

**A CASE STUDY :**

Economics of climate change and financing climate adaptation and mitigation in India

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SUMMARY : Climate change is one of the most important challenges facing the world in general and India in particular. Climate change presents a unique challenge for economics, it is the greatest and widest-ranging market failure ever seen. India is among the developing countries that are vulnerable to climate change, while also in need to promote economic growth to alleviate poverty. To promote sustainable, low-carbon and climate-resilient growth, India will require continuous efforts in mitigation and adaptation through Nationally Appropriate Mitigation Actions and National and State Adaptation Plans. This article examines economic costs of climate change and climate finance with a focus on India. It highlights multilateral agencies, government schemes, programmes and funds received through global climate change conventions to support in climate mitigation and adaptation way forward to climate resilient growth. First, it reviews major estimates of the economic costs of climate change as well as adaptation costs and mitigation costs through literature and then discusses climate finance and how it relates to estimates of costs of adaptation and mitigation. This recommends that though continuous support of multilateral agencies will be required in the future, efforts to access mitigation and adaptation funds must be made through global climate change negotiations.

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BACKGROUND AND OBJECTIVES

India is at the forefront of the impacts of climate change and is uniquely positioned in global efforts to manage climate change. Higher temperatures, sea level rise and extreme weather events linked to climate change are having a major impact on the region, harming its economies, natural and physical assets and compounding developmental challenges, including poverty, food and energy security and health. Without

climate-oriented development, climate change could force more than 100 million people from the region into extreme poverty by 2030, wiping out the gains in poverty reduction achieved over the last decades in Asia-Pacific region. At the same time, the region accounts for 53 per cent of global emissions and the high-growth path on which many of the region's economies themselves on means this contribution will grow without fundamental policy interventions (ESCAP, 2016).

The economics of climate change offers

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critical insights into the costs and benefits of both inaction and action on climate change. Estimates of the costs of inaction have gone up, while those of action have decreased, mainly due to lower technology costs (ESCAP, 2016). Five key priority areas of the climate change response for the Asia-Pacific region and the economic policies and instruments that can be used to achieve them. First, adaptation to climatic changes and improved resilience are the most immediate challenges. Second, priority must be placed on pricing carbon to provide long-term incentives for economic actors to switch to low-carbon pathways. Third, countries should phase out fossil fuel subsidies, as their distortionary effect hinders energy efficiency and clean energy alternatives. Fourth, initiatives to accelerate the uptake of renewable energy and energy efficiency solutions are needed for emissions reductions, energy security and energy access. Fifth, adequate climate financing is required to allow the region to realize its climate ambition and take advantage of the opportunities that climate change offers. Regional cooperation will help address many of these issues and enhance the ongoing national effort to implement ambitious climate change actions.

Ensure adaptation to climate change and improved resilience :

Regardless of the progress made in mitigation efforts by the global community over the coming decades, climate change is already occurring. Adapting to climate change is, therefore, essential. Striking the right balance between mitigation and adaptation investments is an ongoing challenge for policy makers, especially in India. Adaptation efforts can take several forms – altering farming practices and crop varieties, building water reservoirs, enhancing water use efficiency etc.,. Adaptation to climate change and putting in place multi-hazard early warning systems provide largely local benefits. Effective adaptation interventions represent good development and tend to be no-regret measures that would have been undertaken even in the absence of climate change. While it is difficult to arrive at an aggregate estimate of the costs and benefits of agricultural adaptation in the India. Some of the modeling work in the Asia-Pacific region suggests benefits in the value-added of the sector could be large, even reaching 10 per cent. The damage costs of flooding exacerbated by climate change are likely to be substantial to cities and in the range of 2 to 6 per cent of regional GDP.

Phase out fossil fuel subsidies :

Phasing out fossil fuel subsidies should be at the top of the India's policy reform agenda. Subsidies on fossil fuels distort incentives in favour of fossil fuels at the expense of cleaner energy. They have large negative economic, social and environmental impacts. Beyond their contribution to fiscal imbalances and public debt, subsidies depress investment in the energy sector, which can hamper energy supply and exacerbate economic losses. International experience suggests that successful fossil fuel subsidy reform will be part of a larger energy sector reform agenda. Elements for successful reform include social support through subsidy targeting and cash transfers; institutional reforms to facilitate market-level pricing; facilitating improvements in energy efficiency and a transparent communications strategy.

