

Growth, Sustainable Development and Climate Change: Friends or Foes?

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Inaugural Address as Professor to the Prince Claus
Chair in Development and Equity 2010 – 2012
23 March 2011
Utrecht University

Universiteit Utrecht



Rector Magnificus, Your Royal Highness, Members of the Curatorium of the Prince Claus Chair in Development and Equity, Excellencies, ladies and gentlemen

It is my privilege to be here in this historic place and deliver my inaugural lecture, which is dedicated to the legacy of His Royal Highness Prince Claus and the extraordinary humanism he brought to issues of development and social justice.

Climate Change – a Global Challenge

Let me start by introducing climate change as a global challenge.

Global climate change due to rising levels of greenhouse gases (GHGs) in the atmosphere is one of the most serious environmental challenges of the present time. While significant uncertainties remain, there is increasing consensus on the scope and drivers that shape global climate change. In 2007, the Intergovernmental Panel on Climate Change (IPCC) concluded that climate change is not only accelerating but has been induced by human activity, particularly by the combustion of fossil fuels for energy.

However, energy is also a prime mover of economic growth and development. This is critically important for developing countries like India where the economy is developing rapidly. Simultaneously providing adequate and equitable access to basic amenities and services is the immediate priority of policymakers. Energy access for all is recognized as a policy priority and stems from the recognition of its strong impact on creating opportunities for economic development. Without access to basic energy services, daily needs like cooking, heating and lighting can only be met at the expense of economic productivity. Energy is hence required to meet the targets defined in the Millennium Development Goals adopted at the UN Millennium Summit in Johannesburg in September 2000 to improve the condition of the world's poorest by 2015. The literature also reveals that no country has substantially reduced poverty without massively increasing its use of energy. Electricity, in particular, plays a crucial role in improving levels of human development and quality of modern life (ADB, 2007). This is suggested by the empirical relationship between the Human Development Index (HDI) and energy consumption for different countries (UNDP, 2007; ADB, 2007).

Climate change is a reality today, with its impacts being disproportionately felt by various sections of people. Authoritative sources such as the Human Development Report 2007/2008 make clear that there are glaring inequities in the distribution of responsibility for the causes of climate change and the distribution of its impacts among the nations and people of the world. It is well established that the poor, being dependent on the natural environment for their basic subsistence, are more vulnerable to any changes to it. With their lower coping capacity, the poor are more vulnerable to the impacts of climate change due to both bio-physical and socio-economic factors.

Climate change response options take the form of adaptation and mitigation. The IPCC third assessment report defines mitigation in the context of climate change as ‘a human intervention to reduce the sources of, or enhance the sinks of greenhouse gases’ (IPCC, 2001). Adaptation is defined as ‘*the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities*’ (IPCC, 2001).

Climate Change and Sustainable Development

First, I would like to talk about the linkages between climate change and sustainable development.

Climate change is a phenomenon with pervasive and far-reaching social, economic, environmental, and political repercussions. The IPCC’s assessment and other analyses have highlighted the potential negative impacts for poverty alleviation efforts, which threaten to unravel many of the development gains made in recent decades. Climate change has the potential to undermine the existence of many of the world’s poorest and most vulnerable people, who lack the financial, technical, human and institutional resources to adapt. Existing forms of vulnerability are compounded by climate change related risks such as increased water stress, food insecurity resulting from droughts, desertification, new health risks, and the increasing frequency and severity of extreme weather events.

Tackling climate change is indeed a defining challenge. However, it also provides an opportunity. For as the Human Development Report 2007/2008 reminds us,

“We live today in a world that is divided at many levels. People are separated by vast gulfs in wealth and opportunity. In many regions, rival nationalisms are a source of conflict. All too often, religious, cultural and ethnic identities are treated as a source of division and difference from others. In the face of all these differences, climate change provides a potent reminder of the one thing that we share in common. It is called planet Earth. All nations and all people share the same atmosphere. And we only have one” (UNDP, 2007).

