions adopted by environment regulatory bodies. There are some incentives provided by national policy such as technology up-gradation and cluster development but these are limited in number and reach.

The other has been the SSIs own limited technological capabilities coupled with social (fixed attitudes and cultural factors) and techno-economic (including lack of market demand and access to technology, information and finances) deterrents that make it difficult for SSIs to undertake concerted efforts for cleaner technology diffusion on their own. Though networks and associations have proactively or collaboratively brought a change in some cases, they usually do not really focus on cleaner technologies diffusion. Initiatives have been successful only in cases where the push has come from external sources (e.g. judicial order for change over to natural gas based furnaces in the glass industry in Firozabad and closure of iron foundries in Agra were a result of the public interest litigation against polluting industries to save the Taj Mahal). The piece-meal approaches, more often, benefit only a select few.



Being left out

There are only a few activities undertaken under the climate change policies relevant to SSIs. Most of them are geared towards capacity building and pilot demonstrations rather than actual implementation of cleaner technologies in SSI units or clusters. Of particular relevance are the GEF and the small-scale CDM and the certain degree of emphasis on SSIs in the NAPCC. This is mainly due to the design of the climate policy instruments and the circumstances (internal and external) that surround SSIs.

Firstly, SSIs work on disaggregated and informal basis. This makes aggregation of units or taking a cluster approach to highlight the GHG benefits difficult. Since there is hardly any monitoring of energy usage in SSIs which is essential under quantifying the climate benefits, the transaction costs further increase. At the same time, most of the SSIs units are unaware of the emerging opportunities. Networking

among the units as well as with other relevant organizations (financial and technical organizations, NGOs) is also limited. Linkages with the state and government departments are inadequate.

Secondly, the SSIs lack experience related to market-based instruments or formal incentives as those provided by the climate change policies. They still enjoy, though reduced, preferential policy treatment that provides concessions. The emphasis of national policy is on end-of-pipe solutions and there are no standards for CO₂ making them less environmental conscious.

Thirdly, the national policy and perceptions with regard to climate change are still associated with biases towards the larger sectors and many of these activities have remained top-centric. Representation of SSIs in climate change related debates and activities is normally low or even non-existent. Information about the potential GHG reduction options and needs of the SSIs therefore do not reach higher levels effectively. There are cases where consultants and relevant players are involving the SSI sector. But, again, compared to the involvement of other sectors this is very limited.

THE EMPHASIS OF NATIONAL POLICY is on end-of-pipe solutions and there are no standards for CO₂ making them less environmental conscious.

Big steps out for the small sector

It will be fair to say that small-scale industries are low in priority within the national climate change policy as well they tend to get left out under the international climate change policies. India, as the other developing countries, has not been able to effectively organize the SSIs or put forth effectively their priorities within the climate change framework. Currently the focus is on supporting green-field projects. These are a virtual trading of GHG benefits where the problem may not actually be solved but it may just be circumventing the problem. Climate change policies cannot achieve their objectives by supporting and targeting only a few sectors while ignoring the SSIs. The challenge is not just to avoid emissions but also to reduce emissions at source. The host priorities have to get reflected in the climate change projects, or at least there has to be greater transparency to ensure that the broader objectives and principles of the climate change policies are kept in mind.

Convergence of interests among different stakeholders is also needed. A number of people point out that climate change policy instruments are not a 'solution for everything' and all kinds of projects and sectors cannot be included under these options. The idea, however, is to use them for genuinely 'additional' projects in energy-relevant sectors for betterment of the environment and achieving national sustainable development benefits at the same time. This is where the climate change and SSI link becomes relevant.

This 'weak link' can be strengthened by adequate policy responses at different levels. At the national level, an incentive needs to be created for the SSIs to improve energy efficiencies, which may be similar to the trade mechanisms being proposed for the large units. In addition, organization related to activities in the SSI sector need to be supported. In light of the emerging new regime under the UNFCCC, four propositions may be put forth.

One, there is an urgent need for increasing the knowledge base on SSIs and various stakeholders and facilitating interaction between them. SSI representation may be encouraged in the different climate change forum for overall policy making and implementation related to cleaner technologies in the country.

