

**A Civil Action:**  
**The Role of Indian Civil Society in the Climate Arena**

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**For Oxfam India**

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## Introduction

Climate change is likely to become the most serious environmental challenge that South Asia will face in this coming century, with impacts relating to forest loss and increased fire risk, tropical cyclones, floods and landslides, reduced agricultural yields, increased incidence of vector-borne diseases, glacier melt in the Himalayas leading to acute shortages in freshwater availability, drought in some areas, floods in others, and sea-level rise leading to coastal inundation, erosion and saltwater inundation. Indeed, virtually no aspect of social and economic life will remain untouched by these physical changes. Climate scientists suggest that an increase in global average temperatures of 1.5 to 2 degrees above pre-industrial levels will lead to “dangerous” climate change, and GHG concentrations must be kept below 350-450 parts per million (ppm) to avoid this outcome.<sup>1</sup> Current concentrations are already at about 385 ppm in carbon dioxide equivalent terms (CO<sub>2</sub>eq), so there is an urgent challenge to reorient global activities so as to get to a stable pathway.

While India is responsible for about 2.6% percent of the total contribution of carbon dioxide to the atmosphere to date, it nevertheless is the fourth largest emitter after China, the United States and Russia. Moreover, in 2005, India’s per capita emissions were at 0.5 tonnes of carbon equivalent (C-eq.), compared to those of the United States, at 6.4, Japan at 2.9, China at 1.5, and the world average, at 1.6 tonnes C-eq. Scenarios of India’s emissions growth indicate that its per capita emissions will be close to today’s world average by 2030, but for climate security, the world average in 2030 itself needs to be significantly lower than today’s level.

Finally, India is home to about a third of the world’s poor, with nearly half its children malnourished. It also has severe challenges in terms of access to basic services, like sanitation, drinking water and electricity in many parts of the country. Well over half of the households in India relies on biomass fuel for cooking, and women and children are as a result especially vulnerable to serious respiratory and other health problems. Improved access to modern energy services, particularly for the bottom half of India’s population is therefore an urgent development challenge.

With respect to climate change, therefore, there are three sets of issues that Indian policymakers and civil society organisations need to be prepared to address.

First, it is important to understand and be able to respond to the array of climate risks in different regions and climatic zones of the country that are likely to become more prominent over coming decades.

Second, at the international level, as one of the major contributors to GHG emissions, India needs to play a responsible leadership role in negotiating a global emissions reduction treaty

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<sup>1</sup> There is no clear agreement on what constitutes “dangerous” climate change. And there remain uncertainty in the science to link the level of excess GHG concentrations in the atmosphere with a specific temperature rise.

that follows fair burden-sharing principles, while ensuring that a stable climate will be achieved.

Third, as a consequence of taking its own development stance seriously, India's domestic policies should be focussed on poverty reduction strategies for those most vulnerable, even as it develops low carbon strategies for the country as a whole that includes comprehensive planning for altered lifestyles and a less carbon-intensive economic infrastructure.

In this report, we begin with an overview of the science of climate change and its impacts in South Asia. Then we briefly examine India's climate emissions profile and the range of impacts that may result from a changed climate. Then we discuss possible areas of engagement for the civil society domestically and internationally.

### **Climate science and impacts in India/South Asia**

Asia will be one of the most severely affected regions of the world as a result of "business-as-usual" global warming. By mid-century, average surface temperatures could be higher by up to 3 degrees, along with a modest increase in average precipitation. There will, however, be an increase in the occurrence of extreme weather events including heat wave and intense precipitation events, as well as an increase in the interannual variability of daily precipitation in the Asian summer monsoon. Additional factors, such as vegetative changes and the presence of radiation absorbing soot from industrial pollution and cook stoves, can modify monsoonal precipitation, although most modelling studies seem to suggest that GHGs will have the dominating effect on regional climate (Christensen and Mearns 2007; Cruz 2007).

The key areas of human, ecosystems, and economic impacts relate to:

1. *Hydrology and water resources:* The South Asian region is expected to suffer from serious problems relating to water availability with potentially serious disruptions of the entire monsoon cycle. With accelerated melting of mountain glaciers, substantial reductions in water availability are possible for large parts of North India, roughly 80% of whose water resource needs are met primarily by Himalayan snow-pack melt during the dry summer months. Per capita gross water availability is also expected to decline by over one-third by 2050, resulting in severe water stress in many parts of the country.