Encourage renewable energy and energy efficiency:

To encourage energy efficiency and renewable energy take-up, experience in the region shows that a policy mix of targets, regulations, standards, labeling and fiscal incentives work well to accelerate energy efficiency improvements. As fossil fuel subsidies are phased out and carbon pricing gains hold, prices approach their real costs, making energy efficiency improvements more desirable. For renewable energy investments, providing clear long-term policy signals, overcoming the region's high cost of capital and shortage of long-term investment capital and de-risking investments are important to catalyze private sector investments. This can include guarantees, subsidized loans or regulatory targets such as portfolio targets.

Ensure effective carbon pricing :

Carbon pricing is a key reform to correct the underlying market failure of climate change. Pricing carbon economy-wide results in price signals that drive low carbon pathways by businesses and consumers and stimulates clean technology and process innovation, while also supporting long term behaviour change. Credible and long term carbon prices have the potential to induce fundamental and long term shifts in infrastructure, technology and behaviour, which form the basis of a low carbon economy. Many countries in the Asia-Pacific region like India have implemented emission trading schemes at sub-national or national levels and others are under development. The main policy imperative is to increase the effective carbon prices across key countries

in the region as these are currently too low to provide adequate incentives to pursue a low-carbon path and to expand carbon markets by linking them to each other to reap greater cost efficiency opportunities. Carbon pricing can raise valuable public revenue through the auction of permits and the collection of carbon taxes.

Climate finance :

As climate change continues to progress and extreme weather events become more frequent and more severe, the need for adaptation finance for developing countries also continues to grow. At current estimates, adaptation finance needs of developing countries are in the range of US\$140bn to US\$300bn per annum. On top of this, incremental investment from 2015 to 2050 to de-carbonize the Asian energy sector alone is estimated at a net US\$21tr or US\$600bn per annum (ESCAP, 2016). But, compared to annual GDP, these amounts are relatively modest ranging from 0.1 per cent today to 4 per cent by 2050, mainly because the benefits of de-carbonization include higher energy efficiency, lower fuel costs and lower operating expenditures as well as substantial health benefits from reduced air pollution and its associated economic and health impacts.

Scaling up climate finance will require identifying and addressing the barriers to investment and access to finance. Adequate carbon pricing and the integration of long-term policy frameworks for the low-carbon transition into national planning and budgeting will be important elements to support climate investment. Financial regulation will also play an important role in easing the risks for private investors thereby unlocking private finance, as will green bonds. Grant finance should be used increasingly to catalyze other sources of financing rather than as standalone project finance and vulnerable countries in the region require additional help to ensure that they can access available sources of grant financing.

Adaptation and mitigation costs :

An important first step towards addressing climate change is knowledge of the costs of adaptation and mitigation. However, estimation of adaptation and mitigation costs is not straight forward as it involves conceptual, methodological and practical issues. For example, there are different concepts of such costs. IPCC defines adaptation costs as costs of planning,

preparing for facilitating and implementing adaptation measures including transaction costs. Other issues related to adaptation include how much to adapt compared with the full impacts of climate change and different concepts of adaptation such as soft (institutional and policy issues) versus hard (capital intensive, physical infrastructure) adaptation; public versus private adaptation and planned versus spontaneous/autonomous adaptation (World Bank, 2010). Issues that are also relevant for estimation of mitigation costs include treatment of uncertainty about climate change and related issues such as future technologies, the relative value of resources in the future and future socio-economic variables.

Climate finance :

This section discusses climate finance and the related issue of development finance. 9 It starts by presenting why climate finance is needed. It then presents the state of adaptation and mitigation finance. The last sub-section presents issues related to financing gap and potential sources of finance to fill this gap as well as governance and allocation of climate finance 10.

Why climate finance :

While it may not be possible to avoid all the damages caused by climate change (partly due to inertia in the climate system), its negative impacts could be reduced through actions that help affected agents adapt to the changes. Actions taken to reduce the impacts of climate change through measures such as reduction of GHG emissions would also contribute towards reducing the impacts and hence, the economic costs of climate change. Developing countries in general and Asian countries in particular have a number of development challenges to grapple with and climate change adds to these challenges. These countries are already unable to fully address challenges other than climate change on their own. There is also the argument that climate change is a global externality largely caused by actions of developed countries who also have much better capacity to address climate change challenges. At least partly for these reasons, parties to the UNFCCC have agreed to follow the principle of 'common but differentiated responsibilities.

