Achieving the Sustainable Development Goals in India

A Study of Financial Requirements and Gaps

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ABBREVIATIONS

AAY	–	Antyodaya Anna Yojana
AEEI	–	Autonomous Energy Efficiency Improvement
AMRUT	–	Atal Mission for Rejuvenation and Urban Transformation
ASER	–	Annual Status of Education Report
AWC	–	*Anganwadi* Centre
BAU	–	Business As Usual
BIG	–	Baseline, Inclusive Growth
CAGR	–	Compound Annual Growth Rate
CSP	–	Concentrated Solar Power
CSR	–	Corporate Social Responsibility
CTE	–	College of Teacher Education
DIET	–	District Institute of Education Training
ECBC	–	Energy Conservation Building Code
ECD	–	Early Childhood Development
ESMAP	–	Energy Sector Management Assistance Program
EWS	–	Economically Weaker Section
FAO	–	The Food and Agriculture Organisation
GDP	–	Gross Domestic Product
GER	–	Gross Enrolment Ratio
GHG	–	Greenhouse Gases
GRBMP	–	Ganga River Basin Management Plan
HPEC	–	High Powered Expert Committee
ICAR	–	The Indian Council of Agricultural Research
ICDS	–	Integrated Child Development Services
ICT	–	Information Communication and Technology
IESS	–	India Energy Security Scenario
IIPS	–	International Institute of Population Sciences
IITC	–	Indian Institute of Technology Consortium
IMF	–	International Monetary Fund
IMR	–	Infant Mortality Rate
INDC	–	Intended Nationally Determined Contribution
JNNURM	–	Jawaharlal Nehru National Urban Renewal Mission

LCIG	–	Low Carbon, Inclusive Growth
LDC	–	Least Developed Country
LES	–	Linear Expenditure System
LIG	–	Low Income Group
MDGs	–	Millennium Development Goals
MGNREGS	–	Mahatma Gandhi National Rural Employment Guarantee Scheme
MIS	–	Management Information System
MoI	–	Means of Implementation
MSME	–	Micro Small and Medium Enterprise
MSP	–	Minimum Support Price
NAPCC	–	National Action Plan on Climate Change
NCMH	–	National Centre for Central Health
NFSA	–	National Food Security Act
NRDWP	–	National Rural Drinking Water Programme
NSDC	–	National Skill Development Corporation
NSS	–	National Sample Survey
NUEPA	–	National University of Educational Planning and Administration
OECD	–	Organisation for Economic Co-operation and Development
PAT	–	Perform Achieve Trade
PDS	–	Public Distribution System
PHC	–	Primary Health Centre
PHD	–	Progress Harmony Development
PPP	–	Public Private Partnership
PRI	–	Panchayati Raj Institutions
PTR	–	Pupil Teacher Ratio
PV	–	Photovoltaic
R&D	–	Research and Development
RAY	–	Rajiv Awaas Yojana
RBI	–	Reserve Bank of India
RRR	–	Repair, Renovation and Restoration
RTE	–	Right to Education Act
RUSA	–	Rashtriya Uchchatar Shiksha Abhiyan
SAPCC	–	State Action Plan on Climate Change
SCERT	–	State Council for Educational Research and Training

SCP	–	Sustainable Consumption and Production
SDGs	–	Sustainable Development Goals
SIDS	–	Small Island Developing States
SME	–	Small and Medium Enterprise
SSA	–	Sarva Shiksha Abhiyan
TFP	–	Total Factor Productivity
TSC	–	Total Sanitation Coverage
ULB	–	Urban Local Bodies
UN	–	The United Nations
UNCTAD	–	The United Nations Conference on Trade and Development
UNICEF	–	The United Nations International Children's Education Fund
WCD	–	Women and Child Development
WHO	–	World Health Organisation

DATA NOTES

1 crore = 100 lakh = 10 million

1 million = 10 lakh

1 billion = 1000 million = 100 crore

1 trillion = 1000 billion = 1 lakh crore

Exchange rate used

USD 1 = INR 63

Final estimates for each Goal have been rounded off to the nearest lakh crore in INR and the nearest billion in USD, therefore exchange rate conversions between USD and INR in the final estimates may not be exact.

Population figures have been projected using the CAGR of the population between 2001 and 2011, as found in Census of India 2001 and Census of India 2011. In case a sub-group of the population is considered (for example, population aged 5-19 considered under Target 4.1), the CAGR of that sub-group of the population is considered to make projections.

Wholesale Price Index has been used to adjust finances for inflation.

Finances estimated here include both recurring and non-recurring costs, unless otherwise specified.

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Section I

ABSTRACT

With world leaders set to meet in September 2015, a great deal of energy is being spent deliberating on what the new goals should be, which are currently in the form of draft Sustainable Development Goals (SDGs). The SDGs will be more ambitious than the Millennium Development Goals, covering a broad range of interconnected issues, from economic growth to social issues to global public goods.

The implementation of SDGs needs every country to judiciously prioritise, and adapt the goals and targets in accordance with local challenges, capacities and resources available. Since the Third International Conference on Financing for Development held July 2015 in Addis Ababa, world leaders have also started turning their attention to the critical matter of how to finance the post-2015 agenda.

Financial resources are a key driver to various other capital and human resources. Therefore, the availability and management of finance is one of the initial steps for achieving the post-2015 development agenda. This report is written with the aim of conducting a financial assessment for India to achieve the SDGs. The study assesses the public resources already available within various government programmes and policies. In particular, it looks at programmes and policies that are aligned with the SDGs to estimate the additional finance required and gaps for India to achieve the SDGs.

With the breadth of 17 Goals and 169 Targets drafted by the Open Working Group on SDGs, this study must be interpreted as only a foundational exercise providing minimalist estimates; the actual finances required may be much higher.

The Study

THE STUDY

This section defines the context, scope, methodology and limitations of the study. It summarises the estimates derived in the study and attempts to put these estimates in perspective.

What is the Post 2015 Development Agenda?

The global community, after dedicated and consistent efforts over the last year, has developed an agenda that promises to address the concerns of human development for all while ensuring the health of the planet and its ecosystems. The Post 2015 UN Development Agenda is a unique participatory exercise that has led to the design of a Sustainable Development framework consisting of 17 Goals that address the key concerns of humanity and 169 interlinked Targets within these Goals that reflect the complex and interrelated nature of social, economic and ecological well-being parameters.

In September 2015, the post 2015 UN Development Agenda, comprising of 17 Sustainable Development Goals (SDGs) will be adopted, replacing the Millennium Development Goals (MDGs). These ambitious and aspirational SDGs call for significant rethinking in development processes across the world. They also call for significant resources to be dedicated and invested in priority areas as identified in the framework of Goals and Targets for each member state.

Role of SDGS in India

India has, over the past years, directed its development pathway to meet its priorities of employment, economic growth, food, water and energy security, disaster resilience and poverty alleviation. India has also aimed to restore its natural capital and adopt transparent and robust governance along democratic lines. However, emerging challenges of climate change impacts, increasing inequities, and lagging human development indices are well recognised by both the citizens as well as the government. The post 2015 UN Sustainable Development Agenda framework provides an opportunity to renew and integrate efforts in order to meet, to a significant degree, national and global aspirations in a defined time frame.

Photo credit: The Dollar Business

Finance: The Elephant in the Room

The SDGs will be more ambitious than the MDGs, covering a broad range of interconnected issues, from economic growth to social issues to global public goods. To realise this vision, a just-as-ambitious plan for financing and implementation is needed. The magnitude of the SDG financing challenge far exceeds the capacity of any one organisation and demands a strong partnership among governments, the private sector, and development organisations.

The SDGs will have very significant resource implications worldwide. At the global level, total investment needs according to UNCTAD are in the order of USD 5 to USD 7 trillion per year. Total investment needs in developing countries alone could be about USD 3.9 trillion per year, mainly for basic infrastructure (roads, rail and ports, power stations, water and sanitation), food security (agriculture and rural development), climate change mitigation and adaptation, health, and education. Current investment in these sectors is around USD 1.4 trillion leaving a gap of around USD 2.5 trillion and implying an annual investment gap of between USD 1.9 and USD 3.1 trillion (UNCTAD, 2014).

India's Finance Gap

The first level of estimates indicate a financial shortfall of **INR 533 lakh crores (USD 8.5 trillion)** over the mandated 15 years for achieving SDGs[1]. Per year, on average, this works out to **INR 36 lakh crores or USD 565 billion**. (Note that this is only the gap in finance to achieve the SDGs, not the overall financial requirement.) This is a minimalist estimate and the actual amounts are likely to be much higher. The table at the end of this section summarises the estimates for each goal.

These estimates are a fraction of the global estimates of USD 5-7 trillion per year required for meeting the SDGs according to the UNCTAD 2014 Report. Estimates for *investment needs* in developing countries range from USD 3.3 trillion to USD 4.5 trillion per year. The SDGs will require a step-change in the levels of both public and private investment in all countries. At current levels of investment in SDG-relevant sectors, developing countries alone face *an annual gap* of USD 2.5 trillion. (UNCTAD, 2014).

A compilation by Adam Fishman of the WRI for the International Research Forum indicates that public domestic finance in developing countries more than doubled between 2002 and 2011, increasing from USD 838 billion to USD 1.86 trillion. However as analysed by Kharas et al, "there is a problem of a 'missing middle' where international public support falls faster than the rise of tax and government revenues, leading to a net decrease in total public finance available relative to national" (Kharas, Prizzon, & Rogerson, 2014). OECD countries collect 34% of their GDP as tax; developing nations collect half this rate (DCR 91) (Fishman, 2015).

It is also clear that public finance alone would be inadequate and even the private finance available may not be able to meet the gaps being estimated. There is a need to reassess financial requirements from a perspective of innovative policy strategies to address the core needs of poverty eradication, gender, equity, governance issues, sustained growth, investment in fundamental natural resources and climate response, in a synchronised and systemic manner.

[1] However, the financial requirement for some goals has not been done for 15 years. The numbers presented here are therefore minimalist.

Scope of the Study

This report is supported by the United Nations Development Programme and the Ministry of Environment, Forest and Climate Change, Government of India. It was commissioned to make an estimate of the financing needs for India to achieve the SDGs by 2030.

Quantifying financing needs for such a wide range of targets is complex, since estimates are dependent on a host of assumptions. Nevertheless, these initial studies are expected to shed light on the magnitude of the financing requirements involved, and provide orientation with regard to the negotiations at the international level.

The objectives of the present study in this context are:

1. To assess the synergies and convergences between SDGs and existing government schemes and programmes.
2. To assess and quantify financial resources required and highlight potential financial gaps in achieving SDGs.