Second, at the international level, policy instruments have to be strengthened to focus more on sustainability and 'additionality' such as for the SSIs projects.

CLEAR CLIMATE POLICY SIGNALS NEED to reach the local levels to motivate them to change their way of working and support actions on ground.

Third, the international policy instruments may be translated into effective national instruments. Clear climate policy signals need to reach the local levels to motivate them to change their way of working and support actions on ground.

Fourth, transaction costs have to be reduced at each level for SSIs and bringing in greater transparency in the process. This may be done by setting up a separate policy instrument for SSIs, or a subset of the existing climate policy instruments with lower transaction costs and streamlined procedures. Targeting the collective efficiency of SSI clusters may also reduce transaction costs. Schemes could be developed to build on existing networks and associations and also develop new partnerships by strengthening nodal agencies.

While these provide the necessary conditions, they may not be sufficient in bringing in sustainability in the sector via GHG-reducing climate policies and instruments. In the case of climate change, whatever is the regime at international level, actions will be undertaken at local levels for which the national and local-level circumstances and policies are critical.



About the Author

Ms Sunita Narain

Sunita Narain is currently the director of the Centre for Science and Environment (CSE) and the director of the Society for Environmental Communications and publisher of the fortnightly magazine "Down To Earth". In her years at the Centre, she has worked at analysing the relationship between environment and development and at creating public consciousness about the need for sustainable development.

Her research interests are wide-ranging - from global democracy, with a special focus on climate change, to the need for local democracy. She began her career as researcher by co-editing the State of India's Environment Reports. In the early 1990s she got involved with global environmental issues and she continues to work on these as researcher and advocate. Since the Kyoto Protocol in 1997, she has worked on a number of articles and papers on issues related to flexibility mechanisms and the need for equity and entitlements in climate negotiations. In 2000, she co-edited the publication Green Politics: Global Environmental Negotiations, which looks at the emerging ecological globalisation framework and puts forward an agenda for the South on global negotiations.

Dr Prodipto Ghosh

Prodipto Ghosh, Ph.D in Economics and Policy Analysis from the Carnegie-Mellon University, Pittsburgh PA, is currently Distinguished Fellow at The Energy & Resources Institute (TERI). His concurrent positions include: Member of the Prime Minister's Council on Climate Change; Member of the National Expert Committee on Climate Change, Member of the National Security Advisory Board, and Scientific Consultant in the Office of the Principal Scientific Adviser to the Govt. of India. He continues to assist the Government in the global climate change negotiations, and helped prepare India's National Climate Change Action Plan. He is also Chair of the Task Force on Climate Change of the Federation of Indian Chambers of Commerce and Industry (FICCI).

His recent past positions include: Secretary, Ministry of Environment & Forests, Govt. of India, Additional Secretary, Department of Economic Affairs, Govt. of India, Economic Advisor and Additional Secretary to the Prime Minister, and Senior Environment Specialist, Asian Development Bank among other. He has about 40 peer reviewed publications in the area of energy, environment, and development, and several books in these fields. Among various awards, he received the BP Pal Centenary Memorial Award for Outstanding Contribution to Environment and Resource Conservation (2006), the Alumni Achievement Award of the Indian Institute of Technology for Outstanding Contribution to National Development (2007), and the Alumni Achievement Award of the Carnegie-Mellon University for Contributions to International Environment Policy (2007).

Dr N C Saxena

Dr Naresh C. Saxena was a senior civil servant in Government of India. He worked as Secretary, Planning Commission (1999-2002), Secretary, Rural Development (1997-99), GOI, and Director of the National Academy of Administration, Mussoorie (1993-96). He was a member of the National Advisory Council (2004-08) chaired by Ms Sonia Gandhi.

He is a member on the Editorial Board, Development Policy Review, London, International Forestry Review, Oxford, and the Royal Swedish Academy of Agriculture and Forestry, Stockholm. He was a Director on the ADB Institute, Tokyo from 2002-2004. On behalf of the Supreme Court of India, Dr Saxena monitors hunger based programmes in India. He recently chaired a committee set up by Govt of India on identification of poor households.