So far, the global course of action has been short-sighted and self-defeating—neither mitigation nor adaptation. However, a lot can be done to turn the challenge of climate change into opportunities for sustainable development. By promoting clean energy technologies and sound tropical forestry, we can involve the poor in an urgent global effort to mitigate greenhouse gas emissions, and we can do so in ways that improve livelihoods while reducing climate vulnerability. With proper forethought and planning, we can minimize the impact of inevitable natural disasters.

The paradigm of sustainable development reflects a consensual shift, from a singular focus on economic growth to a concept of socio-economic development, that is, “modified to take into account its ultimate dependence on the natural environment”. After several decades of effort and thought, the concept has evolved to explicitly encompass three overwhelming concerns for human welfare - economic, social, and environmental - as well as the inter-dependencies and inter-linkages between them.

Since the formulation of Agenda 21 in 1992, adopting a development path based on the principles of sustainable development has become an aspiration for countries across the world. The concept of sustainable development is relevant in principle to all countries or societies, whether they be developing or developed. To realize sustainable development goals, many countries have initiated strategies including programmes at local, regional, and national levels. However, which of the three ‘pillars’ needs maximum strengthening or is at maximum risk from external or internal pressures depends on subjective values and preferences, and so is often the subject of intense debate.

The current situation suggests that a major departure has to be made from the past pattern of development. It is also true, that for a developing country like India,

promoting economic growth and development will continue to remain a primary goal. Therefore, it is crucial here to understand the need to achieve future development that is economically viable, socially equitable, environmentally sustainable, and, above all, ethically acceptable.

Climate Change and Social Justice

Climate change has been described as the defining global social justice issue. While it raises equity considerations between generations, it also has powerful implications for intra-generational equity. Climate change brings into focus the sharp division of a world that is highly polarized – between intensive greenhouse gas-emitting countries and resource-poor countries that will suffer the worst consequences. The rich countries of the world are predominantly responsible for climate change due to the historic contribution to the build-up of greenhouse gases in the atmosphere, while poor people in poor countries bear the brunt of its impacts.

It is also important to recognize that there are middle-income countries, particularly oil producing countries, with per capita emissions equal to or higher than those of industrialized countries, and highly populous, fast growing developing countries such as India and China with sharply rising greenhouse gas emissions. While it may appear convenient to characterize climate change mitigation as being primarily the responsibility of rich countries and adaptation the main concern of poor countries, things are not quite so simple. Vulnerability to climate change, viewed first and foremost as a development challenge, cuts across any such divisions.

In all geographic settings that are highly exposed to climate hazards, people are vulnerable in different ways, whether as a result of their sources of livelihood, levels of income and asset holdings, social class, gender, age, ethnicity, access to public support, or their ability temporarily or permanently to migrate in search of economic opportunities. Just as levels and forms of vulnerability to the effects of climate change vary, so too does the capacity of societies to adapt to the changes that they will face. The adaptive capacity of developing countries is generally constrained by the limited availability of technology, weak institutional capacity, low levels of education, inadequate financial resources, and other development priorities.

Long-term horizons, uncertainty, and the challenge of coordination among a vast number of decentralized actors involved in climate action point to the importance of developing climate action approaches as a socially inclusive learning process. In many respects, sound development is the best form of adaptation: strong and accountable institutions, effective delivery of education and health care services, integrated water resources management, good infrastructure and a diversified economy all contribute to societal resilience.

In terms of tackling the causes of climate change or mitigation, a social justice perspective emphasizes the need for equitable sharing of responsibility to reduce greenhouse gas emissions among nations. This should be based on an acknowledgement of the highly unequal distribution of past, present and projected future emissions among them. This is what lies behind the Kyoto Protocol's guiding doctrine of 'common but differentiated responsibility'. While making the transition to a low-carbon economy necessary in low and middle income countries as well as in the developed world, access to affordable energy services for the poor is a prerequisite for poverty reduction and sustainable economic growth.