Approach and Methodology

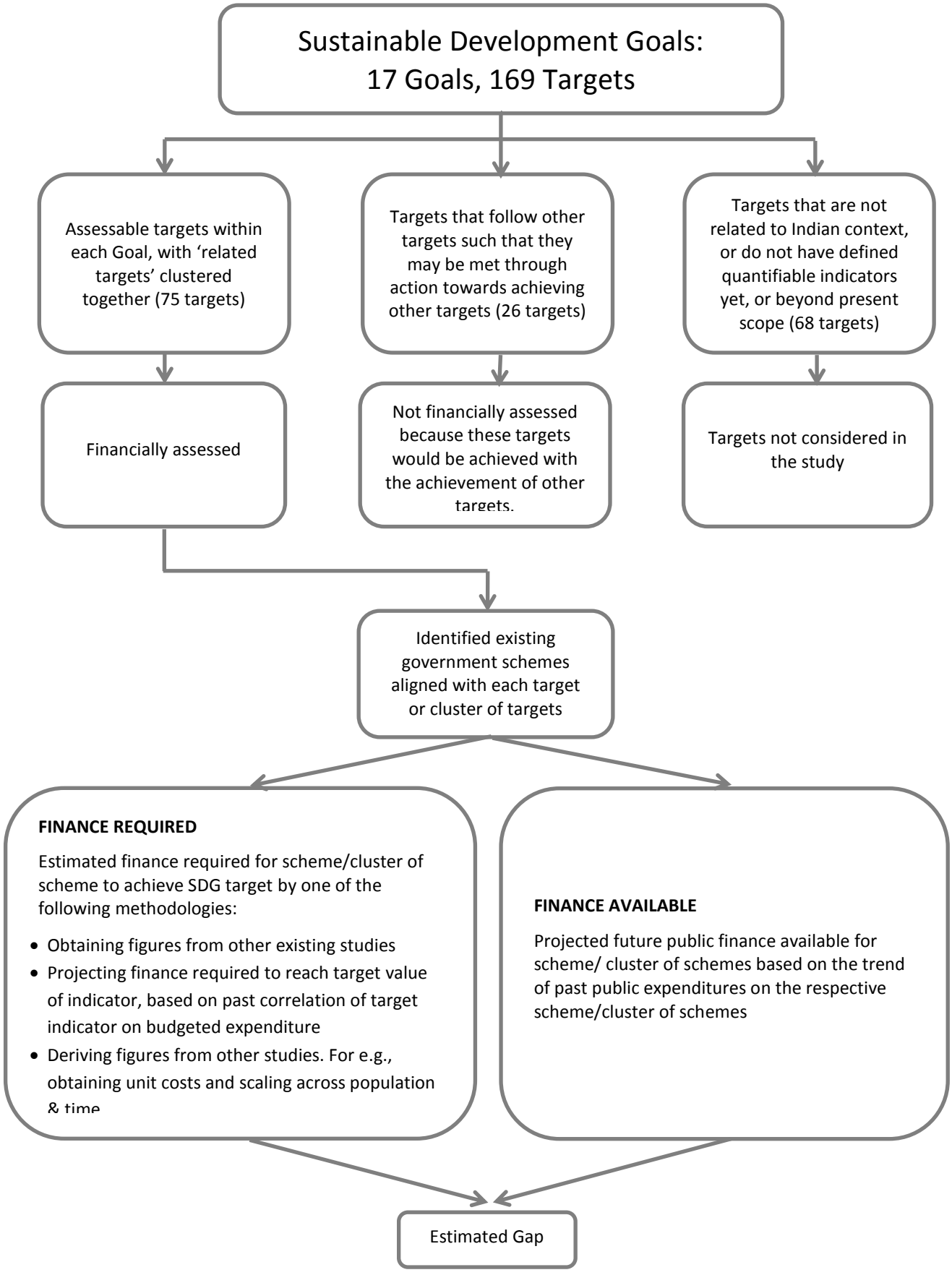
This study has to be seen as a starting point in a process that is far more complex and requires much more in-depth analysis. The study has taken the approach of looking at trends in public expenditure to estimate availability of public finance in the future, and building on existing sector-specific studies wherever possible to derive estimates of finance requirements. These estimates are then used to calculate the potential financial gap.

Although the study appreciates the interrelatedness of targets across Goals, it has at present dealt with this complexity by classifying the 169 targets into three categories:

1. Assessable targets within each Goal, with 'related targets' clustered together
2. Targets that follow other targets such that they may be met through action towards achieving other targets
3. Targets not considered in the study

The study financially assesses the first category of targets. The second category of targets is not financially assessed because these targets would be achieved with the achievement of other targets in the first category. The third category of targets is not considered in this study because these targets are either not related to Indian conditions, or may not have financial implications, or do not have defined quantifiable indicators yet, or are beyond the present scope.

Approach and Methodology of the Study



These are dynamic categories as we expect that most targets in category 3 (and in the end all) would move into categories 1 and 2 as greater understanding becomes available.

The costs of creating awareness, and research and development for enabling sustainable development, have been estimated separately as a percentage of the future GDP. Some costs are not fully calculated. For example, in the waste management sector, the cost of only domestic solid waste management in urban areas has been calculated due to lack of data on industrial and other forms of waste management.

The complexity of assessment is also enhanced by the fact that many indicators evident in the targets are not yet quantified or quantifiable and for many financial assessment methodologies are not available.

Sources of Finance Considered in the Study

For the following SDGs, predominantly public sources of finance were considered in the financial assessment.

- *Goal 2:* Food subsidies are the mandate of the government. The sector-specific study that was used to derive investment needs in sustainable agricultural techniques considers only public expenditures.
- *Goal 3:* The assessment has only used public expenditures because health and well-being for all is primarily the mandate of the government.
- *Goal 4:* The study assesses public expenditures required in universal completion of primary and secondary education, restructuring Integrated Child Development Services and strengthening teacher education. There are considerable private sector initiatives in rural areas catering to the bottom of the pyramid. However, they have not been considered in the study.
- *Goal 5:* The study calls for increasing public expenditure on women as captured in the Union Gender Budget.
- *Goal 6:* Since access to clean drinking water is a mandate of the government, only public source of finance is considered.
- *Goals 14 and 15:* The study assesses the cost of expanding India's protected area network. These costs have to be borne by the government.

Assessment of the total finance required (which may be sourced from public and private expenditures) was conducted for the following goals:

- *Goal 4:* The costs of increasing the gross enrollment ratio in higher education and skilling the workforce will be borne by both the government and the private sector.

- *Goal 6:* In expanding sanitation coverage, while majority of the cost is borne by the government, beneficiary households also bear part of the cost.
- *Goal 7:* Total finance requirements for scenarios of different energy mixes are assessed under this goal. The calculations are based on the costs of different energy sources, the finance for which can come from varied sources.
- *Goal 8:* Assessment of total finances is conducted in case of MSMEs. Also, cost of complete financial inclusion is calculated. These finances can be leveraged through various sources.
- *Goal 9:* Total infrastructure requirements of roads, railways and airways have been calculated. Expected public and private investments have been indicated under this goal.
- *Goal 11:* The total finance required for affordable housing and urban infrastructure and services will be borne by the government, the private sector as well as the beneficiaries.
- *Goal 13:* The costs of adaptation to climate change across different sectors may be borne by government as well as the private sector.

Limitations of the study

This study must be interpreted as a foundational exercise in the financial assessment of SDGs in India. The estimates provided are conservative and minimalist. They should be interpreted as the bare minimum figures, such that the true finances required cannot be below what is presented here.

This study has several limitations, as described below. It is hoped that further studies will build on the methodologies presented here to provide more precise estimates.

Firstly, the study does not account for all possible development pathways that India can choose. India may explore alternative strategies in different sectors, in accordance to the need, availability, resources, expertise, and political will of the Indian Government. This may impact the finances required and the gap faced by the sector. While this has not been the scope of this study, such an assessment, if conducted in the future, may help compare the relative costs and benefits of alternative scenarios and assist India in making a well-informed choice. It is hoped that further research will provide these crucial analyses.

Secondly, the links at the target level as well as the goal level have not been exhaustively researched or understood in this study. The SDGs are replete with linkages, such that financial flows towards one SDG target may easily influence other targets across Goals and vice versa. The estimates presented here look at targets or specific groups of targets in isolation without accounting for the full complexity of the linkages. It is only mentioned in passing what these linkages could be. A further

limitation is that for each target or group of targets, the range of government schemes/programmes considered that could potentially impact the target is rather small; there could be other schemes outside the nodal Ministry that could also be impacting said targets.

Thirdly, many targets that could potentially be financially assessed individually have been assessed as a group. For example, targets in Goal 3 (health) catering to reduced infant mortality rate and AIDS control have been grouped together and assessed together, and overall budgetary allocations for healthcare have been considered to estimate finance requirements and gaps. It may have been possible to consider each aspect of health separately and look for disaggregated budgetary allocations for each such aspect; however, such a disaggregation has not been done. Such an approach disregards the specificity of some targets. Sector experts may be able to conduct financial assessments more exhaustively and with greater specificity.

Fourthly, this study has not assessed some targets due to inability to find relevant data or appropriate methodologies. However, it is suspected that relevant data and methodologies do exist or can be developed by those with greater understanding of the sector. For example, Targets 8.5 (providing full and productive employment and decent work for all) 8.9 (sustainable tourism), 11.5 (managing disasters), 16.9 (providing legal identity to all), and 17.18 and 17.19 (developing capacities to collect and process data for monitoring and accountability) on the surface appear to have well-defined costs, and there are already government schemes that are aligned with these targets. But these targets could not be assessed in this study.

Understanding the Numbers

UNDERSTANDING THE NUMBERS

The table below compares the estimates of the UNCTAD study and the present study about financial requirements and gaps. The methodology used by UNCTAD for estimating global investment needs and gaps for achieving SDGs has certain similarities and differences with the methodology of this study, as highlighted in the box in the following page.

Study	Finance required	Gap
UNCTAD: annual investment needed globally to achieve SDGs	USD 5-7 trillion	
UNCTAD: annual investment needed in developing countries to achieve SDGs	USD 3.9 trillion	USD 2.5 trillion
Present study: annual spending needed in India to achieve SDGs	**USD 0.96 trillion**	**USD 0.56 trillion**

The financial gap estimates may be put in perspective by comparing with current public expenditures in India, as highlighted in the table below. The annual financial gap estimated in the study is more than twice the plan and non-plan budgeted expenditure of the Union Budget of India. The annual gap is almost equal to the combined budgeted expenditure of the centre and states, 2013-14.