The south-west monsoon is one of the most significant weather events in the world and delivers about 90 percent of the annual rainfall for the region. The onset, duration, spatial extent and total precipitation of the monsoon are all critical factors in determining the health of India's agricultural sector, which continues to play a dominant role in the country's economy. According to one estimate, 45 percent of the variation in India's gross domestic product over the last 50 years can be explained by the fluctuations in rainfall (FAO 2006).

The response of the Indian monsoon to significant increases in GHG concentrations in the global atmosphere is not well characterised, in large part because of the poor resolution of existing climate models and the complex roles played by regional orography and other factors such as heating over the Tibetan plateau and the reflectivity or albedo of Himalayan glaciers,

the behaviour of the El Nino-Southern Oscillation (ENSO) and sea surface temperature. Based on the paleoclimatic record and the known sensitivity of the monsoonal system to these factors, however, there is sufficient cause for concern that there could be abrupt changes in the monsoon as the climate warms (Overpeck and Cole, 2007; Shukla, J. 2007).

2. Coastal zones and ecosystems: Yet another likely consequence of climate change is sea level rise caused by thermal expansion of oceans, and the break-up and melting of polar ice caps. Even in its conservative scenarios, the IPCC estimates sea level in 2100 to be about 40 cm higher today, which will cause an additional 80 million coastal residents in Asia alone to be flooded. The majority of those flooded will be in South Asia, particularly in Bangladesh and India. Several scientists have challenged the IPCC's projections on account of its omission of any effect of ice-sheet dynamics. More realistic assessments, which take into account current understandings of business as usual conditions, suggest that a 1-3 metre rise in sea levels is possible with a 4-5 degree rise in average global temperatures, which will hasten the break-up of ice sheets in Greenland and Antarctica (Rahmstorf 2007; Ananthaswamy 2009; Bamber et al. 2009).

A one-metre sea level rise would result in nearly 6000 square kilometres in India alone being flooded, including parts of major cities such as Mumbai, Calcutta and Chennai. Sea level rise will affect the coastal zone in multiple ways, including the inundation and displacement of wetlands and lowlands, coastal erosion, increased coastal storm flooding and salinisation. The impacts will vary by location depending upon the coastal morphology and the extent of human modification. Rapid urbanisation has led to the enlargement of natural coastal inlets and dredging of waterways for navigation, port facilities and pipelines, all of which exacerbate saltwater intrusion into surface and ground waters. Thus, built-up areas are more vulnerable than those protected by mangroves, and deltas, low-lying coastal plains, coral islands, beaches and barrier islands. Degradation of coastal ecosystems by human activity will generally aggravate the problems caused by sea level rise, increasing shoreline retreat and coastal flooding in cities.

Climate models suggest that tropical cyclones will become more intense with increased climate change, with larger peak wind speeds and more heavy precipitation. This could have drastic effects on coastal settlements (and settlers) and ecosystems.

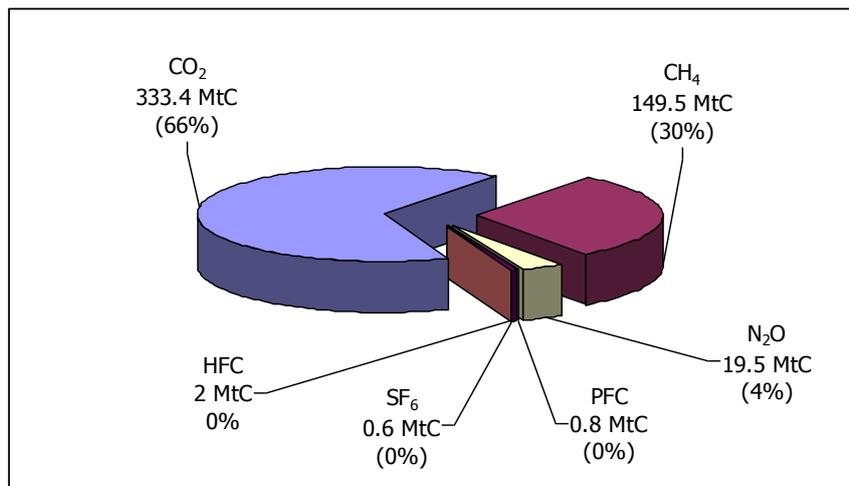
3. Agriculture and food security: Agricultural production is likely to be one of the most seriously affected sectors in South Asia through a combination of rising temperatures and water stress. The IPCC estimates that up to 10% drop in cereal production is likely even in conservative climate change scenarios and that a rise in average temperature above 2.5°C will result in a loss in farm-level net revenue of between 9% and 25%. Small-holder farmers, who comprise almost three-quarters of the country's farmers, are likely to be hit the hardest given their dependence on rain-fed agriculture.

