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India and Climate Change

India is confronted with the challenge of sustaining rapid economic growth amidst the increasing threat of climate change. India stands 18th in the world on the Climate Risk Index with the score of 38.50 (Kreft & Eckstein, 2013), indicating the high level of exposure and vulnerability to extreme events. Evidence has shown that impacts of climate change will be felt most acutely by the people whose livelihoods are most dependant on natural systems, around 700 million in India (Satapathy, et al., 2011). The UNHDR 2014 cites some studies that predict crop yields up to 30 per cent lower over the next decades. Water availability and changing cropping zones may further raise concerns to India's food and water security. Achievement of vital national development goals related to other systems such as habitats, health, energy demand and infrastructure would also be adversely affected by impacts of changing climate (Planning Commission, 2011). The WHO warns that the risk of death and disease from climate change will double in the next 20 years. Furthermore, being the third largest carbon emitter in the world, India will also have to devise ways to reduce its carbon emissions while choosing its development trajectory.

Combating Climate Change and its Impacts: A Study of India's Financial Requirements and Gap

1. Introduction

The world will see the adoption of the Sustainable Development Goals (SDGs) in September 2015. The SDGs, a set of 17 Goals consisting of 169 Targets, cover a broad range of interconnected issues, from economic growth to social issues to global public goods. This brief explores the financial implications for India of SDG 13, "Take urgent action to combat climate change and its impacts" (See Box 1).

The data presented here has been extracted from the report "Achieving the Sustainable Development Goals in India: A Study of Financial Requirements and Gaps" developed by Technology and Action for Rural Advancement, Development Alternatives Group for the Ministry of Environment, Forest and Climate Change. The study was supported by the United Nations Development Programme.

In the assessment of SDG 13, the SDG finance report estimates the costs of

- Strengthening resilience: the process of increasing capacity to absorb future climate stresses
- Adaptation: efforts to adjust to changing climate conditions
- Mitigation: efforts to reduce or prevent emissions of greenhouse gases
- Capacity building and strengthening institutions for climate change response
- Research and development for combating climate change and its impacts

The study on SDG finance estimates financial requirements and gaps for achieving each SDG. It estimates finance required through various methodologies depending on the specific SDG. Methodologies include deriving estimates from existing sector-specific studies where available, projecting finance required to achieve a target value of a relevant indicator based on past correlation between spending and indicator values, etc. The finance available is estimated by projecting past public expenditures into the future. Further details about methodology, assumptions and limitations of the study may be found in the main report.

Box 1: Sustainable Development Goal 13: Take Urgent Action to Combat Climate Change and its Impacts

- 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
- 13.2 Integrate climate change measures into national policies, strategies and planning
- 13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
- 13.a Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilising jointly \$100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalise the Green Climate Fund through its capitalisation as soon as possible
- 13.b Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries, including focusing on women, youth and local and marginalised communities

The assessment of the costs is done keeping in mind that these costs are linked with strategies and achievement of other SDGs. Climate change will impact our agricultural systems, water availability, health status, biodiversity and forest ecosystems and therefore the strategies for adapting to climate change will be closely associated with respective goals on these sectors (SDGs 2, 3, 6, 14, 15). Actions for mitigating climate change should be taken in high carbon emitting sectors like energy, industrial processes, transportation, etc. and therefore will have implied linkages with Goal 7, 9, 11 and 12 on energy, industries, urbanisation and sustainable consumption and production patterns respectively. While the study is cognizant of these linkages (see Table 1), a few costs, in particular the cost of disaster risk reduction and disaster resilience-building, are not included in the estimates due to unavailability of required data and methodologies. Additional investment will undoubtedly be required to adapt to as well as mitigate climate impacts such as cyclones, flash floods etc. Further, research and development (R&D) on climate action is crucial to define effective response strategies. In the study on SDG finance, R&D costs are estimated for all SDGs together, and the same estimate is presented in this issue brief. A significant, nationally-appropriate proportion of these costs would be required to combat climate change.

The primary components of the costs of strengthening resilience, adaptation and mitigation to combat climate change include

- *Infrastructure investments*

Infrastructure investment is essential for climate response. The energy sector can play a crucial role in mitigation through investment in renewables. In agriculture, investment is needed in irrigation, soil and water conservation. Urban infrastructure investments include managing municipal solid waste, storm water drains and sewerage for strengthening resilience. Other infrastructure investments include food storage, clean industrial production etc.