Interestingly, the annual financial gap in achieving SDGs is one-fourth of the GDP of India, 2014-15.

Comparison	Value	Source/Remarks
Plan and non-plan budgeted expenditure, Union Budget of India 2015-16	USD 0.2 trillion	Union Budget of India 2015-16
Combined budgeted expenditure of centre and states, 2013-14	USD 0.5 trillion	Indian Public Finance Statistics 2013-14, Ministry of Finance
GDP of India, 2014-15	USD 2.3 trillion	Nominal, April 2015, IMF

Similarities and differences between UNCTAD methodology and present study methodology

Similarities

- The UNCTAD report derives investments required in different sectors from estimates made by available studies on the subject/sector. The present study has also taken a similar approach in estimating finance requirements.
- The present study, like the UNCTAD report, draws on estimates for future investment requirements and gaps not made specifically with SDGs in mind. Nevertheless, the aims underlying these estimates are normally for sustainable development purposes consistent with the SDGs.
- In both the studies, figures are quoted on a constant price basis to allow comparisons between current investment, future investment needs and gaps.
- Both studies assume that projections many years into the future can never fully anticipate the dynamic nature of climate change, population growth and interest rates – all of which will have unknown impacts on investment and development needs.

Differences

- The UNCTAD assessment only calculates investments required and identifies respective gaps. Investment refers to capital expenditure. Operating expenditure, though sometimes referred to as 'investment' is not included. The present study, on the other hand, derives total finances required which are inclusive of not just investments but finances required for operations, other recurring costs, subsidies and incentives.
- The UNCTAD Report, due to non-availability of studies on social sectors like health and education at the global level, estimated investment needs in these sectors using the annualised investment required to shift low-income developing countries to the next level of middle income developing countries, the investment required to shift this latter group to the next level, and so on. The present study, due to availability of studies on social sectors at the national level, has used their assessment for deriving finance requirements in the respective sectors.
- The assessment of gap in the UNCTAD report has been derived by review and analysis of various studies to establish consensus estimates on future investment requirements. The present study however looks at public expenditure trends in different sectors in the country as primary basis of finances that are available for human development and economic growth. Gap is derived by comparing finance required to finance availability.

Putting the Goal-wise Estimates in Perspective

Goal 1: End poverty in all its forms everywhere

The study has assumed that multi-dimensional extreme poverty requires action on all fronts of water, energy, food security, livelihoods creation, securing the health of natural resources on which the livelihoods of people depend, reducing vulnerabilities, ensuring equity and a just governance framework. These are components of the targets in the other SDGs. Therefore financial assessments for "ending poverty" arrive from the 16 subsequent Goals.

Photo credit: Yolanda Coervers. Pixabay.

Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Food security is influenced by a number of factors, including those that determine food availability—domestic food production and the capacity to import food—as well as determinants of food access, including the distribution of food among various segments of the population. The financial requirement for India to meet its costs for food security is around INR 46 lakh crores (USD 729 billion) from 2015-24. This cost includes the financial requirements for providing access to safe and nutritious food for all. It also includes investments in irrigation, soil and water conservation, wasteland regeneration and rain-fed farming. Of the finances required for ensuring food security, the financial gap that India is estimated to face is of the order of INR 18.5 lakh crores (USD 293 billion) for access and distribution costs of food and for financing sustainable agricultural production systems.

This gap is likely to rise in the case of agricultural production, which shall require huge investments for an overall transition of the country to sustainable agricultural practices. Further, costs of implementing and scaling up agricultural intensification techniques, urban agriculture, agroforestry, horticulture, etc. have also not been included. Continuous shrinking of land for agriculture due to land demand for industries, infrastructure and cities may increase the costs of food security. Climate change may influence the availability of various resources for agriculture, further increasing the costs. Transition to sustainable agriculture systems is also likely to increase the food subsidy bill of the government due to a probable dip in the food production during the transition period. The financial gap numbers for food security (Goal 2) can be seen in the need for increase in budgetary outlays. Additional budgetary support required just for the implementation of the National Mission on Sustainable Agriculture up to the end of XII Five Year Plan (2017) was estimated by the Department of Agriculture and Cooperation, Ministry of Agriculture in 2010 to equal INR 1,08,000 crores (USD 17 billion) (DAC; MoA; GoI, 2010).

Photo credit: Wikipedia

Goal 3: Ensure healthy lives and promote well-being for all at all ages

For India to achieve this goal, it will have to reach the value of around 0.9 for its Health Index, which includes health status of population, quality of healthcare institutions and financial instruments for access to healthcare (insurance, etc.). India will require around INR 55 lakh crores (USD 880 billion) till 2030 to achieve this value of the Index. A gap of around INR 19 lakh crores (USD 305 billion) is projected with respect to availability of finances for public health in India.

Public expenditure on health in India has hovered around 1 per cent of the country's GDP, and accounts for less than one third (33 per cent) of total health expenditure. Only a few countries have such low ratios of public to total expenditure on health. The world's average is 63 per cent and even the average of Sub-Saharan Africa is 45 per cent (Drèze & Sen, 2013). Available literature on the subject argues that countries with high level of public spending in health have secured better health outcomes compared to the countries with low level of spending on health (Drèze & Sen, 2013).

The costs may get affected due to additional health burdens that the country may face due to epidemics, climate change impacts and other such factors that cannot be yet predicted. Setting up more medical institutions and increasing the salaries of public doctors in accordance to global or private standards has possibilities of further additional financial requirements.

With respect to the Goal on Health (Goal 3), the estimates indicate a need to enhance public expenditures considerably to meet the total gap of INR 19 lakh crores (USD 305 billion). It will be relevant to note that the preliminary estimates for the incremental annual investment needs in developing countries till 2030, related to achieving the outcomes for health goal alone range from USD 51-80 billion (as in 2010) (Sachs, J. D. & Schmidt-Traub, G. , 2014).

Photo credit: Lokayat

Goal 4: Ensure inclusive and equitable quality education and promote life-long learning opportunities for all

In order to achieve all the targets of Goal 4; the total financial requirement for India is of the order of INR 142 lakhs crores (USD 2258 billion). While there is no financial gap identified in case of primary and secondary schooling due to provisions and finance allocations under Right to Education Act, there are significant gaps in case of early childhood development and tertiary and higher education. There is a gap of INR 27 lakh crores (USD 429 billion) out of the total of INR 35 lakh crores (USD 555 billion) required for ensuring access to quality early childhood development, care and pre-primary education. Further, India will require an additional INR 19 lakh crores (USD 301 billion) for ensuring quality technical, vocational and tertiary education. To enhance the standards of Indian higher education to match world standards, additional finance may be required over and above what is estimated here.

India is estimated to require a sum of INR 9 lakh crores (USD 145 billion) to skill India's workforce. Estimates indicate that only about 2 per cent of the existing workforce has undergone formal skill training and about 15 per cent of the existing workforce has marketable skills, whereas 90 per cent of jobs in India are skill based and require vocational training (Simon M. , 2014). The Government of India has announced a target of skilling 500 million individuals by 2022. The gap in finance under this component is not assessed due to the scattered nature of government and private sector investments in skill building. However, India's current skilling capacity is only 7 million people per annum, which necessitates substantial involvement of the private sector in skilling workforce as well as a substantial expansion of the government's skilling capacities.

Goal 5: Achieve gender equality and empower all women and girls

The Gender Gap Index of India is comparable to countries like Bangladesh, Cambodia, Ghana, Uganda and Tanzania. This index includes indicator for economic participation and opportunity, educational attainment, health and survival and political empowerment of women. Comparing to the per capita spending requirement of these countries to ensure gender equality, India requires a sum of INR 89 lakh crores (USD 1408 billion) to ensure gender equality by 2030. The current trend in gender budgets of the country shows a gap of INR 69 lakh crores (USD 1091 billion) under this component. These finances are largely required for access to basic social, political and economic rights for women and are therefore covered in goals that deal with universal access to such basic needs. However, such small numbers in the available finances highlight the limited reach and delivery of benefits of social schemes and entitlements to women. Even though these costs are covered in various other goals, this figure is a caution figure for India to increase the gender budget in its various schemes.

The cross cutting Goal 5 on gender equality with an estimated gap of INR 69 lakh crore (USD 1091 billion) over the fifteen year period needs to be looked at with a view to improve our Gender Equality Index that continues to be extremely low. The index tracks the strong correlation between a country's gender gap and its national competitiveness. Because women account for one-half of a country's potential talent base, a nation's competitiveness in the long-term depends significantly on whether and how it educates and utilises its women. The Nordic and Scandinavian countries continue to dominate the Gender Gap Index (World Economic Forum) with Iceland at the top and Sweden at 4th and Denmark at 5th place. India stands at a 114 amongst 142 countries, with Bangladesh at 68 and Sri Lanka at 78, clearly indicating that there is a long way to go for India (World Economic Forum, 2014).

Goal 6: Ensure availability and sustainable management of water and sanitation for all

For access to and availability of water and sanitation for all, India is estimated to require a sum of INR 13 lakh crores (USD 199 billion) till 2030. While no additional finances are required for access to drinking water for all, an additional sum of INR 8 lakh crores (USD 123 billion) is needed for universal sanitation coverage in the country and cleaning of the Ganga River. Increasing water quality of other natural and artificial resources will require more such planning and finance.

Ensuring water security (Goal 6) for domestic, agriculture and industry applications and sustainable management of our rivers and water bodies in order to retain the ecological flows is another huge task. The Namami Ganga Plan has an outlay for INR 20,000 crore (USD 3 billion) only for the next five year period; the operational management for the next 10 years are also to be funded by the government and the amounts for that are not yet known. On the other hand, the Ganga River Basin Management Plan (2015) (NDTV India, 2015) estimates that nearly INR 6-7 lakh crores is required to address the pollution problem in the Ganga. All of this is expected to be funded by the government.

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all

For ensuring access to energy in the Business As Usual (BAU) scenario, that is, a fossil fuel dominant energy mix, India would require finances of the order of INR 28 lakh crores for enhancing production capacity alone, and not including other related costs. India may opt for two other scenarios. If India moderately increases the share of renewable energy and reduces the fossil fuel component from the current 60 per cent to 50 per cent, the financial requirement increases to INR 34 lakh crores. India may also opt for an energy mix with net-zero emissions by 2050, for which by 2030 it must reduce the fossil fuel energy component further from 50 per cent to 27 per cent, which entails a financial requirement of INR 42.5 lakh crores (USD 675 billion).