Linking Adaptation and Sustainable Development

Now let me turn to the connections between adaptation and sustainable development.

An important advance in the literature over recent years is the completion of studies of potential climate change impacts under alternative socioeconomic development trends. These studies recognize that, for example, the future number of people at risk from climate-related events such as flooding or drought will depend not only on the amount of climate change itself, but also on the size of the vulnerable populations living in high-risk areas, their income levels, and their access to financial and technological resources to protect themselves from flooding or drought.

The sustainable development programmes and adaptation to climate change can be mutually supportive and in fact share many of the same characteristics. Successful adaptation programmes are seldom driven by climate change alone but are often

embedded in broader development objectives. Adaptation and sustainable development programmes both draw on the same human, technological, and information resources and rely in similar ways on good governance, community participation, and equitable distribution of resources (financial, human, information, and technological) to be effective. Rather than competing for the same limited resources, experience suggests that merging development and adaptation perspectives could mutually strengthen the capacity to deliver both development and sustainability in the face of climate change. (IPCC, 2007b)

Examples of specific synergies between sustainable development and adaptation include soil and forest conservation, programmes to manage and retain biodiversity, security of water supply, coastal and river flood protection, and diversification of agricultural production and rural livelihoods. All these programmes, if they are to deliver sustainable economic growth and social progress, need to cater for long-term population development, economic development trends, and changing technology and social structures, as well as changing climatic conditions and exposure to climatic extremes. (IPCC, 2007b)

Impact of Sustainable Development Policies on Future Greenhouse Gas Emissions

Sustainable development policies have a strong influence on future greenhouse gas emissions. Let me briefly touch upon this issue.

All model studies agree that the cost of mitigation to achieve a given stabilization target is highest in those scenarios that assume higher baseline emissions in the absence of mitigation measures. It is important to note that higher emissions do not automatically equate with greater wealth or well-being, because many factors, including access to technology to provide energy services, play an important role in addition to basic income levels. Indeed, many scenario studies confirm that societies do not have to choose between being either 'wealthy and polluted' or 'poor and green' – the available socioeconomic development paths span a much more diverse range of choices. (IPCC 2007c)

Higher emission levels under business-as-usual scenarios virtually always result in greater costs of mitigation to stabilize greenhouse gas concentrations. Development pathways that exhibit low emissions even in the absence of specific mitigation measures

will, therefore, make it easier to stabilize greenhouse gas concentrations at low levels and costs.

These perspectives raise an important question: what sustainable development path would help in steering towards a low-emissions future? It is well recognized that overall, global socioeconomic developments that lead to lower emissions and faster development and diffusion of efficient technologies make the task of mitigation easier. How can we actually make progress in this direction in concrete terms? It is worthwhile to mention that, climate policies are usually much more effective and readily accepted if they are integrated into broader development plans.

I will describe some of specific measures for selected sectors that are identified for India here.

Sustainable Development Low Carbon Pathways for India

While there is an urgent need to adopt a multi-pronged strategy to prepare for low carbon pathways for India. Energy efficiency and mainstreaming of renewable sources into the country's energy mix are indispensable in order to achieve its developmental objectives.

Adoption of demand side management at the consumer end can help to lessen the need for incremental investments in energy supply. Industrial, commercial and residential sectors have substantial potential to decrease the energy demand by adopting energy efficient measures. Energy efficiency also addresses energy security concerns, as it decreases demand itself, and defers the need to add additional supply capacity, as well as reducing the need to import (fossil) fuels.

While several large industries are already implementing energy-efficient technologies and India has some of the best available technologies in some sectors to demonstrate this, there is a need to scale up the efforts and tap into energy efficiency across the economy. Small and medium-sized enterprises (SMEs) generally have a currently untapped large potential for energy efficiency improvement. Economically, SMEs are the key driver of economic development and employment in India, making this an important sector to focus our attention on.