4. Human health: A range of projected climate impacts – heat waves, increased urban air pollution, extreme events, flooding, changes in disease patterns – may contribute to increased health impacts.

The poor are at particular risk from climate change. As the IPCC (2001a) states, “the impacts of climate change will fall disproportionately upon developing countries and the poor persons within all countries.... Populations in developing countries are generally exposed to relatively high risks of adverse impacts from climate change. In addition, poverty and other factors create conditions of low adaptive capacity in most developing countries.” Even many of the climate stresses discussed above may operate simultaneously on the poor: for example, reduced agricultural yields may contribute to increased poverty and malnutrition, which may increase susceptibility to heat stress.

### Greenhouse gas emissions and sources

In 2005, India emitted 506 million tonnes of GHGs in C-eq, representing roughly an increase by one-third over its emissions in 1997, the year the Kyoto Protocol was signed. While these are comparable to those of its nearest neighbour, Russia, they are roughly a quarter of the emissions from either China or the United States, the top two emitters. Energy dominates the overall share, approximately 2/3<sup>rd</sup> of the overall GHG emissions; within this category, the power sector is the major contributor. Agriculture is the other major contributor (see Figure 1).



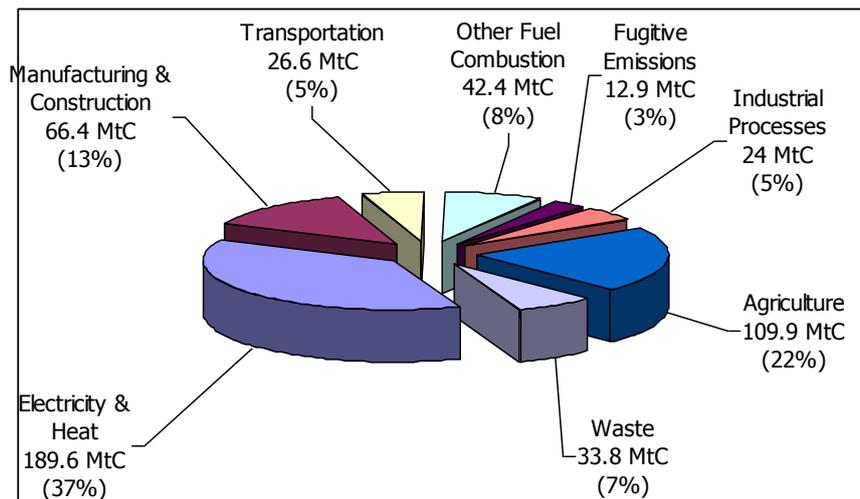


Figure 1. Indian GHG Emissions by gas (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, PFCs, HFCs, SF<sub>6</sub>; excludes land use change) and by sector in 2005. *Source:* <http://cait.wri.org> Accessed 24 September 2009.

Electricity & Heat	6.80%
Manufacturing & Construction	2.5%
Transportation	1.2%
Other Fuel Combustion	2.2%
Fugitive Emissions	3.3%
Industrial Processes	7.5%
Agriculture	1.3%
Waste	1.8%
All sectors	3.5%

Table 1: Annual GHG emissions growth rate by sector, 1990-2005 (based on data from CAIT)

Table 1 indicates that while the national GHG emissions grew at about 3.5% per annum between 1990 and 2005, emissions from the power and the industrial sector grew at a much faster rate, which then logically must become targets for mitigation. At the same time, while agricultural emissions displays a small rate of growth, the overall scale of emissions from this sector still suggest paying attention to it.

## **Opportunities for Mitigation and Adaptation**

While climate change may be seen as a threat to India's development imperatives – and the additional burden imposed on financial, human, and institutional resources by climate change certainly adds to an already-stressed developmental effort – in many cases, it can also be viewed as an opportunity to reshape its development trajectory, taking into account both mitigation and adaptation needs.