In order to address the energy security (Goal 7) needs of the country, along with mitigating carbon emissions India has upped its targets for renewable energy considerably. The total renewable energy installed capacity in India at the end of financial year 2014-15 stood at 35.77 GW. The Indian government plans to increase this capacity to 175 GW by end of 2022. Under existing policies, in today's values, the cost of supporting 20 GW of utility scale solar energy by 2022 is INR 46.97 billion (INR 2.71/W) (Gireesh, Srinivasan, Goel, Trivedi, & Nelson, 2015). The current study estimates a total finance requirement of INR 54 lakh crores (USD 854 billion) from 2015-30 to increase generation capacity with a high share of renewable energy, install transmission and distribution infrastructure and provide access to clean cooking fuel. A shortfall of INR 26 lakh crores (USD 406 billion) is estimated.

Photo credit: Wikipedia

Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

For a sustained, inclusive and sustainable economic growth, India will require to enhance its MSME sector and other labour intensive sectors. It would require growth strategies that generate employment opportunities for its youth. In addition to this, for India to ensure sustainable economic growth it needs to look at costs of resource efficiency and promoting sustainable production systems. The study estimates finances required to support MSMEs and financial inclusion of the population.

IMF expects India to be the third largest economy in the world after US and China, with a growth rate of over 8 per cent, by 2050. India's MSMEs are likely to play a greater role than before in its holistic development (Varhad Group, 2013). MSMEs are contributing 12-13 per cent to GDP of India. The projected desirable contribution to India's GDP from MSMEs is ranging from 20-25 per cent. The finances required by MSMEs for such contribution is about INR 148 lakh crores (USD 2360 billion). Of this INR 148 lakh crores (USD 2360 billion), India is yet to find financial source for INR 105 lakh crores (USD 1672 billion).

According to a compilation by Adam Fishman of the World Resource Institute (Fishman, 2015), the current unmet need for credit for MSMEs has been estimated to be up to USD 2.5 trillion in developing countries and USD 3.5 trillion globally; over 200 million MSMEs lack access to financial services.

Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Infrastructure development has always been on the top of the agenda for India, considering the current global economic dynamics as well as domestic growth imperatives. Infrastructure spending is likely to have a positive spiral effect to the GDP growth and is likely to be one of the main levers to unleash India's economic growth potential.

Based on projections provided in the Mid-Term Appraisal of the Eleventh Five Year Plan, in order to attain a 9 per cent real GDP growth rate, infrastructure investment should be on average almost 10 per cent of GDP during the XII Five Year Plan (2012-2017). The present study estimates a financial requirement of INR 119 lakh crores (USD 1900 billion). Assuming 50 per cent of the investment will be met by budgetary resources, INR 59.5 lakh crores (USD 950 billion) would need to be met through debt and equity.

The Delhi-Mumbai Industrial Freight Corridor initiative of the Government of India, initiated in 2006, is an ambitious plan that requires an investment of about USD 90 – 100 billion projected over a thirty-year period. India and Japan have agreed on a USD 9 billion fund with equal contribution from both sides as initial investment; the rest is expected to be raised through private investments. Public private partnerships have been initiated through bids for about INR 5000 crores (USD 0.8 billion). In addition, four more proposed corridors — Amritsar-Kolkata, Visakhapatnam-Chennai, Chennai-Bengaluru and Bengaluru-Mumbai — are to be initiated with secured initial investments (Arun, 2015). At the global scale, the UNCTAD has estimated that the total investment in economic infrastructure in developing countries – power, transport (roads, rails and ports), telecommunications and water and sanitation – is currently USD 1 trillion per year for all sectors, but will need to rise to between USD 1.6 and USD 2.5 trillion annually over the period 2015-2030 (UNCTAD, 2014).

Goal 10: Reduce inequality within and among countries

The targets under this goal are not separately assessed financially because of the close link of the targets with other goals.

Inequality is multi-faceted in nature. There is inequality in income; but there is also inequality in educational attainment, health status, employment, access to food, access to water, access to social security and in general access to opportunities and choices. These different aspects of inequality are interlinked; improved access to water and sanitation may help reduce inequality in health outcomes, improved educational attainment may help people find better jobs and reduce the inequality in employment and incomes, and so on. Therefore the achievement of Goal 10 will be closely linked to the achievement of all other goals.

Photo credit: Wikipedia

Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable

For making cities inclusive, safe, resilient and sustainable, India will require a sum of INR 131 lakh crores (USD 2067 billion). This includes housing for all, development and planning of cities, efficient transport systems, public spaces and other components of urban infrastructure costs. Of the INR 131 lakh crores required for such urban development, India at present faces a financial gap of INR 76 lakh crore (USD 1202 billion). The costs for disaster management are not included in this estimate at present.

The government of India has already rolled out ambitious plans for sustainable urban development (Goal 11). The AMRUT (initial 500 cities) and 100 smart cities programmes have a Central allocation of INR 98,000 crore (USD 15.6 billion) for a period of five years, while the Housing for all (urban) by 2022 has a Central allocation of INR 5625 crore (USD 893 million). This accounts for a small fragment of finances required for sustainable urbanisation as it does not cover the finance that will come from the States for the same and additional cities in the AMRUT programme. In addition the 'Rurbanisation Initiative' has an estimated cost of INR 43033 crore (USD 6.8 billion) which includes budgetary support of INR 33453 crore from Government of India for the entire implementation period.

Goal 12: Ensure sustainable consumption and production patterns

The methodology for the calculation of this goal has considered the financial gaps for 'low carbon strategies' as detailed out in April 2014 by the Planning Commission, with projections up to 2030 (Planning Commission, GoI, 2014). The cumulative costs of low carbon strategies have been estimated to be around INR 62.5 lakh crores (USD 992 billion), between 2011 and 2030. If these costs were borne entirely by domestic resources, the cumulative loss in output (GDP) between 2011 and 2030 would be USD 1,344 billion, at 2011 prices. The estimates do not yet take into consideration costs for waste management in a comprehensive manner or for financial requirements for new technology development and research and development for cleaner resource efficient production systems.

Goal 13: Take urgent action to combat climate change and its impacts

This study considers the overall finance required for adapting to climate change, mitigation and climate planning in the major sectors of the economy. The total finance required for climate adaptation alone from 2015 to 2030 is INR 17 lakh crores or USD 267 billion. The costs of mitigation and resilience have been calculated under other targets and goals.

In comparison, the Planning Commission of India has estimated the total costs of implementing the National Action Plan for Climate Change (NAPCC) and State Action Plan for Climate Change (SAPCC) at INR 17 lakh crores (USD 270 billion) from 2015-17. The estimated costs are for all programmes and activities envisaged in each of the eight identified missions.

Goals 14 and 15: Conserve and sustainably use the oceans, seas and marine resources for sustainable development; Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

Target 11 of the Aichi Targets for Biodiversity Conservation states, "By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes" (CBD, 2010). For India to achieve this target as well as corresponding SDG goals, there are 2 kinds of costs: direct administrative costs and opportunity costs of protection. The total finance required is estimated at INR 31 lakh crores (USD 489 billion), while the finance gap is around INR 30 lakh crores (USD 481 billion).

Summary of Results

The following table summarises the goal-wise estimates.

Summary of finance required and gaps in achieving SDGs*								
Sustainable Development Goal		**Thrust area assessed**	**Cross-goal linkages**	**Source of finance considered****	**Finance required**		**Gap**	
					In lakh crore INR	In billion USD	In lakh crore INR	In billion USD
1	End poverty in all its forms everywhere		All other goals	Not assessed				
2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture	Sustainable agricultural production, food distribution	1 (Poverty); 5 (Gender); 10 (Inequality); 13 (Climate); 15 (Ecosystem)	Public	46	729	18.5	293
3	Ensure healthy lives and promote well-being for all at all ages	Universal health coverage, reduction of IMR, enhancement of life expectancy	5 (Gender); 6 (Water and Sanitation); 10 (Inequality); 11 (Cities); 12 (SCP)	Public	55	880	19	305
4	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Primary and secondary education, early childhood development, higher education, skill development, teacher education	9 (Infrastructure and Industrialisation); 10 (Inequality); 12 (SCP); 16 (Institutions)	Public and private	142	2258	46	740

Summary of finance required and gaps in achieving SDGs*								
Sustainable Development Goal		**Thrust area assessed**	**Cross-goal linkages**	**Source of finance considered****	**Finance required**		**Gap**	
					In lakh crore INR	In billion USD	In lakh crore INR	In billion USD
5	Achieve gender equality and empower all women and girls^	Cost of achieving gender equality	3 (Health); 8 (Eco growth); 9 (Infrastructure and Industrialisation); 10 (Inequality); 16 (Institutions)	Public	89	1408	69	1091
6	Ensure availability and sustainable management of water and sanitation for all	Drinking water, sanitation, water quality, IWRM	3 (Health); 5 (Gender); 9 (Infrastructure and Industrialisation); 10 (Inequality); 12 (SCP); 15 (Ecosystem and biodiversity)	Public and private	13	199	8	123
7	Ensure access to affordable, reliable, sustainable and modern	Meeting energy demand, renewable energy, energy efficiency	9 (Infrastructure and Industrialisation); 10 (Inequality); 12 (SCP)	Public and private	54	854	26	406

Summary of finance required and gaps in achieving SDGs*								
Sustainable Development Goal		**Thrust area assessed**	**Cross-goal linkages**	**Source of finance considered****	**Finance required**		**Gap**	
					In lakh crore INR	In billion USD	In lakh crore INR	In billion USD
	energy for all							
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	Employment, MSMEs	4 (Education); 10 (Inequality); 12 (SCP); 14 (Oceans and marine resources); 16 (Institutions)	Public and private	148	2360	105	1672
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation (till 2017)	Infrastructure, ICT, retrofitting industries	6 (Water); 7 (Energy); 8 (Eco growth); 10 (Inequality); 12 (SCP); 13 (Climate)	Public and private	119	1900	59.5	950
10	Reduce inequality within and among countries		1 (Poverty); 8 (Eco Growth); 9	Not assessed				

Summary of finance required and gaps in achieving SDGs*								
Sustainable Development Goal		**Thrust area assessed**	**Cross-goal linkages**	**Source of finance considered****	**Finance required**		**Gap**	
					In lakh crore INR	In billion USD	In lakh crore INR	In billion USD
			(Infrastructure and industrialisation); 16 (Institutions)					
11	Make cities and human settlements inclusive, safe, resilient and sustainable	Urban housing, infrastructure and services	1 (Poverty); 9 (Infra-structure); 10 (Inequality); 12 (SCP); 13 (Climate); 14 (Marine resources); 15 (Ecosystem)	Public and private	131	2067	76	1202
12	Ensure sustainable consumption and production patterns	Low Carbon Strategies	2 (Food); 3 (Health); 4 (Education); 5 (Gender); 6 (Water and sanitation); 8 (Eco growth); 9 (Infrastructure and industrialisation); 13	Public and private	63	1000	63	1000

