ECONOMIC DEVELOPMENT AND THE COSTS OF CLIMATE CHANGE

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Abstract

The role of the government and public sector funding in the Indian economy for ensuring a basic quality of life is critical for building coping capacities and autonomous adaptation through providing basic amenities, public health care provisioning, biodiversity conservation, and investing in facilitating technology transfer, knowledge sharing and addressing social and economic inequities.

Keywords: Indian economy, quality of life, public health, technology.

Introduction

Theories and narratives on economic growth (Malthusian, Classical, Marxian and many others such as the Stiglitz Commission) have created and contributed in building an understanding on what is economic development; what are the most important factors that determine it; and what the key dimensions for assessing economic development are. The role played by natural resources in the process of economic development, and its relevance in answering these questions is by no means new. Population, human capital, social capital, resource endowment, technology, institutions and political economy have featured prominently in understanding economic development. Climate change has contributed in bringing in an important additional dimension to the understanding of the role of nature in development, in particular because of certain characteristics peculiar to climate change and its impacts. An improved understanding of the science of climate change and the high levels of consensus reached among scientists in the past decade on the adverse consequences of global warming has contributed to furthering the focus from economic development to sustainability of the development process. This is also reflected in the way definitions of sustainable development have evolved. A widely used articulation of sustainable development is that of the UNDP's(1995): of development that meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development, 1987), and assumes the conservation of natural assets for future growth and development. The very recently adopted Sustainable Development Goals (SDGs) (UN 2015) explicitly incorporate a goal on climate change: take urgent action to combat climate change and its impacts. The first target mentioned under the climate goal of the SDGs is to strengthen resilience and adaptive capacity to climate-related hazards and natural

disasters in all countries. In fact, many of the other goals have interlinked ages with the environment, calling for conservation and sustainable use of natural resources. This is also in keeping with the thinking on *wellbeing* as the true measure of progress in human society.

Recent studies on observable and likely impacts of climate change as assessed in the latest report of the IPCC provide evidence that climate change poses risks for regions across the world. The adverse consequences are likely to be higher in future for those communities and ecosystems which are already vulnerable. These include the poor, those whose likelihoods are natural resource dependent such as in rural areas and fragile ecosystems and species, which are already under threat. Risk levels vary from low to very high, and differ by region and sector. For instance, the risks to coral reefs increases to very high levels with even a 1 degree C rise in temperature whereas on average, the risk to crop production does not reach high levels for most regions and crops till a 2 degrees C or higher temperature rise (IPCC AR5 2014).

Three key risks identified for Asia, include increased flood damage to infrastructure, livelihoods and settlements, heat related human mortality, and increased drought related food and water shortage (IPCC AR5 2014). In short, as per the current understanding of climate related risks, the likely impacts from climate change will have adverse impacts on the growth and development of the Indian economy in a manner that cuts across sectors and regions of India. Some of these projected impacts will be felt in the near term (say by 2040) while others are projected to occur in the longer term (by 2100). Considering flood risks and associated losses, India is among the top 20 countries most at risk from extreme events, and could experience an 80 per cent increase in population at risk from sea level rise by 2050, with Kolkata and Mumbai as the two major cities facing risks to population and assets. Heat stress can adversely impact labour productivity and also poses a heightened risk of heat strokes in India, particularly for those whose work exposes them outdoors for long hours such as workers in construction and agricultural activities. There are several other sectors that are likely to feel economic impacts such as beach and mountain tourism, and health impacts from increased cases of malaria and diarrhoea.

Substantial economic impacts from climate change in India can be expected to occur given the current low levels of adaptive capacity, the country's geographical location, large numbers dependent on natural resource based livelihoods, and impacts on agriculture. Some idea of the magnitude of the economic impacts can be gauged from studies relating to the projected impacts on food production systems and food security due to rising air temperatures. Sorghum grain yield is projected to decline between 2-14 per cent by 2020, with worsening yields by 2050 while in the Indo-Gangetic plain, reduction in wheat yields upto 51 per cent in the most favourable area is projected. In rice plant cultivation, current temperatures are claimed to be already approaching critical levels during stages of growth, e.g. in Northern India (October), Southern India (April, August) and Eastern India (March-June). One recent study projects an overall decline in foodgrain production by 18 per cent by 2050 (Dasgupta 2013).

In sum, the impacts are projected to be wide-ranging and can impose a substantial economic burden. Risk levels are influenced by the factors that influence the probability of hazards occurring and by interventions that can reduce the impacts when these occur. The former relates to activities that can reduce the emissions of greenhouse gases (or mitigation) and the latter aspect includes actions that reduce vulnerability to these impacts or increase coping capacities (or adaptation). Consumption patterns, population growth, availability of technology and knowledge, and institutional capacities are some of the factors that influence adaptation and mitigation responses. Economic decision-making with regard to the prioritization of resource allocation and the use of economic policy instruments is crucial in determining the responses to the climate challenge. Costing of the projected impacts and the resources required taking up appropriate mitigation and adaptation responses is an important input into decision-making.

The economic costs related to climate change can be considered in different ways. On one hand, the adverse impacts are losses for the economy that have to be carefully assessed. On the other hand, there are costs for reducing these losses through adoption of mitigation and adaptation activities. Note that the two are not the same. Climate science provides evidence that impacts are already being felt, some of which could be irreversible, and some amount of warming is inevitable. Even if resources to take action for reducing the impacts were fully available, there are limits to what adaptation can achieve.