India's experience with development even after robust economic growth for over two decades has been that the development process has bypassed the poor, who still do not have clean energy sources for cooking, lighting and other needs. Furthermore, climate change impacts are expected to be worse for the poor who are much more vulnerable. But, the National Action Plan on Climate Change (NAPCC) does not take equity into consideration. As we chart a new path that mainstreams reduction in greenhouse emissions along with a focus on climate adaptation, it is clear that unless one develops an explicit policy framework that prioritises the poor in considering the impacts of energy and climate policy, there will be no equity in the implementation of the NAPCC. Further, the focus in the NAPCC has, for the most part, been on technological fixes rather than the overall development path.

Given the low per capita emissions in India and the critical adaptation challenges, much needs to be done by way of integrating specific policies into existing development processes. For instance, demand for efficient energy technologies could be increased through financial incentives, regulation and so on. In addition, there might be need to create a separate agency that would develop new standards or norms in a transparent and rational manner.

Most urgently, given that climate change will have disproportionately worse impacts on the poor, it is imperative that explicit attention be given to increasing their resilience. The vulnerability to climate change for large sections of the population across different climatic zones needs to be considered and India needs to develop locally relevant adaptation strategies even as it shifts towards a low carbon pathway. . Fortunately, there are specific opportunities that both policymakers and civil society groups can gain from in making these shifts. In a developing country like India, the task of building new institutions, strengthening old ones and building capacity in various sectors to improve human development is still in progress. What is now needed is a policy framework that includes climate mitigation and adaptation to ongoing development programmes. In some cases this may call for small shifts, that is to say, mainstreaming climate adaptation and carbon-reduction opportunities into existing plans, while in others it may require entirely new programmes and initiatives.

Infrastructure investment in rural and urban centres is being expanded or new plans are being proposed. These provide opportunities for India to build climate resilient infrastructure as part of development in a low carbon pathway. Outlined below are some indicative changes that need to be made in where main climate impacts will be experienced. Given the close integration, in many cases, between opportunities for mitigation and those for adaptation, these are combined below.

### *Domestically-focused agenda: some suggestions*

Civil society can play a key role in helping develop nationally appropriate climate policy and to help mainstream mitigation and adaptation into development imperatives:

1. *Greater and systematic engagement with the domestic policy-making process:* Indian policy-making on climate is still evolving (with some significant shifts in recent months), although mostly with little input from stakeholders and it is critical that civil society play an active role in opening up this policy process to greater and systematic engagement and ensuring synergy between development and climate imperatives.<sup>2</sup> At the same time, it must also help shape the government's approach in both the international negotiations as well as domestic actions, particularly to pay more attention to the needs of the poor and the vulnerable. This is particularly critical after the less-than-clear policy approach during and after Copenhagen.

Greater engagement by civil society organisations will entail:

- Better understanding of the technical issues surrounding climate change and their interface with the energy, agriculture and other sectors, gender and livelihoods;
- Setting priorities that dovetail climate mitigation and adaptation goals with development goals; and
- Making specific efforts to bring grassroots concerns on development and climate to the attention of decision-makers.

So far, civil society also has not taken a particularly coordinated approach to engaging with the government on climate issues, both in terms of probing for the rationale/implications policy approaches and in projecting particular perspectives into the policy arena. A coordinated and systematic engagement is much more likely to be effective and Oxfam could likely play an important role in this facilitation process and also linking up researchers and analysts with civil society.

The other area where Indian civil society could also play an important role is in informing and shaping public opinion on the climate issue, whether through partnerships with the media channels or through direct outreach. Opinion surveys (of the kind that Pew carries out, for example) to understand how the Indian public thinks about this issue and how its views are being shaped could also be very valuable.

2. *Put the focus on the poor in climate policies:* Civil society must ensure not only that the rights and needs of the poor are protected in climate policies, but also identify specific opportunities for livelihood protection and income enhancement for the poorest groups when climate policies are implemented. For example, afforestation activities under the National Action Plan for Climate Change or conservation activities that might be relevant under a

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<sup>2</sup> At the same time, there needs to be a primacy of sustainable development over using a carbon lens where perfect alignment between sustainable development and adaptation/mitigation may not be possible or desirable.