Summary of finance required and gaps in achieving SDGs*								
Sustainable Development Goal		**Thrust area assessed**	**Cross-goal linkages**	**Source of finance considered****	**Finance required**		**Gap**	
					In lakh crore INR	In billion USD	In lakh crore INR	In billion USD
			(Climate); 14 (Ocean and marine resources); 15 (Ecosystem); 16 (Institutions)					
13	Take urgent action to combat climate change and its impacts[#]	Cross-cutting goal	2 (food security); 3(health); 4 (Education); 6 (Water and sanitation); 9 (Infrastructure & DRR); 11 (resilient cities), 12 (SCP); 14, 15 (Eco-systems); 16 (Institutions)	Public and private	17	267	17	267
14	Conserve and sustainably use the oceans, seas and marine resources for	Protecting areas, opportunity costs of protection	9 (Infrastructure and industrialisation); 12 (SCP); 13 (Climate); 15 (Ecosystem and	Public	31	489	30	481

Summary of finance required and gaps in achieving SDGs*								
Sustainable Development Goal		**Thrust area assessed**	**Cross-goal linkages**	**Source of finance considered****	**Finance required**		**Gap**	
					In lakh crore INR	In billion USD	In lakh crore INR	In billion USD
	sustainable development		biodiversity); 16 (Institutions)					
15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss		2 (Food); 6 (Water); 9 (cities), 12 (SCP); 14 (Oceans and marine resources 16 (Institutions)	Public				

Summary of finance required and gaps in achieving SDGs*								
Sustainable Development Goal		**Thrust area assessed**	**Cross-goal linkages**	**Source of finance considered****	**Finance required**		**Gap**	
					In lakh crore INR	In billion USD	In lakh crore INR	In billion USD
16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels		3 (Health); 4 (Education); 5 (Gender); 8 (Eco growth); 10 (Inequality); 11 (Cities)	Not assessed				
17	Strengthen the means of implementation and revitalize the global partnership for sustainable development		All other goals	Not assessed				
	Research and Development	Research and development across sectors such as infrastructure, agriculture,		Public	60	950	35	555

Summary of finance required and gaps in achieving SDGs*								
Sustainable Development Goal		**Thrust area assessed**	**Cross-goal linkages**	**Source of finance considered****	**Finance required**		**Gap**	
					In lakh crore INR	In billion USD	In lakh crore INR	In billion USD
		healthcare etc.						
	Awareness creation on sustainable development	Creating awareness on SCP, sustainable lifestyles, etc.		Public and private	30	474	30	474
				Totals	**909**	**14427**	**533**	**8468**

* *All finances in 2014-15 prices, exchange rate of USD 1 = INR 63. Due to rounding off, INR figures mentioned here may not exactly convert to corresponding USD figures. Some finances are not calculated for all the way until 2030.*

** *This indicates the sources of finance currently available for each goal that are considered in the estimation. The finance required may come from additional sources too. The study does not comment on where additional finances will come from. Private contributions include contributions from the community. Sources of finance also vary by target in each goal.*

^ *Finance required and gap of Goal 5 are not added to the cumulative total as the goal is cross cutting other goals*.

\# *Includes only adaptation and planning cost. Cost of mitigation and strengthening resilience in various sectors are calculated under corresponding goals and summarised in the Goal 13 section of the report, but are omitted here to avoid double counting.*

Section II

Goal 1

End poverty in all its forms everywhere

GOAL 1: END POVERTY IN ALL ITS FORMS EVERYWHERE

1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day

1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions

1.3 Implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable

1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance

1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters

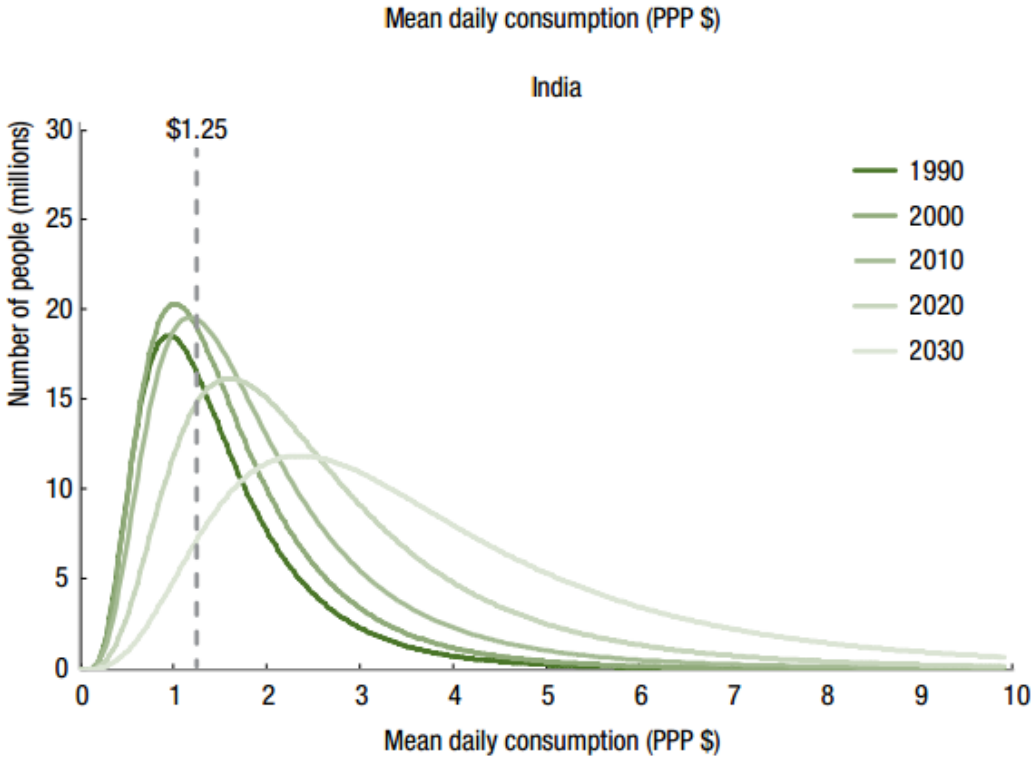
1.a Ensure significant mobilization of resources from a variety of sources, including through enhanced development cooperation, in order to provide adequate and predictable means for developing countries, in particular least developed countries, to implement programmes and policies to end poverty in all its dimensions

1.b Create sound policy frameworks at the national, regional and international levels, based on pro-poor and gender-sensitive development strategies, to support accelerated investment in poverty eradication actions

GOAL 1 ASSESSMENT SUMMARY

Ending poverty in all its forms everywhere implies attention to both completely eliminating extreme poverty while attending to other key socio-economic, cultural, political and environmental dimensions of poverty, and monitoring progress in social protection and inequality. The intricate nature of poverty with various social, economic and environmental components makes an independent assessment of this goal difficult. Many issues relating to poverty are covered under various goals like food security (Goal 2), access to healthcare (Goal 3), education (Goal 4), water (Goal 6), and energy (Goal 7) for all. Additionally, Goals 9 and 11 aim for infrastructure development that can enable capital formation and generate job opportunities. Goal 8 aims for inclusive economic growth models that can enable income opportunities which will contribute towards poverty reduction. Scientific literature (ICSU, ISSC, 2015) on the relations among climate, sustainability and poverty suggests that the targets of Goal 1 need to be at the centre of all other targets, in order to avoid an inequitable transformation to a low carbon future. Apart from the basic needs fulfilment schemes, attention to national and international processes of wealth creation, redistribution and regulatory regimes will be instrumental in poverty eradication. Persistent poverty is often due to global as well as national and local power relations that enable dispossession, unequal treatment and disrespect to people's rights and human dignity. Enabling institutions to address such issues of poverty may require additional investments.

A Brookings Institution study (Chandy, Ledlie, & Penciakova, 2013) looks at the distribution of people by consumption (how many people consume USD 1 a day, USD 2 a day and so on) in developing countries. It shows how the distribution has changed over time, and how it might change in future. Plotted on a chart, the distribution looks like a fireman's helmet, with a peak in front and a long tail behind. The chart for India is given below. As countries get richer, the helmet moves to the right, reflecting the growth in household consumption. The faster the rate, the farther to the right the line moves every year, so the strong 4.3% annual growth in consumption since 2000 has pushed the line a good distance rightward. If developing countries were to maintain their post-2000 performance, it says, then the number of extremely poor people in the world would fall from 1.2 billion in 2010 to just 200 million in 2027 (The Economist, 2013).



India mirrors the developing world as a whole: growth will push a wave of Indians through the USD 1.25 barrier over the next decade (see chart). The subcontinent could generate the largest gains in poverty reduction in the next decade (The Economist, 2013).

It is therefore clear that poverty eradication will mean pursuing three separate but interdependent objectives: tackling chronic poverty, stopping impoverishment, and sustaining poverty escapes. While social assistance and basic needs fulfilment schemes will help in furnishing the first two of the objectives, inclusive economic growth models will allow opportunities for sustaining poverty escapes and thus become an essential component of poverty eradication.

The financial requirement for provision of basic income and social protection to eliminate extreme poverty has been calculated in various other goals. Further, there are some additional targeted poverty eradication costs in providing opportunities, awareness and information to support everyone to come out of poverty. This has not separately calculated in the study.

Goal 2

End hunger, achieve food security and improved nutrition and promote sustainable agriculture

GOAL 2: END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVED NUTRITION AND PROMOTE SUSTAINABLE AGRICULTURE

2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round

2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons

2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment

2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality

2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and ensure access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed

2.a Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries

2.b Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round

2.c *Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility*

FINANCIAL ASSESSMENT OF GOAL 2

Financial Assessment of Goal 2				
Targets	**Classification**	**Linkages**	**Finance Required**	**Gap**
2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round	Assessed together	Goal 3, 9, 11,12	INR 20 lakh crore USD 320 billion (2015-24)	INR 4 lakh crore USD 63 billion (2015-24)
2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons				
2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	Not assessed	Target 2.4, 2.5, 2.a		

Financial Assessment of Goal 2				
Targets	**Classifica-tion**	**Linkages**	**Finance Required**	**Gap**
2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	Assessed together	Goal 6, 13, 15,	INR 26 lakh crore USD 409 billion (2015-24)	INR 14.5 lakh crore USD 230 billion (2015-24)
2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and ensure access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed				
2.a Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries	Considered under finance for research and develop-ment	Goals 9, 11		

Financial Assessment of Goal 2				
Targets	**Classification**	**Linkages**	**Finance Required**	**Gap**
2.b Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round	Not assessed			
2.c Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility	Not assessed			
		Total	**INR 46 lakh crores** **USD 729 billion**	**INR 18.5 lakh crores** **USD 293 billion**

GOAL 2 ASSESSMENT SUMMARY

Food security is influenced by a number of factors, including those that determine food availability—domestic food production and the capacity to import food—as well as determinants of food access, including the distribution of food among various segments of the population. The financial requirement for India to meet its costs for food security is around INR 46 lakh crores (USD 729 billion) from 2015-24. This cost includes the financial requirements for providing access to safe and nutritious food for all. It also includes investments in irrigation, soil and water conservation, wasteland regeneration and rain-fed farming.