- *Costs of alternative green technologies*

Energy sector has great scope for promotion and use of alternative green technologies. Transition to zero emission energy fuel mix is envisaged by changing the technology used for production of the energy from coal based to solar and wind (renewable energy) based energy production. Additional low carbon strategies for economic growth also include technological changes.

- *Costs for capacity building*

Building capacities of stakeholders and developing institutional mechanisms for climate change are also primary components of the costs for combating climate change. They include various capacity building costs like building capacities of farmers for practicing sustainable agriculture, building capacities of communities to sustainably manage water resources, etc.

- *Planning*

Climate-sensitive policymaking is necessary to ensure that every intervention is planned keeping its climatic repercussions in mind, and to further enable co-benefits between development and climate action. For this, investment is needed in building capacities of government district and block-level officers for climate-sensitive planning.

2. Estimates in Perspective

Table 1 indicates the finance required and gap in climate action. It includes all SDGs that involve climate action. Box 2 indicates the finance gap estimated for SDG 13 on combating climate change, compared to overall finance gap.

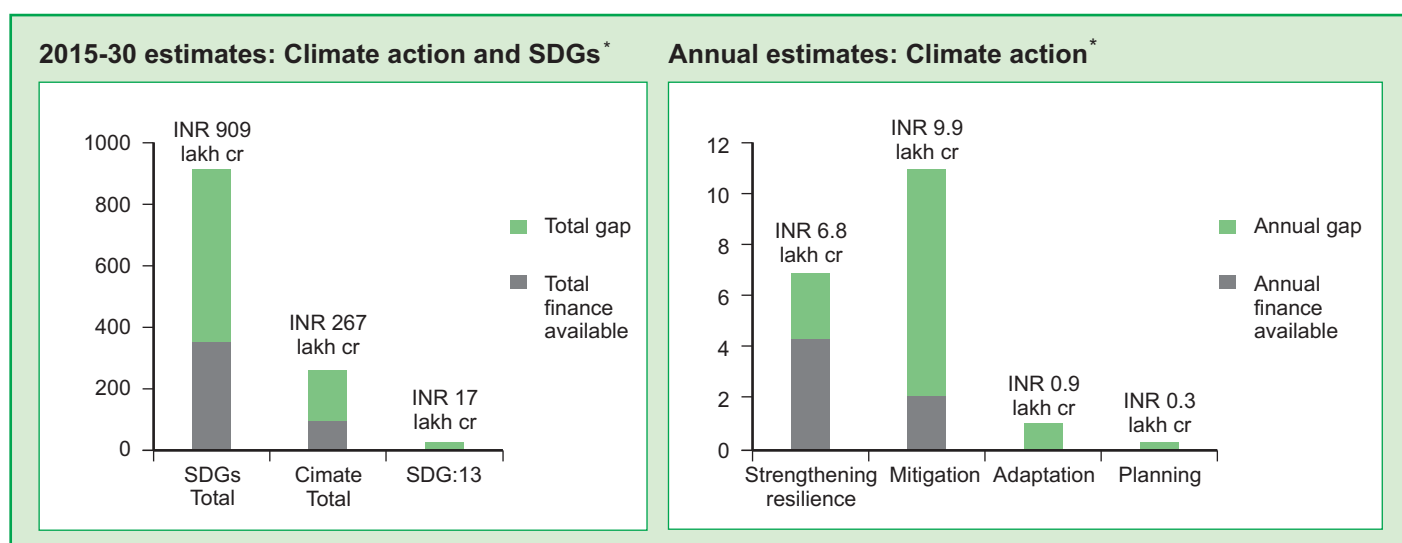
Average annual climate finance gap is

- **33% of annual SDG finance gap**
- **65% of plan and non-plan budgeted expenditure, Indian union budget 2015-16**
- **36% of combined budgeted expenditure of centre and states, 2013-14**
- **9.2 % of GDP at current prices, 2014-15**