Adaptation financing :

Clearly, an overarching concern whether speaking of mitigation or adaptation finance is that we arrive at a fair, sufficient, global deal, that does not adversely affect

Table 1: Funds primarily supporting adaptation (USD millions)

Fund	Pledge	Deposit	Approval	Disbursement	No. of projects approved
Adaptation fund (AF)	323.05	186.48	166.36	29.14	25
Least developed country fund (LDCF)	536.65	435.46	286.73	126.63	126
Special climate change fund (SCCF)	241.61	196.4	147.25	100.23	39
Pilot programme for climate resilience (PPCR)	1119	804.8	317.48	8	79

Source: Schalatek *et al.* (2012a)

the world’s poorest and most vulnerable people and at the same time safe guards (rather than diminishes) current finance for development. When addressing adaptation, specifically the UN Frame work Convention on Climate Change (UNFCCC) estimates costs to developing countries in the range of \$49–\$171 billion each year relating to agriculture, forestry, fisheries, water supply, human health, coastal zones and infrastructure. Industrialization in developed countries is responsible for the lion’s share of the problem. As such, the ‘polluter pays principle’ should apply – essentially, the developed world needs to make compensation payments to developing countries for the environmental damage it has caused. Beyond this a key consideration is ‘ability to pay’, and again, it is developed countries who have the greater capacity. With the source of flows from North to South in mind, the report develops criteria to judge financing proposals which include:

Sufficiency – Where the funds generated are equal to the scale of the task

Predictability–Where funds are generated in as stable and predictable a way as possible

Equity – Where contributions reflect both historical responsibility and capacity to pay

Additionality –Where funds are ‘new and additional’ to existing aid commitments

Verifiability – Where funds are collected and disbursed in a transparent and verifiable manner

Ease of implementation– Where mechanisms are favoured that can be readily implemented.

Table 1 presents the major dedicated climate funds targeting adaptation actions of developing countries (either exclusively or predominantly). It can be seen that there is a huge difference between amount pledged and amount disbursed, which is true for all funds though with varying degrees (Mekonnen, 2014). In terms of regional distribution of adaptation finance, the data show that sub-

Saharan Africa receives the largest share (44%) followed by Asia and Pacific (27%) (Table 2). Out of 119 countries that receive adaptation 20 countries (representing only 16.8% of the 119) receive 50.3% of total adaptation funding (Schalatek *et al.*, 2012a). The data also show that some of the most vulnerable countries receive very little.

Table 2: Regional distribution of adaptation finance

Region	Percentage share (%)
Asia and Pacific Global	27
Europe and Central Asia	5
Latin America and Caribbean	15
Middle East and North Africa	4
Sub-Saharan Africa	44
Unknown	2

Source: Schalatek *et al.* (2012a)

Mitigation financing :

The UNFCCC speaks of figures upward of \$200 billion per year that will be required to fund mitigation in developing countries, breaking down the costs into the following categories: energy, industry, buildings, transport, waste, agriculture, forestry and technology. Moving away from fossil-fuel dependence for energy generation is predicted to be the most expensive category. The Stern Review (Stern, 2006) states that ‘investing’ today to move the economy onto a low-carbon footing would certainly be expensive, but far less so than dealing with the economic consequences of the level of climate change resulting from continuing with ‘business as usual’ – a colossal 5%–20% of global GDP on an on-going basis. In terms of ways forward the report describes two approaches: quantity-based or price-based. That is, to shift to a sustainable, low-carbon trajectory we can either restrict the quantity of global emissions or we can increase the costs of these emissions to achieve the same result. In policy terms these two options equate to a global limit or ‘cap’ or to a global carbon tax. Either option can

only work in the context of a sound and effective global deal to limit climate change, which is based on historical fairness and where future human development is an integral part.

Table 3 presents climate funds that primarily support mitigation. We note from the table that Clean Technology Fund (CTF) has the largest share of mitigation finance in terms of pledges (USD 4,806 million). However, in terms of the amount disbursed, the Global Environmental Facility Trust Fund (GEF 4/5) contributes much more (USD 980 million compared with USD 136 million for CTF). Table 4 shows about 26% of total mitigation finance goes to Asia and Pacific (Mekonnen, 2014).