Of the finances required for ensuring food security from 2015-24, the financial gap that India is estimated to face is of the order of INR 18.5 lakh crores (USD 293 billion) for access and distribution costs of food and for financing sustainable agricultural production systems.

These costs only partially include the investments required for the country to transition to sustainable agricultural practices. Huge additional investments may be needed for an overall transition. Improving agricultural productivity will entail substantial research and development costs, which have been included in the cumulative research and development costs. Further, costs of implementing and scaling up agricultural intensification techniques, urban agriculture, agroforestry, horticulture, etc. have also not been included. Continuous shrinking of land for agriculture due to land demand for industries, infrastructure and cities may further increase the costs of food security. Climate change may influence the availability of various resources for agriculture, further increasing the costs. Transition to sustainable agriculture systems is also likely to increase the food subsidy bill of the government due to a probable dip in the food production during the transition period.

TARGETS 2.1, 2.2

2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round

2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons

Summary of Targets 2.1, 2.2				
Government bodies working on the target	**Programmes/ Schemes of government**	**Indicator/ Thrust Area**	**Finance Required***	**Gap***
Department of Food and Public Distribution and Food Corporation of India, Ministry of Consumer Affairs, Food and Public Distribution	Antyodaya-Anna-Yojana, National Food Security Act (NFSA)	Access to food and nutrition	INR 20 lakh crore USD 320 billion (2015-24)	INR 4 lakh crore USD 63 billion (2015-24)

**In 2014-15 prices*

Background

Despite rapid economic growth and gains in reducing its poverty rate, India is saddled with one of the highest levels of hunger and malnutrition in the world. More than half of Indian women aged between 15 and 49 years are anaemic, and more than one-third have a low body mass index. Among children younger than age five, 48 per cent have low height-for-age, and 42.5 per cent have low weight-for-age. In addition, 43.1 per cent of children aged 6–59 months have moderate to severe anaemia. Further, India has reduced hunger only marginally over the past two decades (OECD/FAO, 2014).

Food security is a challenge in India because of the large number of low-income consumers. The per capita distribution gap is projected to rise from 2.4 to 2.7 kg per capita, indicating that food consumption by those people who are food insecure is projected to slip further below the consumption targets.

India has provided wheat and rice at favourable prices through its Public Distribution System (PDS) for food grains. This involves the distribution of products that have been procured by the Department of Food and Public Distribution at Minimum Support Price (MSP). Prior to 2013, subsidised grains were provided to qualifying groups in rural and urban areas depending on their income status (over or under the poverty line). About 10 million persons belonging to the severe poverty group were also beneficiaries of the subsidy through the Antyodaya-Anna-Yojana (AAY). In all, this food distribution system catered to about 30% of the Indian population. For those over the poverty line, rice could be bought for INR 8.3/kg, for those under the poverty line the price was INR 5.65, and for those in AAY the prices was INR 3.0. For wheat the distribution prices for these groups were INR 6.1, 4.15 and 2/kg, respectively. The effective cost of the food subsidy depends on the difference between procurement and distribution prices, the size of distribution entitlements per household and the costs of distribution. In the last ten years, the costs of the PDS have increased substantially as MSP was raised, from about USD 5 billion in 2002-03 to almost USD 14 billion in 2012-13.

Thrust area

Food security is influenced by a number of factors, including those that determine food availability — domestic food production and the capacity to import food — as well as determinants of food access, including the distribution of food among various segments of the population. Although India is now carrying surpluses of wheat and rice in government stocks, improving food access remains a significant problem. Given India's current large stock levels, constraints on production and restrictions on trade are less significant challenges for near-term food security than finding ways to improve domestic food distribution and access. This section will therefore focus on the distribution costs of nutrients to all in the country.

Methodology

In September 2013, a new National Food Security Act (NFSA) was enacted to substantially enlarge India's food distribution programme. As of early 2014, the programme has been implemented in a number of states, and it remains to be implemented in others. The programme extends the previous distribution programme for wheat and rice. The NFSA now provides up to 5 kg per person per month for 67% of the population at prices of INR 3/kg for rice, INR 2/kg for wheat and INR 1/kg for coarse grain.

This Food and Agriculture Organisation (FAO) Agricultural Outlook, 2014 (OECD/FAO, 2014) has assumed that the Act will remain in effect over the next decade, to 2023-24. The report derives an effective subsidisation of 28 kg of rice at a price of INR 3/kg, 24 kg of wheat at a price of INR 2/kg, and 8 kg of coarse grain at INR 1/kg. At retail prices for rice, wheat and coarse grain of about INR 31.8, INR 19.6 and INR

24.2/kg respectively; the net saving for the average recipient is about INR 1 674 per year in 2013. Assuming no change in the offer prices, in the rates of inflation, the effective subsidy in this projection, according to the report rises to INR 3076 p.a. per person by 2023 (OECD/FAO, 2014).

From the projections of the Outlook report, the effective food subsidy is projected to rise from INR 1674 per person per year in 2013 to INR 3076 per person per year. Assuming that the rate of growth per person expenditure of subsidy is constant, the growth over these ten years was calculated. Using this consumer subsidy per person in each of the years, calculation of the total consumer subsidy for each of the year using projected population was done. The gap was estimated by projecting the future budget allocations for food subsidy based on past trends in public expenditures, and subtracting these future allocations from the finance required.

Linkages

This target is linked with Goal 3 on health and well-being of all. While the intake of food and nutrients determine an individual's health, sanitation, hygiene and health care facilities also affect the nutrition of an individual. Therefore, target 2.1 and 2.2 will be affected by the overall healthy environment provided to an individual. Further, these targets are also linked with Goal 9 and 11 as they have component of infrastructure which plays a major role in access and distribution to food for all. Goal 12 highlights the food loss in the process of distribution and thus impacts the achievement of these targets.

TARGET 2.3

2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment

This target follows from targets 2.4, 2.5 and 2.a, and has not been independently assessed here.

India's agriculture production changed dramatically from 1957 to 1968, when the expansion of the country's research capacity and initiation of price support programmes for farmers set the stage for the Green Revolution. However, there has been a drop in the productivity growth over time. According to the Global Agriculture Productivity (GAP) Report 2014 (Global Harvest Initiative, 2014), at the current rate of total factor productivity (TFP) growth, domestic production will meet only 59 per cent of India's food demand by 2030. This indicates that greater

attention is needed to increasing productivity through technologies and practices that do not stress the resource base. Thus, if the current trend continues, imports will become more important for meeting growing demand. In 2011, Chand *et al* assessed the contribution of different productivity enhancing factors to TFP growth for a variety of Indian crops. They found that public investment in agricultural research constituted a significant source of TFP growth in 11 out of 15 crops. Public investment in extension and technology transfer contributed positively toward TFP enhancement in only two crops, which likely reflects suboptimal investment. The authors suggest that improvements in both the investment levels and quality of extension services are needed. In addition, to achieve the 4 per cent growth per annum in agricultural GDP — the Government of India's target — greater emphasis should be placed on the development of livestock, horticulture and fisheries (Global Harvest Initiative, 2014).

The study identifies research and development, and embracing technologies as crucial elements that create enabling environment for improving agricultural productivity, increasing the availability of food to more people at affordable prices, conserving natural resources and reducing waste and loss.

Research investments in India create high returns in terms of output growth and more efficient use of resources, and they help meet the government's food security goals. The Indian Council of Agricultural Research (ICAR) is a semiautonomous institute that coordinates research and education conducted by 99 specialised institutes and 53 agricultural universities across the country.

Technological innovations are the backbone of productive and resilient farms, fisheries and livestock operations and a safe, wholesome food supply. They contribute to improvements in the quality of seeds, animal stock and inputs, labour-saving devices, effective production and conservation practices, reduction of post-harvest losses, efficient price discovery mechanisms and control of pests, diseases and contamination.

Access to these innovations will be essential if farmers and producers along the value chain are to meet the rising global demand for agriculture in the face of climate change.

Having said that, this target will be closely dealt with under target 2.4, 2.5 and 2.a where costs of research and development and investments in agriculture production systems have been calculated.

TARGETS 2.4, 2.5

2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality

2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and ensure access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed

Summary of Targets 2.4, 2.5				
Government bodies working on the target	**Programmes/ Schemes of government**	**Indicator/ Thrust Area**	**Finance Required***	**Gap***
Department of Agriculture and Cooperation, Ministry of Agriculture	Rashtriya Krishi Vikas Yojana, Rainfed Farming System, Crop Protection Policy	Sustainable Agriculture Techniques	INR 26 lakh crore USD 409 billion (2015-24)	INR 14.5 lakh crore USD 230 billion (2015-24)

** In 2014-15 prices*

Background

Sustainable agriculture and food security in India face various challenges today. India is losing 5,334 million tonnes of soil every year due to soil erosion because of indiscriminate and excess use of fertilisers, insecticides and pesticides over the years. About one millimetre of top soil is being lost each year due to soil erosion and the rate of loss is 16.4 tonnes per hectare (The Hindu, 2010). Non-judicious and imbalanced use of inorganic fertilisers and unsustainable irrigation practices over the years resulted in deterioration of soil fertility in large parts of productive agricultural land.

Agriculture is not only the world's largest water user in terms of volume, it is also a relatively low-value, low-efficiency and highly subsidised water user. This has not only economic and social impacts but also severe environmental impacts. The water demand from agriculture is set to increase tremendously and will have to be met to ensure food security. The current approach of subsidising electricity encourages

increased use of water, thereby risking agricultural sustainability. This is exacerbated by existing unsustainable cropping patterns.

FAO estimates that there are roughly a quarter million plant varieties available for agriculture, but less than 3 per cent of these are in use today. While there are more than 50,000 edible plants in the world, the global food supply depends on only 150 plant species. Of those 150, just 12 provide three-quarters of the world's food. More than half of the world's food energy comes from a limited number of varieties of three "mega-crops": rice, wheat, and maize (IDRC).