In buildings there is tremendous scope for energy efficiency improvements, especially in view of rapid expansion of new construction in India. It is estimated that implementing energy efficient measures would help to achieve 30% energy savings in new residential buildings and 40% energy savings in new commercial buildings. The Government of India has already put in place building energy efficiency codes and has adopted Green Rating for Integrated Habitat Assessment, developed by my home institute, TERI, as a national 'green' building rating system that should greatly enhance energy efficiency of buildings.

Energy-efficient appliances (such as refrigerators) have a large potential to save energy. The Bureau of Energy Efficiency in India has recently introduced energy labelling for air conditioners, refrigerators and some other appliances. A shift from currently sold unlabelled systems with an energy efficiency rating of 7 to 10 (5 star) can save 30% in annual energy consumption. The energy labelling programme needs to be placed on a fast track with an accelerated effort to label and certify all appliances and equipment on their energy performance.

Efficiency of energy use and reduction in greenhouse gas emissions can be enhanced in the transport sector through a coordinated approach consisting of a number of interventions such as improving the efficiency of motor vehicles, an aggressive move towards public transport for intra-city passenger movement as well as a major shift from road-based to rail-based transport modes. Encouraging measures that will allow buses and mass rapid transit systems to play a more effective role in moving passengers within urban areas offers significant scope for bringing sustainable development to the transport sector. Apart from making available adequate public transportation modes, it is also important to focus the attention on simultaneously developing good feeder services and developing good road connectivity to demand centres, in order to promote the use of these services.

The share of railways in freight traffic needs to be enhanced by augmenting the capacity on high-density corridors to meet the growth in freight traffic, promoting

greater multi-modalism as a means of integrating with competing modes, increasing railway productivity through, for instance, improved signalling and synchronization. Interestingly, increased energy efficiency, resulting in reduced coal use, may also result in creating increased capacity for rail transport, as today coal is the largest commodity shipped by rail in India.

While the advanced coal-based power generation technologies exhibit higher efficiencies compared to the sub-critical coal fired plants, and can contribute to energy security by achieving fuel saving to some extent, renewable based power generation technologies need to be tapped and integrated into the country's generation mix in a major way in order to address energy security concerns whilst simultaneously working at reduction of greenhouse gas emissions as well.

Conventionally, the role of renewables has been considered primarily for decentralized applications. However, given the large potential of renewables in India, this is one area that needs to be re-evaluated in terms of its possible contribution to the decrease of fossil fuel use and making a major difference to energy security and environmental impacts. The potential of solar thermal energy is very large, varying from megawatt level solar thermal power plants to domestic appliances such as solar cooker, solar water heater and PV lantern. Other applications are industrial process heat, desalination, refrigeration and air-conditioning, drying, large-scale cooking, water pumping, domestic power systems, and passive solar architecture. While technological demonstration is necessary to scale up the use of the options that are commercially viable, focus on R&D is essential in order to increase availability of appropriate solar energy technologies for a larger range of applications.

Efforts need to be made by all concerned stakeholders to shift from fossil fuels to renewable energy resources. Moving forward, there is a need to provide an enabling environment for promoting the use of renewable energy to meet the incremental demand for energy. Adequate incentives need to be provided to developers to encourage them to invest in the sector.

Now I would like to take this opportunity to sketch new directions for research that I will undertake as holder of the Prince Claus Chair.

Fostering Research Cooperation between Dutch and Indian institutions

One of my main tasks will be to act as a research ambassador from India to The Netherlands. I will strive to develop and strengthen research cooperation between the Dutch and the Indian institutions, in particular with my parent organization, The Energy and Resources Institute (TERI), New Delhi and, Utrecht University. I will interact with researchers from various faculties and departments of this university and other Dutch institutions to explore the possibilities of mutual cooperation between institutions of both countries.