Table 1: Summary of finance required and gap for climate action

Climate action	Thrust area	Finance required (INR lakh crores)	Finance required (USD billions)	Gap (INR lakh crores)	Gap (USD billions)
Strengthening resilience	<ul style="list-style-type: none"> Sustainable agriculture (Target 2.4) Maintaining genetic diversity (Target 2.5) Cleaning water bodies (Target 6.3) Urban infrastructure (Target 11.2, 11.3, 11.6, 11.7) Reducing food wastage (Target 12.3) 	102	1593	38	596
Mitigation	<ul style="list-style-type: none"> Renewable energy (Target 7.1, 7.2, 7.3) Low carbon economic strategies (Target 12.1, 12.2) Increasing protected areas network (Goal 14, 15) 	148	2335	119	1879
Adaptation	<ul style="list-style-type: none"> Agriculture (Goal 2) Forestry (Goal 15) Fisheries (Goal 14) Infrastructure (Goal 9) Water resources (Goal 6, 14) Ecosystem services (Goal 14, 15) 	13	206	13	206
Planning	Capacity-building and building of institutional mechanisms for climate change	4	61	4	61
Total		267	4195	174	2742

Box 2: Estimates in perspective



* If total finance required were spread over 15 years, even though some goals are not assessed for exactly 15 years.

3.a. Strengthening Resilience

The total finance required for strengthening resilience is estimated to be INR 102 lakh crores (USD 1593 billion). The estimated gap is INR 38 lakh crores (USD 596 billion). These costs are estimated across sectors in the goals that have been financially assessed in the study on SDG finance (see Table 2). There will be additional investments needed for sectors outside the purview of the study, for example in coastal zones and disaster management.

3.b. Mitigation

The total finance required for mitigation is estimated to be INR 148 lakh crores (USD 2335 billion). The estimated gap is INR 119 lakh crores (USD 1879 billion). The costs of mitigation are estimated across sectors in the goals that have been financially assessed in the study on SDG finance (see Table 3). There will be additional investments needed for sectors outside the purview of the study, for example in transportation and livestock.

Table 2: Finance required and gaps in climate resilience

Targets	Areas considered for finance*	Time-frame	Finance required (INR lakh crores)	Finance required (USD billions)	Gap (INR lakh crores)	Gap (USD billions)
2.4, 2.5	Sustainable agriculture techniques, genetic diversity	2015-24	26	409	15	230
6.3	Improving water quality: cleaning River Ganga	2015-30	7	103	6	98
11.2, 11.3, 11.6, 11.7	Urban infrastructure and services, including managing municipal solid waste, storm water drains and sewerage	2015-30	68	1073	16	260
12.3	Food storage infrastructure to prevent food wastage	Present need	1	8	1	8
Total			102	1593	38	596

Table 3: Finance required and gaps in climate mitigation

Targets	Areas considered for finance*	Time-frame	Finance required (INR lakh crores)	Finance required (USD billions)	Gap (INR lakh crores)	Gap (USD billions)
7.1, 7.2, 7.3	High share of renewable energy in the production mix	2015-30	54	854	26	406
12.1, 12.2	Reducing emissions across sectors	2015-30	63	992	63	992
14, 15	Expanding protected area network	2015-27	31	489	30	481
Total			148	2335	119	1879

* Excludes cost of R&D. R&D costs are estimated separately for all SDGs together.

3.c. Adaptation

The additional costs of adaptation to climate change for India are derived from a World Bank study which focuses on the following sectors: agriculture, forestry, fisheries, infrastructure, water resources, health and ecosystem services.

- *Finance required:* India's finance requirement for climate adaptation is approximately INR 13 lakh crores (USD 206 billion) from 2015-30 in 2014-15 prices.
- *Gap:* The National Action Plan on Climate Change (NAPCC) and State Action Plans on Climate Change (SAPCC) indicate finance required. Currently available sources of finance for combating climate change in India are insignificant compared to the size of funds required. For example, India's National Adaptation Fund amounts to INR 350 crores. This is about 0.4 per cent of the annual finance required for climate adaptation in India. Therefore, the size of the finance gap for the current target is almost equal to the total finance required.