Dr Saxena did his Doctorate in Forestry from the Oxford University in 1992. He was part time Visiting Professor for six years on Forestry to the Regional Community Forestry Training Centre (RECOFTC), Bangkok during 1993-98. He was awarded honorary Ph.D from the University of East Anglia (UK) in 2006 for his academic excellence.

Currently Dr Saxena advises donor agencies, such as UNICEF, UNDP, and the World Bank.

Dr Jyoti Parikh

Dr Jyoti Parikh is Executive Director of Integrated Research and Action for Development (IRADe), New Delhi. She is a Member of the Prime Minister's Council on Climate Change –India and is a recipient of Nobel Peace Prize awarded To IPCC authors in 2007. She served as the senior professor and Acting Director of Indira Gandhi Institute of Development Research (IGIDR), Mumbai 1986-2003. International Institute for Applied Systems Analysis (IIASA), Austria for 8 years (1980-86, 76-78) and Planning Commission, as senior energy consultant at New Delhi (1978-80). She obtained her M.Sc. from University of California, Berkeley, in 1964 and Ph.D. in Theoretical Physics from University of Maryland, College Park in 1967. She achieved Gold Medal from the Systems Society of India for energy and environment in 1988.

Dr Preeti Soni

Dr Preeti Soni has over sixteen years of experience of working in field of Energy, Climate Change and Sustainable Development. She is the Head of the Energy and Environment Programme at UNDP India since 2006 and is responsible for providing strategic direction for the development and effective implementation of the energy and environment portfolio. Prior to this position, she served as the Resource Person (Environment) for UN Solution Exchange – the Knowledge Management Initiative of UN India – wherein she was instrumental in launching and managing the Solution Exchange Community of Practice for Environment (water). She also worked as the Area Convenor (in 1999) and Research Associate at the Center for Global Environment Research, Tata Energy Research Institute (TERI, now The Energy Research Institute) between 1993 and 1999. At TERI, she worked on research projects and capacity building programmes on issues pertaining climate change, particularly climate policy and instruments, energy and environment, and trade and environment. She has authored and edited several papers, articles and books on related topics.

Dr Soni has a Masters Degree in Economics from Delhi School of Economics, and a Ph.D. from the Institute for Environmental Studies, Vrije University, the Netherlands. Her Ph.D. thesis entitled “Global Solutions Meeting Local Needs: Climate Change Policy Instruments and Diffusions of Cleaner Technologies in the Small Scale Industries in India” aims to deepen the scientific understanding regarding the effectiveness of global environmental regimes at local levels.

UNDP is committed to help India achieve the global Millennium Development Goals as well as the national objectives articulated in consecutive Five-Year Plans. The goal of the organization is to help improve the lives of the poorest women and men, the marginalized and the disadvantaged in India. UNDP India works in the following areas: Democratic Governance, Poverty Reduction, Disaster Risk Management, Environment and Energy, and HIV and Development.

UNDP is the UN's global network to help people meet their development needs and build a better life. We are on the ground in 166 countries, working as a trusted partner with governments, civil society and the private sector to help them build their own solutions to global and national development challenges.

Climate Change Perspectives from India



Energy and
Environment



Democratic
Governance



Crisis
Prevention
and Recovery



Poverty
Reduction



HIV and
Development

Climate change is no more an environmental concern. It has emerged as the biggest developmental challenge for the planet. To dialogue from the perspective of the poor is one of UNDP's contributions to overall development process. This collection of articles captures and disseminates perspectives on climate change from the Indian context. Starting from an argument on a new climate deal to highlighting the importance of the small-scale industrial sector within the climate change debates, some of India's best known environmentalists, economists and policy makers have put forward their concerns and convictions in this collection.

We hope that this collection will ferment a debate that links climate change to overall development and put a human face to the overall climate change debate.

United Nations Development Programme

55, Lodi Estate, P.O. Box 3059
New Delhi - 110 003, India
Tel: +91-11- 4653 2333
Fax: +91-11- 2462 7612
Email: info.in@undp.org
<http://www.undp.org.in>