The Netherlands has a very strong energy/sustainability research tradition and community that includes an immense body of knowledge in the domain of environmental sciences. The Utrecht region has an outstanding knowledge network in the university, the university of applied sciences, and various research institutes. It also profits from the presence of many knowledge-based companies in the energy and environmental sector. In addition, the region has many knowledge institutions active in the domain of sustainable development. TERI is an internationally visible not-for-profit organization focusing on scientific challenges in the field of sustainable development and energy. TERI is already partnering with several research organizations from the Netherlands through collaborative research projects funded by various agencies. Future research cooperation will build on TERI's existing collaborations with the Dutch institutions and will develop and strengthen research cooperation between both countries.

Research on Specific Themes within Broad Domain of Sustainable Energy and Climate Change

As a Prince Claus Chair holder, I will focus my research on selected themes. During the first three months of stay at Utrecht University, research is initiated in these themes and it will continue during the entire tenure as Prince Claus Chair. These activities could be further taken forward as a PhD thesis or postdoctoral research by other researchers to ensure further intense collaborative research in these themes and foster the long term sustainability of research cooperation.

Let me sketch the three main themes that my research will focus on.

Low carbon energy solutions for low purchasing power people

Over the years, India has made substantial progress in social welfare with the Human Development Indicator (HDI) increasing from 0.320 in 1980 to 0.519 in 2010 (UNDP, 2010). However, the 119th position of India in the HDI list reiterates the fact that the country has to move upward significantly in human development.

While the past economic performance of India reflects the strength of the economy in many areas, it is also true that large parts of the population have yet to experience a decisive improvement in their standards of living. India's development is characterized by a wide variation in social and economic progress of its states and union territories. Several states lag behind the national average in terms of both economic capacity and social development. There are also wide disparities in levels of poverty among the states of India. Similarly, disparities are evident at the inter-state and rural–urban level in the provision of basic services that include water supply, sanitation, and clean energy.

These facts are also true for many other fast growing highly populous countries. Growth in these economies, and consequently in their energy requirements and greenhouse gas emissions, are increasingly being seen as an important element in the future global energy and climate scenario. Therefore, it is essential to delineate undesirable growth trends at an early stage in order to avert any potential threats (economic or environmental) as well as to plan ahead for moving towards sustainable development.

Research on low carbon energy solutions for low purchasing power people in the rural areas, in suburbs of mega cities, and for residents of smaller towns of developing countries will include identifying appropriate technologies, analyzing and designing different financing strategies, market stimulation measures aimed at particular user groups, and designing effective and efficient policy measures. This could be further linked with employment generation, women empowerment and equity-related issues. Outcomes of the research can be further extended to other sectors such as health and sanitation facilities for providing local based solution for low purchasing power people later on by other researchers.

Applicability of white certificate trading system in India

The second theme that my research will concentrate on is the applicability of the white certificate trading system in India. This will build on the Perform, Achieve and Trade (PAT) scheme of the Government of India's National Mission on Energy Efficiency under the National Action Plan on Climate Change. The white certificate is a new policy approach to increase energy efficiency using market-based mechanisms targeted at overcoming existing market based barriers. Some European countries such as France, Italy, and the United Kingdom have implemented tradable white certificate schemes in their countries.

The government of India has introduced new legislation the Energy Conservation (Amendment) Bill 2010. This legislation aims to push the energy-efficiency drive in the country. It has provisions to kick-start the PAT scheme under the national mission on energy efficiency, which lays down efficiency targets for energy-intensive industries over a period of three years. The proposed Mandatory PAT scheme will cover more than seven hundred installations (termed as designated consumers) in nine energy-intensive Indian economic sectors (such as thermal electric power generation, fertilizers, steel, cement, pulp and paper, aluminium, chlor-alkali, textiles and railways). Under the PAT scheme, energy-saving certificates are issued to industries that consume less than the specified quantum of energy and allows them to sell the thus earned credits to those industries whose energy consumption exceeds the standard specified.

While these kinds of initiatives are new to India, these are widely used in selected European countries in the form of different market-based mechanisms which include white certificate trading, renewable energy trading, electricity markets, and emission trading. In fact, the Netherlands was one of the first countries in the world to introduce a renewable energy-based electricity trading system and it has also a mature and reasonably well-functioning electricity market system. This research theme will analyze both the pros and cons of market-based mechanisms, and will attempt to provide an honest analysis to policymakers within the Indian context.