REDD+ agreement should not disempower the local people in forested areas. Similarly, biofuel programs on ‘marginalized’ lands should not displace local people. These are particularly important in the Indian context where property rights are not well-defined and local communities depend on forests (or land that might be used for forestry) for multiple resources/uses such as firewood, forest products, grazing. Furthermore, the perspective and approach of the Forest Department is often not aligned with the interests of local inhabitants. Such issues have manifested themselves in past forest ‘management’ program such as Joint Forest Management.<sup>3</sup> In this area (as possibly in others), analysis of past policies and practices would be very helpful in identifying future potential problems to inform and shape the activity of Oxfam and its partners.

Smallholder agriculture is another area of significant importance where climate change and development intersect. These farmers have not benefited from the changes in agricultural practices and markets over the last few decades; if anything, their vulnerability has increased over this period. Supporting a move towards sustainable agriculture should be helpful not just to increase the resilience of their agriculture production systems but also contribute to climate mitigation. This also will overlap well with the agricultural mission under NAPCC.

While civil society organisations must avoid putting a ‘carbon filter’ on all development projects and programmes, they should try to ensure that low-cost opportunities to reduce greenhouse gas emissions involving improved efficiency or decentralised renewable energy are prioritised, but only insofar as these help empower poor communities. It is especially important to identify and avoid supporting those projects and programmes that may selectively target some groups at the expense of others, leading to uneven development even though a certain degree of carbon reduction is achieved. Similarly, in adaptation programmes, emphasis should be placed on the needs of all sections of a local community, especially those who are already disempowered, such as women, children and the elderly.

*3. Integrate understanding of climate impacts with other drivers of change:* Civil society organisations in particular need to develop an integrated understanding of all the drivers affecting development, including climate change, globalisation, economic policy, social context and governance. For instance, in a coastal community, where fishing and agriculture are impacted simultaneously by drought, salinity associated with sea level rise, the impact of globalisation on markets for products, and policies such as the National Rural Employment Guarantee Scheme, complex interconnected stresses will be placed on livelihoods. Actions to resolve such challenges should not be developed on the basis of piecemeal analysis looking simply at climate impacts.

*4. Streamline actions across sectors and organisations:* Since most adaptation activities will take place locally, grassroots organizations can play an important role by being part of an “adaptation action network.” This will help ensure that locally-relevant approaches and solutions are being developed and put in place. For example, civil society could play a key

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<sup>3</sup> We wish to thank Sharad Lele from ATREE for useful discussions on the subject of REDD and other related issues.

role in disaster risk reduction and mitigation programs by partnering with the government in the shaping and delivery of these programs (or even lead the effort, in the cases where the government is unable to do so). Such preparedness programs will become increasingly critical to managing the human and social impacts of climatic events such as floods or coastal storms.

Being effective on these will require civil society actors themselves to be better informed about both the complexity (see Box) and some salient details of climate change issues. Thus improved linkages with researchers (science and policy) would be helpful so that there is ongoing information exchange between these communities. A closer connection between these communities may also help in shaping, designing, and implement grassroots action on adaptation and mitigation.<sup>4</sup> It will also require better coordination among civil society actors to avoid duplication and also to learn from each others' experiences. For instance, donors and large civil society groups may want to actively promote the utilisation of knowledge portals such as UNDP's Solution Exchange (<http://www.solutionexchange-un.net.in>) and UNEP's Global Network on Energy for Sustainable Development (<http://www.gnesd.org/>) to ensure that best practices and other useful lessons learned in implementing projects and programmes are widely disseminated.

#### Illustrative examples of potential mitigation and adaptation activities

##### *Water resources*

There are opportunities to use local methodologies to increase the absorption of rainwater, surface, recharge ground water and increase the use of surface water in agriculture (ref Tushar Shah's report).

Till around the 1970s surface water was predominantly used in agriculture. A number of factors have led to the increasing, and now the predominant, use of ground water for agriculture. The gradual removal of agricultural subsidies for pumping ground water with the simultaneous increase in development of check dams and other structures to improve and increase surface water use (through NREGS for example) would change water use patterns in agriculture. Such a shift in reliance from ground to surface water has already been demonstrated in Saurashtra, Gujarat. Even if such changes cannot completely eliminate the use of ground water, they would result in changing the availability and use of water for agriculture, better prepare communities for the vagaries in the monsoon as warming trends continue, precipitation becomes uneven and less reliable.