3.d. Capacity-building and Institutional Strengthening for Climate Change Response

To estimate finance required for capacity and institution-building, the study on SDG finance observes trends in SAPCCs. Budget allocations for capacity and institutional strengthening were estimated explicitly in a few SAPCCs (Andhra Pradesh – 0.004%, Jammu & Kashmir – 0.7%, Nagaland – 3.1%, Lakshadweep – 1.4%, Mizoram – 0.75%, Punjab – 0.1%, Madhya Pradesh – 1.5% of total SAPCC budget). The study suggests that 1.5 per cent (derived as the average of the lowest and highest proportions, 0.004% and 3.1% respectively) of the total cost of climate change resilience, adaptation and mitigation be used for capacity building exercises and building institutional mechanisms. Therefore, the finance required and gap are as follows.

- *Finance required:* The cost of capacity building and institutional strengthening is approximately INR 4 lakh crores or USD 61 billion (in 2014-15 prices) for 15 years from 2015-30.
- *Gap:* The gap in capacity building and institutional strengthening is assumed to be the entire finance required as there is currently no earmarked fund available for this purpose.

3.e. Research and Development

Research and development are essential to come up with alternative pathways for development that do not adversely impact climate. The study on SDG finance estimates the financial resources required for research and development across all sectors for the achievement of the SDGs. India currently spends about 0.84 per cent of its GDP on research and development. On the basis of observations of other developed nations – Germany, USA, China and France that spend 2.9, 2.7, 2.08 and 1.9 per cent of their GDP respectively on research and development – the study proposes that India should aspire to spend at least 2 per cent of its GDP on research and development across all sectors. Accordingly, the finance required for research and development from 2015 to 2030 in 2014-15 prices is INR 60 lakh crores (USD 950 billion), with an expected shortfall of INR 35 lakh crores (USD 555 billion). A part of these finances would be directed towards research and development on issues of climate adaptation, mitigation and resilience.

4. Financing Opportunities

According to the estimates of this study, the finance gap to address climate change is around 65 per cent of the total finance required. Global and national funds allocated for climate change can be seen as opportunities to fill this gap.

The Green Climate Fund and the Adaptation Fund are the two main global funds in this respect being governed by COP to UNFCCC, along with the Special Climate Change Fund of GEF and the thematic funds of World Bank Climate Program on Climate Resilience. The Green Climate Fund aims to mobilise USD 100 billion per year by 2020 of which is only approx. 10.2 billion USD has been pledged out of only 4 billion has been contracted that is a small fraction of the financial shortfall faced by developing countries. The Adaptation Fund, mandated to support adaptation efforts in developing countries, amounts to only USD 0.5 billion. Funding approved for India from the Adaptation Fund amounts to a little less than INR 5 million (www.climatefundupdate.org, 2015).

At the national level, Government of India is also making efforts to raise predictable and adequate finances to support long term planning and in this context has announced the National Adaptation Fund with INR 350

crores (USD 55 million) of budgetary support to tackle climate change in India (Ministry of Environment Forest and Climate Change, 2015). Also, the Government of India has also announced National Clean Energy Fund amounting to INR 17,000 crores (USD 2.7 billion) raised from Coal Cess (Reporter, 2015) and has recently mandated to broaden the focus on 'Environment' also. The Green India Mission has also received an approved budget of INR 46,000 crores (USD 7.3 billion) (NITI PIB P, 2015) from its domestic sources. The CAMPA fund of more than 40,000 Crore can be utilised to gain climate benefits in forestry sector.

While these are welcome moves, the quantum of funding from these funds need to be multiplied to meet India's financial shortfall. India may be looking at mobilising private sector funds by creating transparent and enabling environments, appropriate financial instruments, tools and institutional arrangements. Private investments are already being noticed in sectors like renewable energy, transport, waste management, etc. and need to be further encouraged by targeted low-carbon policy frameworks that address known barriers like high risk perception, high cost of financing etc. But on a comprehensive climate action strategy, there is a long way to go.

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Development Alternatives (DA) is a premier social enterprise with a global presence in the fields of green economic development, social equity and environmental management. It is credited with numerous technology and delivery system innovations that help create sustainable livelihoods in the developing world. DA focuses on empowering communities through strengthening people's institutions and facilitating their access to basic needs; enabling economic opportunities through skill development for green jobs and enterprise creation; and promoting low carbon pathways for development through natural resource management models and clean technology solutions.

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