Energy efficiency improvement in small and medium enterprises

A third subject for investigation is energy efficiency improvement in small and medium enterprises. The industry sector accounts for about 50% of total commercial energy consumption in India. The energy-intensive industries fall both within the large industry segment as well as in the small and medium enterprises (SMEs) segment. SMEs also play an important role in the Indian economy, accounting for about 40% of gross value of output of the manufacturing sector and contributing to over 34% of total exports from the country. While the large industries sector is already experiencing a transformation towards high energy-efficiency levels, SMEs still require a push to ensure that energy-efficient technologies are adopted in the sector on a large scale.

The low end–use efficiencies in SMEs can be attributed to a variety of barriers, including (i) the use of obsolete technologies, (ii) the non-availability of ready-made technological solutions, (iii) the low level of awareness/ information availability, (iv) the limited availability of technology providers at the local or cluster level, and (v) the relatively high cost of technologies and poor access to finance. Given the diversity of the SMEs, the promotion of technology upgrades in this sector necessitates the development of sector–specific programs for technology development. TERI’s experience of working in the small-scale industrial sectors over the past ten years shows that it is possible to reduce energy consumption significantly, if sustained and concerted efforts are put into research, development, demonstration and dissemination in order to develop and disseminate cluster/sector specific technologies. For example, in the case of the Firozabad glass industry cluster, TERI has developed and demonstrated an energy-efficient glass melting furnace and today already nearly 50% of the furnaces in this cluster have switched over to this energy-efficient design.

Similarly, SMEs are important in the Netherlands, as these are typically the motors of innovation. Though considerable potential for efficiency improvement exists, generally SMEs are hard to engage in energy efficiency and environmental programs. Joint research will be developed on the role of energy efficiency in SMEs with a particular focus on energy efficiency improvement opportunities and policy approaches. This will result in bundling the expertise available in both countries.

Professor Ernst Worrell is one of the world renowned experts in the area of energy efficiency, while TERI has a vast experience in energy efficiency while working with SMEs.

Words of Gratitude

I cannot conclude my lecture without expressing my sincere thanks and appreciation to the Curatorium of the Prince Claus Chair for their nomination. I still cherish the recollection of my first meeting with its Chair, Her Royal Highness Princess Máxima, around nine months ago. The graciousness and warmth of her reception and our interesting and wide-ranging discussions highly impressed me.

My special thanks are due to Utrecht University and its Executive Board for the honour bestowed upon me by this appointment. I would also like to specially acknowledge Professor Ernst Worrell, Department of Innovation and Environmental Sciences and all the staff of the department for the warm welcome and continuous support they have given me. The short time I have already spent at the faculty of Geosciences has been a pleasure and a privilege and I am looking forward to our continued collaboration.

I deeply acknowledge the efforts of the Professor G.J. van der Zwaan, Rector Magnificus Designate, for his kind support.

I acknowledge and appreciate the encouragement and support of Dr R.K Pachauri, Director General, TERI for giving me this opportunity and also for providing a good professional platform and work atmosphere at TERI.

Last but not least, I would also like to extend a special word of thanks to my wife Ms. Sakshi Chamola, and to other family members and friends for their continuing support and encouragement.

Thank you!

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Prince Claus Chair in Development and Equity

The Prince Claus Chair in Development and Equity, established by Utrecht University and the Institute of Social Studies (ISS), aims at promoting research and education in the field of development and equity, in honour of the late Prince Claus of the Netherlands.

The Prince Claus Chair rotates annually between Utrecht University and the ISS. Each academic year an eminent scholar from Africa, Asia or Latin America will hold the title of holder of the Prince Claus Chair. He or she will reside for three months in the Netherlands.

A curatorium nominates candidates for the Chair.

This Curatorium is chaired by Princess M^axima of the Netherlands.

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