In India, farming as a livelihood is becoming unattractive to people living in rural areas, particularly smallholder farmers and small to medium entrepreneurs, due to low priority, high input cost, no control on market, society's perception of farming as a poor livelihood option, etc. During July 02 – June 03, for which the data is available, average income per farmer household was INR 11524 per annum, which turns out to be INR 960 per month per household. Also about 40 per cent farmer households in the country did not like farming because it is not profitable, risky and it lacks social status and felt that, given a choice, they would take up some other career (NSSO, MoSPI, 2005).

In order to make agriculture an attractive and sustainable sector, key areas for investment and support include sustainable agricultural practices, rural infrastructure, storage capacities and related technologies, research and development on sustainable agricultural technologies, developing strong agricultural cooperatives and value chains, and strengthening urban-rural linkages.

Thrust area

India has high population pressure on land and other resources to meet its food and development needs. The natural resource base of land, water and bio-diversity is under severe pressure. Food demand challenges ahead are formidable considering the non-availability of favourable factors of past growth, fast declining factor productivity in major cropping systems and rapidly shrinking resource base. Targets 2.4 and 2.5 focus on sustainable agriculture for sustainable food production systems.

Sustainable agriculture deals with conserving and sustainable use of land, water, plant and animal genetic resources, in ways that are environmentally non-degrading, technically appropriate, economically viable and socially acceptable. The process of sustainable agriculture meets the following criteria (Samantara & Badatya, 2012):

- It ensures that the basic nutritional requirements of present and future generations, qualitatively and quantitatively, are met while providing a number of other agricultural products.
- It provides durable employment, sufficient income, and decent living and working conditions for all those engaged in agricultural production.

- It maintains and, where possible, enhances the productive capacity of the natural resource base as a whole, and the regenerative capacity of renewable resources, without disrupting the functioning of basic ecological cycles and natural balances, without destroying the socio-cultural attributes of rural communities, or without causing contamination of the environment.
- It reduces the vulnerability of the agricultural sector to adverse natural and socio-economic factors and other risks, and strengthens self-reliance.

Methodology

The financial requirements for India to fight the above mentioned challenges have been calculated in a study titled "A Perspective on Agricultural Credit for 2020" by Samir Samantara & K. C. Badatya. It estimates India's investment needs in the thrust areas of sustainable agriculture. The thrust areas identified for immediate attention for augmenting output in the agricultural sector are irrigation, rainfed farming, wasteland development, soil and water conservation, animal husbandry/dairy development and fisheries, etc. The estimation in this study has been used to derive financial requirements of India till 2023-24 for ensuring sustainable agriculture.

The gap was estimated by projecting the future budget allocations for irrigation, soil and water conservation and animal husbandry based on past trends in public expenditures, and subtracting these future allocations from the finance required.

Linkages

Climate change (Goal 13), resource constraints (Goal 12), storage and distribution of food (Targets 2.1 and 2.2) are some concerns that threaten India's food security. With increasing population and socio-economic development needs, access and availability of resources for food production can be seen as a critical constraint to ensuring food security.

Agriculture is a highly resource intensive sector. Agriculture accounts for 70 per cent of total global freshwater withdrawals, making it the largest user of water. At the same time, the food production and supply chain consume about 30 per cent of total energy consumed globally (FAO, 2011). Food security is related to the nexus between water and energy, and while water and energy are required for irrigation, energy is vital for water access, and water is critical for energy production. While water scarcity in the region increases, food price hikes and food access become grave concerns for many. Agriculture is undeniably a resource intensive sector and this fact comes along with a need for efficient and effective management of finite resources, in order to ensure long term sustainability of agriculture and thus food security for all. Therefore, targets 2.4 and 2.5 are closely linked with the goals on water (Goal 6) and energy (Goal 7). Further, strategies under this target will impact

the ecosystems of the country and thus have a bearing on Goals 14 (marine ecosystems) and 15 (terrestrial ecosystems).

TARGETS 2.b, 2.c

2.b Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round

2.c Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility

These targets have not been considered in the study as they are beyond the scope of the study. Under the food security initiative, India will have to provide very cheap food to the most vulnerable segments of the population. In order to support farmers, it also buys grains from them at MSP along with subsidising inputs like electricity and fertilisers. India wants a permanent solution to the issue of public stock holding of food grains. There may be some financial implications, for which a further assessment would be required.

Goal 3

Ensure healthy lives and promote well-being for all at all ages

GOAL 3: ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL AT ALL AGES

3.1 By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births

3.2 By 2030, end preventable deaths of newborns and children under 5 years of age

3.3 By 2030, end the epidemics of aids, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases

3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well being

3.5 Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol

3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents

3.7 By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes

3.8 Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all

3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

3.a Strengthen the implementation of the world health organization framework convention on tobacco control in all countries, as appropriate

3.b Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha declaration on the trips agreement and public health, which affirms the right of developing countries to use to the full the provisions in the agreement on trade-related aspects of intellectual property rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all

3.c Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing states

3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks

FINANCIAL ASSESSMENT OF GOAL 3

Financial Assessment of Goal 3				
Targets	**Classifi-cation**	**Linkages**	**Finance Required***	**Gap***
3.1 By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births	Assessed together	Target 2.1, 2.2, 5.6, 6.1, 6.2, 6.3, 11.2, 12.4	INR 55 lakh crores USD 880 billion (2015-30)	INR 19 lakh crores USD 305 billion (2015-30)
3.2 By 2030, end preventable deaths of new borns and children under 5 years of age				
3.3 By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases, other communicable diseases				
3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well being				
3.5 Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse, harmful use of alcohol				
3.7 By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and				

Financial Assessment of Goal 3				
Targets	**Classifi-cation**	**Linkages**	**Finance Required***	**Gap***
education, and the integration of reproductive health into national strategies and programmes				
3.8 Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all				
3.6 by 2020, halve the number of global deaths and injuries from road traffic accidents	Follows from other targets	Targets 3.1, 3.2, 3.3, 3.4, 3.5, 3.7, 3.8 Goal 4, 11, 16		
3.9 by 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination	Follows from other targets	Targets 3.1, 3.2, 3.3, 3.4, 3.5 Goal 11, 12, 13, 14, 15		
3.a strengthen the implementation of the world health organization framework convention on tobacco control in all countries, as appropriate	Not assessed			
3.b support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and	Consider-ed under finance for research and develop-ment			

Financial Assessment of Goal 3				
Targets	**Classifi-cation**	**Linkages**	**Finance Required***	**Gap***
vaccines, in accordance with the Doha declaration on the trips agreement and public health, which affirms the right of developing countries to use to the full the provisions in the agreement on trade-related aspects of intellectual property rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all				
3.c substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing states	Not assessed			
3.d strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks	Not assessed			
		Total	**INR 55 lakh crores** **USD 880 billion**	**INR 19 lakh crores** **USD 305 billion**

** In 2014-15 prices*

GOAL 3 ASSESSMENT SUMMARY

Goal 3 includes health and well-being for all, which depends on health status of the population, health infrastructure, access to health insurance, etc. It also includes

targets that look at preventing and reducing death by road accidents and chemical pollution.

To achieve this goal, India would need to increase its Health Index, which includes health status of population, quality of healthcare institutions and financial instruments for access to healthcare (insurance, etc.), to 0.9. As of 2011, India's Health Index was 0.702. India is estimated to require around INR 55 lakh crores (USD 880 billion) till 2030 to achieve the target value of its Health Index. A gap of around INR 19 lakh crores (USD 305 billion) is estimated.

Health outcomes of the population are closely linked with the access to and availability of nutritious food, clean drinking water and healthy and hygienic environment. Goal 3 is therefore closely related to India's position of food security (Goal 2), water and sanitation for all (Goal 6) and green infrastructure systems (Goal 11), clean air, water and environment (Goals 12, 13, 14 and 15).

With such linkages of health outcomes with other goals, predictions about future health (of individuals and populations) can be notoriously uncertain. Future status of healthcare in India would rest on the overall changes in its political economy – on progress made in poverty mitigation (healthcare to the poor), in reduction of inequalities (access to healthcare for all), in generation of employment/income streams (to facilitate capacity to pay and to accept individual responsibility for one's health), in public information and development communication (to promote preventive self-care and risk reduction through conducive lifestyles), and in personal lifestyle changes (often directly resulting from social changes and global influences). Of course it will also depend on progress in reducing mortality and the likely disease load, efficient and fair delivery of healthcare, financing systems in private and public sectors, attention to vulnerable sections, family planning, nutritional services and women's empowerment (Srinivisan, 2010). The finances required for health and well-being may also get affected by additional health burdens that the country may face due to epidemics, climate change and other such factors which cannot be predicted.

TARGET 3.1, 3.2, 3.3, 3.4, 3.5, 3.7, 3.8

3.1 By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births

3.2 By 2030, end preventable deaths of newborns and children under 5 years of age

3.3 By 2030, end the epidemics of aids, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases

3.4 By 2030, reduce by one third premature mortality from non-communicable diseases through prevention and treatment and promote mental health and well being

3.5 Strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful use of alcohol

3.7 By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes

3.8 Achieve universal health coverage, including financial risk protection, access to quality essential health-care services and access to safe, effective, quality and affordable essential medicines and vaccines for all

Summary of Targets 3.1, 3.2, 3.3, 3.4, 3.5, 3.7, 3.8				
Govern-ment bodies working on the target	**Programmes/ Schemes of government**	**Indicator/ Thrust Area**	**Finance Required***	**Gap***
Ministry of Health and Family Welfare, State Health ministries	National Rural Health Mission, National Urban Health Mission, Pradhan Mantri Swasthya Suraksha Yojana, Rashtriya Arogya Nidhi, Rashtriya Swasthaya Bima Yojna, and others	Health Index	INR 55 lakh crores USD 880 billion (2015-30)	INR 19 lakh crores USD 305 billion (2015-30)

**In 2014-15 prices*

Background

The health outcomes of India have made a substantial progress over the last two decades with improvement in living conditions, public health interventions and progress in medical healthcare. Despite the progress, the health indicators are far from a desirable benchmark. Life expectancy at birth in India was at 66.3 years in 2012, which is 14 years lower than the OECD average of 80.2 years (OECD, 2014). India's Infant Mortality Rate at 43.2 deaths per 1000 live births in 2012 still lags behind the average of low and middle income countries at 33 per 1000 in 2010-15 (UNDESA, 2013).