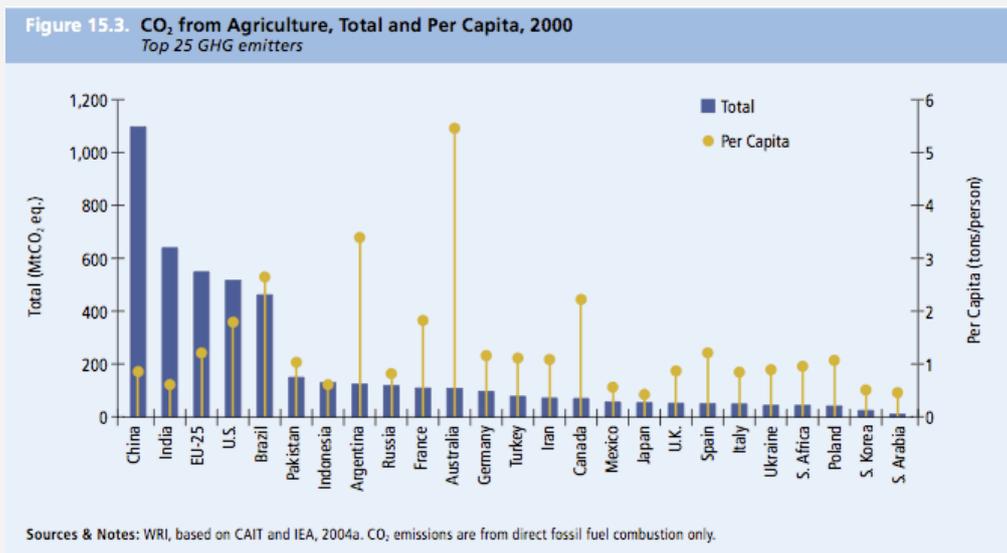
##### *Agricultural productivity*

There is demonstrated success with low-till agriculture with minimal use of chemicals (with low chemical, and therefore carbon, inputs) in parts of Andhra Pradesh and Punjab. In addition, new methods to cultivate specific crops such as the system of rice intensification which increases yield while reducing chemical and water use have success in many districts across the South. The government needs to invest in methods such as these, which have yielded positive results, in a

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<sup>4</sup> This may be helped by an emergent effort to develop a 'climate knowledge network' by a group of Indian scientific, technical, and policy researchers.

systematic manner just as it did with new plant hybrids in the 1960s. But this time around it must work closely with civil society groups and farmers so local varieties resilient to harsh conditions may be retrieved, retested and scaled up in the region only if they work well. At the same time, the implementation of sustainable agriculture practices could help with maintenance of medium and long-term health of agricultural ecosystems and plant biodiversity, allowing for climate mitigation (see Figure below) while building climate resilience into these agricultural systems. Further, while some crops such as rice may have reduced yield in many areas with increases in temperatures, others such as groundnuts and certain kinds of millets may thrive when temperatures rise to less than 3°C. One could also explore policies that provide incentives to move away from cash crops, which often have high environmental costs as also susceptibility to international markets, towards food crops that can keep rural communities employed and free of hunger. In fact recent studies have shown that this can make for more climate resilient agricultural communities. (ref: Practical action book, WB report, work by geethalaxmi).



### *Disaster risk reduction and management*

Reducing the risk from extreme climate events (be they heat waves, floods, or coastal storms) requires a multi-pronged approach: It may require better managing coastal ecosystems (such as mangroves that provide natural protection against storms), improved coastal infrastructure planning to take into account climate-related events, and setting in place event prediction and response systems. Of course, improving livelihoods of people along the coast using diversified income sources and are more resilient. Prepare people living along coasts to respond to more intense storms.

### *Improved energy services*

Clean and modern energy services for rural areas and the poor allow for simultaneously addressing climate and developmental goals. This could include a range of solutions such as decentralized power generation or targeted provision of energy sources using products such as solar lanterns or improved cookstoves.

### *Globally-focused agenda: some suggestions*

1. *Engage directly with the international climate debate:* Given the far-reaching implications

of climate change not only for our society and economy at large, but especially for the poor and the vulnerable, it is critical that we inject our perspectives in the international negotiations, again especially from the point of view of protecting the rights and being attentive to the needs of the poor. For example, one could campaign for energy needs of the poor to be part of any mitigation activities. Establishment of large dedicated funds and programs for adaptation could be another pressure point. In fact, post-Copenhagen, the nature of the negotiations seem to be evolving towards a more fragmented and ‘voluntary’ approach rather than a broad-based multilateral approach. The implications of such a shift for the inclusion of fairness and justice in the eventual outcome, although worrisome, are not fully understood. Thus a focus on this topic, as well as what a fair ‘global’ deal should look like, would be timely and important.