Responsibility and capacity to pay :

It is essential that decisions on climate change financing be made on a fair and equitable basis, using clear principles and that national contributions should vary to reflect responsibility and capacity to pay. One of the recognised systems by which to assess which developed countries ought to shoulder what proportion of financial responsibility, in respect of both mitigation and adaptation, is the Greenhouse Development Rights (GDR) framework (Baer Paul *et al.*, 2008). Fundamental to the GDR approach is firstly the need for emergency measures to reduce global carbon emissions rapidly to avoid global temperature rise of 2°C and secondly the overriding need for poverty reduction in developing countries. Under the framework, Responsibility is calculated by taking each country's total 'cumulative' emissions per capita and

Capability is calculated using per capitational income data, adjusted to reflect differences in purchasing power and inequality from one country to another. As well, the rights of poor people to develop are safe guarded through the use of an income threshold; the greater the proportion of a country's population that falls below this poverty line, the less that country is required to invest. Finally, proportionate responsibility can be determined through the use of a responsibility and capacity index.

Government programmes and schemes for climate resilient agriculture :

National initiative on climate resilient agriculture (NICRA) :

NICRA was launched during February 2011 by ICAR with the funding from Ministry of Agriculture, Government of India. The mega project has three major objectives of strategic research, technology demonstrations and capacity building. Assessment of the impact of climate change simultaneous with formulation of adaptive strategies is the prime approach under strategic research across all sectors of agriculture, dairying and fisheries. Evolving climate resilient agricultural technologies that would increase farm production and productivity *vis-à-vis* continuous management of natural and manmade resources constitute an integral part of sustaining agriculture in the era of climate change. The four modules of NICRA – natural resource management, improving soil health, crop production and livestock – is aimed making the farmers self-reliant.

Table 3: Funds primarily supporting mitigation (USD millions)

Fund	Pledge	Deposit	Approval	Disbursement	No. of projects approved
Clean technology fund (CTF)	4,806	3,415	2,679	136	51
Global environmental facility trust fund (GEF 4/5)	1,894	1,802	1,309	980	288
Global energy efficiency renewable energy fund (GEEREF)	170	66	77	unknown	11
Scaling-up renewable energy programme for low income countries (SREP)	414	329	37	0.47	23

Source: Schalatek *et al.* (2012b)

Table 4: Regional distribution of mitigation finance

Region	Percentage share (%)
Asia and Pacific	26
Sub-Saharan Africa	20
Latin America and Caribbean	20
Middle East and North Africa	16
Global	2

Source: Schalatek *et al.* (2012b)

National mission on sustainable agriculture (NMSA):

NMSA has been formulated to make agriculture more productive, sustainable, remunerative and climate resilient by promoting location specific integrated/ Composite Farming Systems; conserve natural resources through appropriate soil and moisture conservation measures; adopt comprehensive soil health management practices; optimize utilization of water resources through efficient water management to expand coverage for achieving 'more crop per drop; develop capacity of farmers and stakeholders, in conjunction with other ongoing Missions and pilot models in select blocks for improving productivity of rainfed farming by mainstreaming rainfed technologies.

Rainfed area development (RAD) :

Rainfed area development (RAD) as a component of NMSA is being implemented in the country from 2014-15. The RAD focuses on Integrated Farming System (IFS) for enhancing productivity and minimizing risks associated with climatic variabilities. Under this system, crops/cropping system is integrated with activities like horticulture, livestock, fishery, agro-forestry, apiculture etc. to enable farmers not only in maximizing farm returns for sustaining livelihood, but also to mitigate the impacts of drought, flood or other extreme weather events with the income opportunity from allied activities during crop damage. For the Year 2016-17, budget provision of Rs. 225.0 crore has been made for implementation of the programme.

National adaptation fund for climate change (NAFCC):

NAFCC was established in August, 2015 to meet the cost of adaptation to climate change for the State and Union Territories of India that are particularly vulnerable to the adverse effects of climate change. Government has set up a budget provision of Rs.350 crores for the year 2015-16 and 2016-17, with an estimated requirement of Rs. 181.5 crores for financial year 2017-18 for NAFCC. The projects under NAFCC prioritizes the needs that builds climate resilience in the areas identified under the SAPCC (State Action Plan on Climate Change) and the relevant Missions under NAPCC (National Action Plan on Climate Change).

Conclusion:

India faces complex choices in its approach to managing climate change. The region's diversity with states at all stages of development produces different challenges with no "one size fits all" solutions. Many countries in the region such as small island states, least developing countries and landlocked developing countries face severe challenges to address inclusive development, poverty and infrastructure needs. Climate change will compound many of these challenges and create new ones. This recommends that though continuous support of multilateral agencies will be required in the future, efforts to access mitigation and adaptation funds must be made through global climate change negotiations.

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