For instance, the risk levels for heat related mortality are high even if a hypothetically defined high adaptation state can be attained in the long term while in the case of increased risk of drought related water and food shortage causing malnutrition, high adaptation brings down the risk level to low in the near term (2030-2040) and it can be maintained at low to medium in the long term under a 2 – 4 deg C rise in temperature by 2080-2100. The adaptation responses for tackling heat stress would include investing in heat health warning systems, urban planning to reduce heat islands, and improvement of built environment. The adaptation responses for the latter would include investing on disaster preparedness, early warning systems, and strengthening local adaptive capacities (IPCC AR5 2014).

A range of models have been used to capture the impacts on economic growth and the costs of climate change from the mitigation perspective. A number of such models have been experimented with for the Indian economy as well ranging from top down to bottom up models, and integrated assessment models. The general approach is to model the impacts of climate change on economic growth which are expected to be felt through changes in productivity, resource endowments, and production and consumption patterns. Typically, the studies build alternative scenarios for the future, using a reference scenario of no new climate change (mitigation) policy versus alternatives with target reductions in GHG emissions. Costs are derived in terms of the investments required to meet the scenario with climate action, or more often expressed as a percentage of the GDP. The economic cost is measured as a loss of GDP to the economy. The objective function is usually designed such as to maximize economic growth (or consumption expenditure over time),

minimize the costs of mitigation or implement a macroeconomics rule such as maintaining national income accounting identities on savings and investment.

To overcome computational challenges, most models make simplifying assumptions and concentrate on a few sectors so many aspects are actually left out. Social and institutional aspects and nonmarket values tend to be ignored in such approaches. Sectoral approaches which address specific concerns, such as to what extent costs in a particular industry would increase due to adoption of cleaner technology, or hurt the industries competitiveness in global markets, provide more detailed information. As of now, there is a large variation in the available estimates of the aggregative economy-wide costs of climate change. Estimates differ due to varying specifications regarding mitigation scenarios, timelines and assumptions such as those on growth in technical factor productivity and energy efficiency. Parikh (2012) estimates a 12.5 per cent loss in GDP over 2005- 2050; Shukla and Dhar arrive at a 6.7 per cent loss in GDP over the same period while Pradhan and Ghosh (2012) get a 1.1-1.3 per cent loss in the GDP growth rate till 2030.

Mitigation strategies as stated in India's submission to the UNFCCC (INDC 2015) includes a target to achieve 40 per cent cumulative electrical power installed capacity from non-fuel based energy resources by 2030. It also intends to create an additional carbon sink of 2.5 to 3 billion tonnes of carbon dioxide equivalent through forest and tree cover by 2030. Apart from these, there are other responses such as improving energy efficiency, developing climate resilient infrastructure in 100 smart cities, developing public transport systems and other such initiatives.

Costing with regard to adaptation requires an assessment of the impacts of climate change in terms of the damages and losses attributable to climate change, and calculations of the costs of addressing these. Conventional approaches that rely on static analysis or use of standard techniques in arriving at monetary values (cost effectiveness analysis, cost benefit analysis, and other cost curve approaches) may prove inadequate since these are unable to take note of the risk and uncertainty aspects that are central to climate change analysis. A plurality of methods is required for such costing which would include cost benefit approaches that include a time dimension, to newer and heterodox ones including multi-metric approaches and other decision-support tools.

Since climate change is projected to impact economies and populations across the world differentially, a key economic concern is that costing of climate impacts or responses to these, should give due weightage to those whose values can be excluded or understated and, against ecosystems where there are uncertainties about ecosystem services. The valuation of the costs and benefits requires the weighing of differing values against each other (Chambwera, Heal, et al
2014). This is of course a challenge that economists using cost-benefit analysis have grappled with for many years now, but climate change magnifies the concerns due to the projected scale and scope of impacts. Costs incurred for adaptation and mitigation responses range from technological, managerial, personnel and institutional costs to investing in R & D, awareness and capacity building.

When planning for adaptation and mitigation, resource constrained economies make choices; calculate opportunity costs of actions keeping in view the multiple goals that they have for reaching threshold levels of a quality of life for the population. The economic decision-making context for responding to climate change in a developing economy like India is one that recognises the multiple non-climate stressors that exist, and the interaction between, adaptation, mitigation and sustainable development. This will also enable researchers to capture the values of co-benefits and co-costs of climate action which arise from the trade-offs and synergies between adaptation, mitigation and sustainable development.

There is substantial variation in globally available estimates of both mitigation and adaptation costs. The incremental economic impact of emitting carbon dioxide (the social cost of carbon) lies between a few dollars and several hundreds of dollars per tonne of carbon. These estimates vary strongly with the assumed damage function and discount rate, with larger ranges for lower discount rates. Similarly, adaptation cost estimates for developing countries range from
4 to 109 US$ billion per year from 2010 to 2050. At a global level, there is a huge deficit in adaptation needs and available funds (IPCC Synthesis Report).

India's INDC submission cites an ADB study that the economic damage and losses in India from climate change will be around 1.8 per cent of its GDP annually by 2050. It also cites estimates from the NITI Aayog that the mitigation activities for moderate low carbon development would cost around USD 834 billion till 2030 at 2011 prices. As per the INDC, preliminary estimates indicate that around USD 206 billion (at 2014-15 prices) between 2015 and 2030 would be required for adaptation actions in agriculture, forestry, fisheries infrastructure, water resources and ecosystems, and additional investments would be needed for strengthening resilience and disaster management. In India, most adaptation strategies are addressed within the framework of the National Action Plan on Climate Change and the National Missions.

The public sector's role in providing incentives, regulation and the right instruments for leveraging climate funds to meet costs has been advocated in recent years (IPCC AR5 2014). The role of the government and public sector funding in the Indian economy for ensuring a basic quality of life is critical for building coping capacities and autonomous adaptation through providing basic amenities, public health care provisioning, biodiversity conservation, and investing in facilitating technology transfer, knowledge sharing and addressing social and economic inequities.

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