*2. Engage with donor and global NGO community to advance appropriate issues:*

The donor community needs to be informed on specific challenges with respect to building capacity for independent research and analysis, adaptation pilots, and transnational issues such as migration. Furthermore, there is a need to persuade donors to move away from climate-centered programs to consider climate as a co-benefit.

At the same time, there is also an urgent need to work with the global NGO community to project the needs and concerns of developing countries at large, but especially of the poor, into their international activities and campaigns. This is particularly important since much of the international NGO dialogue is dominated by Northern NGOs, with the result that issues such as climate equity and justice or sustainable development get short-changed.<sup>5</sup> One possibility could be a joint campaign to educate the citizens of the North on the linkage between their actions and possible impacts on the poor in the South.

As with domestic agenda, effectiveness on these fronts will require coordination among Indian civil society actors as also improved understanding about the climate issue (and its complexities – see box – which impede an easy or fair resolution).

**Complexities of the climate issue**

Several characteristics of the climate problem contribute to its complexity and to the difficulties in tackling it:

Scale and cost: Given the uncertainty ranges of climate sensitivity, a 50% probability of staying below a 2° C warming requires stabilization at 450 ppmv CO<sub>2</sub>-equivalent (Tirpak et al., 2005) or even lower, as others have suggested more recently. The magnitude of the task becomes obvious when one considers that middle-of-the-range emission scenarios suggest by the year 2100, the atmospheric CO<sub>2</sub> concentrations would be about 650-750 ppmv (up from about 380 ppmv in the year 2000). Thus, avoiding “dangerous climate change” will indeed be an arduous task that also will require enormous financial resources over the coming decades (for example, a recent IEA study projected that halving the CO<sub>2</sub> emission between 2005 and 2050 would cost an additional \$45 trillion).

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<sup>5</sup> See, for example, the response of the major US NGOs to the outcome of the Copenhagen COP.

Global nature: Due to the long-range movement of GHG gases and atmospheric mixing, emissions from all part of the world contribute to GHG-induced warming. This means that solving the climate problem requires cooperative action by all countries worldwide.

Long lifetime of gases: Most of the GHGs have a significant half-life in the atmosphere. This builds inertia into the system in that emission from today will continue to have an impact on the climate system for coming decades.<sup>6</sup> This also means that it is more difficult to engage in a “wait-and-see” strategy (or at least, engaging in such a strategy will have repercussions).

Strong linkages between GHG emissions and human activity: Buildup of GHGs is linked to a wide range of human activities – this includes enhancement of “sources” of CO<sub>2</sub>, methane and other gases as well as reduction of “sinks” (especially forests). This means effort to mitigate the problem will require significant changes in human activity, underpinned by technological advances as well as cultural and behavioral changes.

Uncertainties: While there is widespread consensus on some key issues (such as “are there clear signals of greenhouse warming?” and “are human activities driving climate change?”), there still remain a number of uncertainties surrounding various aspects of the climate problem. These include uncertainties about the flows of GHGs, the relationship between GHG accumulation and warming (i.e., what is the sensitivity of the climate system to GHG buildup) and, and the nature and magnitude of eventual impacts.

Mismatch between contributors to the problem and those suffering impacts: An additional twist regarding the climate problem relates to the fact that not all countries (and groups within countries) get affected equally (and in the same way) by a changing climate. While industrialized countries are responsible for the majority (almost two-thirds) of today’s global GHG emissions and an even greater fraction of the GHG buildup in the atmosphere, it is developing countries that are likely to bear the brunt of the climate impacts. Countries such as small-island states will suffer catastrophic impacts that threaten their very existence, and many African and other tropical countries will suffer serious negative impacts. The mitigation of the GHG emissions, similarly, will affect different countries in a different fashion, both in terms of modification of industrial and other activities that result in these emissions and in terms of the markets for energy sources (especially fossil-fuels). Lastly, different countries have different capabilities to adapt to climate change – countries such as the Netherlands that have the technical and institutional capabilities to respond to sea-level rise is likely to suffer far lower impacts than a poor country like Bangladesh with little response and adaptive capacity.

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<sup>6</sup> The observed rise of global mean temperatures is due to the fact the current GHG concentrations are well-above pre-industrial levels as emissions from the past century have contributed to the accumulation of GHGs.

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