Healthcare infrastructure and systems form a foundational basis for access to and availability of healthcare services for all. The availability of health facilities in India is

comparatively much lower (about 1:1000 – bed:population ratio) than in the developed nations (about 7:1000) (Rao, Krishna, Kumar, Chatterjee, & Sundararaman, 2011). The number of allopathic doctors, nurses, and midwives in India (when adjusted for their qualification) is less than a fourth of the World Health Organisation (WHO) benchmark (Rao, Krishna, Kumar, Chatterjee, & Sundararaman, 2011). When adjusted for qualification, the ratio of nurses to doctors is about 0.6:1 in India, while in many developed countries this ratio is about 3:1 (Rao, Krishna, Kumar, Chatterjee, & Sundararaman, 2011). According to the facility survey conducted by the International Institute of Population Sciences (IIPS) in 2007-08, about 35 per cent of the Sub Centres and 30 per cent of Primary Health Centres (PHCs) had less than 60 per cent of the essential drugs required for primary care. Similarly, about a third of the PHCs had less than 60 per cent of the basic refrigeration facilities required for primary care (Rao, Krishna, Kumar, Chatterjee, & Sundararaman, 2011).

The healthcare spending in India accounts for 5 per cent of the country's GDP, of which public spending is around 1 per cent of GDP. Public expenditure on health accounts for about 33 per cent of total health expenditure in the country. Only a few countries have such low ratios of public to total expenditure on health. The world's average is 63 per cent and even the average of Sub-Saharan Africa is 45 per cent (Drèze & Sen, 2013). Available literature on the subject argues that countries with high level of public spending in health have secured better health outcomes compared to the countries with low level of spending in health (Drèze & Sen, 2013). Thus, size of the public fund in health sector matters for better health outcomes.

Basis for choosing indicator

The Health Index, published annually by the World Health Organisation, is chosen as the indicator for health outcomes because of the comprehensive assessment in calculating the Index. It is derived from three components. The first is the health of the population (both in terms of values of health indicators, and access to health services). The second is responsiveness of the health system to the legitimate expectations of the population. Responsiveness in this context explicitly refers to the non-health improving dimensions of the interactions of the populace with the health system, and reflects respect to persons and client orientation in the delivery of health services, among other factors. As with health outcomes, both the level of responsiveness and its distribution are important. The third intrinsic component is fairness in financing and financial risk protection. The aim is to ensure that poor households should not pay a higher share of their discretionary expenditure on health than richer households, and all households should be protected against catastrophic financial losses related to ill health (Tandon, Murray , Lauer, & Evans, 2001).

Methodology

The annual public expenditure of the Centre and States (adjusted for inflation) per capita[2] on health and family welfare was obtained from government budget documents (Ministry of Finance, 2014). This expenditure was plotted against the Health Index. The finance required was estimated by forecasting the public expenditure required to reach the target value of the indicator through a regression analysis, using the method of least squares[3].

The gap was estimated by projecting the future budget allocations for health and family welfare based on past trends in public expenditures, and subtracting these future allocations from the finance required.

Linkages

Health outcomes of the population are closely linked with the access to and availability of nutritious food, clean drinking water and healthy and hygienic environment. This group of targets in Goal 3 is therefore closely related to India's position on food security (Goal 2), water and sanitation for all (Goal 6), and green infrastructure systems (Goal 11).

TARGETS 3.6, 3.9

3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents

3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

Target 3.6 aims to halve the number of global deaths and injuries from road traffic accidents. This target is not independently assessed for finances. However this target has close linkages with target 3.1, 3.2, 3.3, 3.4, 3.5, 3.7, 3.8, Goal 4, Goal 11 and Goal 16. Targets of Goal 3 have components of efficient healthcare infrastructure and systems and if achieved will provide better facilities for dealing with accident emergencies. Goals 4, 11 and 16 will help in preventive action against road traffic accidents. While Goal 4 on education shall spread awareness and promote safe driving, better infrastructure (Goal 11) and governance institutions (Goal 16) will enable safe driving and prevent road accidents.

[2] Population, as found in Census 2001 and 2011 and estimated for remaining years using the CAGR between 2001 and 2011

[3] Refer annex for detailed calculations

Target 3.9 aims to substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination. This target is also not independently assessed for finances. This target has close linkages with target 3.1, 3.2, 3.3, 3.4, 3.5, 3.7, 3.8, Goal 11, Goal 12 and Goal 13, Goal 14 and Goal 15. Targets of Goal 3 have components of efficient health care infrastructure and systems and if achieved will provide better facilities for dealing with illnesses from hazardous chemicals and air, water and soil pollution and contamination. While Goal 3 looks at the curative side for such illnesses, sustainable urbanisation (Goal 11), Sustainable Consumption and Production (SCP) (Goal 12), mitigation strategies of climate change (Goal 13) and conservation strategies for ecosystem and biodiversity (Goal 14 and 15) shall prevent air, water and soil pollution and contamination and thus prevent such illnesses.

TARGET 3.a, 3.c, 3.d

3.a Strengthen the implementation of the world health organization framework convention on tobacco control in all countries, as appropriate

3.c Substantially increase health financing and the recruitment, development, training and retention of the health workforce in developing countries, especially in least developed countries and small island developing states

3.d Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks

These targets have been not considered in the study.

Target 3.c has not been assessed but can potentially have financial implications for India for training, maintaining and retaining the health workforce of the country. Target 3.d involves costs for developing early warning systems, risk reduction and management, which may also have high financial implications due to India's high vulnerability to health risks and low quality of such systems, but these finances have not been assessed in the study.

Goal 4

Ensure inclusive and equitable quality education and promote life-long learning opportunities for all

GOAL 4: ENSURE INCLUSIVE AND EQUITABLE QUALITY EDUCATION AND PROMOTE LIFE-LONG LEARNING OPPORTUNITIES FOR ALL

4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes

4.2 By 2030 ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education

4.3 by 2030 ensure equal access for all women and men to affordable quality technical, vocational and tertiary education, including university

4.4 By 2030, increase by x% the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship

4.5 By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples, and children in vulnerable situations

4.6 By 2030 ensure that all youth and at least x% of adults, both men and women, achieve literacy and numeracy

4.7 By 2030 ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development

4.a Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all

4.b By 2020 expand by x% globally the number of scholarships for developing countries in particular LDCs, SIDS and African countries to enrol in higher education, including vocational training, ICT, technical, engineering and scientific programmes in developed countries and other developing countries

4.c By 2030 increase by x% the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially LDCs and SIDS

FINANCIAL ASSESSMENT OF GOAL 4

Financial Assessment of Goal 4				
Targets	**Classification**	**Linkages**	**Finance required***	**Gap***
4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes	Assessed independently	Target 4.c	INR 76 lakh crores USD 1200 billion (2015-30)	None
4.2 By 2030 ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education	Assessed independently		INR 35 lakh crores USD 561 billion (2015-30)	INR 27 lakh crores USD 433 billion (2015-30)
4.3 By 2030 ensure equal access for all women and men to affordable quality technical, vocational and tertiary education, including university	Assessed independently	Target 4.4	INR 22 lakh crores USD 349 billion (2015-22)	INR 19 lakh crores USD 306 billion (2015-22)
4.4 By 2030, increase by x% the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship	Assessed independently	Targets 4.3, 4.6	INR 9 lakh crores USD 145 billion (2015-22)	Unknown
4.5 By 2030, eliminate gender disparities in education and ensure equal access to all levels	Follows from other	Target 4.a		

Financial Assessment of Goal 4				
Targets	**Classifica-tion**	**Linkages**	**Finance required***	**Gap***
of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples, and children in vulnerable situations	targets			
4.6 By 2030 ensure that all youth and at least x% of adults, both men and women, achieve literacy and numeracy	Follows from other targets	Targets 4.1, 4.3, 4.4		
4.7 By 2030 ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development	Consider-ed under finance for aware-ness	Targets 4.1, 4.3, 4.4, 4.6		
4.a Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all	Follows from other targets	Target 4.5		
4.b By 2020 expand by x% globally the number of scholarships for developing	Follows from other	Target 4.3		

Financial Assessment of Goal 4				
Targets	**Classifica-tion**	**Linkages**	**Finance required***	**Gap***
countries in particular LDCs, SIDS and African countries to enrol in higher education, including vocational training, ICT, technical, engineering and scientific programmes in developed countries and other developing countries	targets			
4.c By 2030 increase by x% the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially LDCs and SIDS	Assessed independ-ently		INR 21,600 crores USD 3.5 billion (2015-30)	INR 2700 crores USD 0.5 billion (2015-30)
		Total	**INR 142 lakh crores** **USD 2258 billion**	**INR 46 lakh crores** **USD 740 billion**

* *In 2014-15 prices*

GOAL 4 ASSESSMENT SUMMARY

Goal 4 calls for universal access to all levels of education and skill development, starting from pre-primary education, early childhood care and development, primary and secondary education, all the way to tertiary education, and skill development.

With respect to expenditure on education as a percentage of GDP, in 2012, India spent 3.8 per cent, while South Africa spent 6.2 per cent, Japan spent 3.8 per cent and Germany spent 5 per cent (in 2011) (World Bank, 2007).

While India has achieved near-universal enrolment in primary and secondary education (Pratham Education Foundation, 2014), the learning levels of children are low. For example, the Annual Status of Education Report (ASER) 2014 indicates that

of all the students in rural India enrolled in Standard VIII in 2014, about 25 per cent could not read a Standard II level text.

India has nearly universalised access to its early childhood development programme, the Integrated Child Development Services (ICDS), but significant work remains to be done to increase the effectiveness of the programme, particularly with respect to expanding nutritional access and nutritional indicators of children.

India has set ambitious targets to increase its gross enrolment ratio (GER) in higher education and to achieve skill development of the entire workforce in the next decade. Government reports and expert committee reports propound several reforms for India's schemes in all levels of education and skill development. This study draws on some of these reports to derive estimates of India's finance requirements to achieve this goal.

The study estimates a total finance requirement of INR 142 lakh crores or USD 2258 billion to achieve Goal 4. A gap of INR 46 lakh crores or USD 740 billion is anticipated. The finance requirement includes the cost of universal completion of primary and secondary education, early childhood development, increasing the GER in higher education to 30 per cent, skilling the workforce and increasing the supply of qualified teachers. This also includes, partially, the cost of increasing learning outcomes of children through effective teacher education, increasing literacy and numeracy and providing gender and disability-sensitive learning environments. The estimates of finance required are not inclusive of the overall costs of upgrading India's educational institutions to match world standards. They are not fully inclusive of the costs of installing gender and disability-friendly infrastructure, training educators to take care of special needs of individuals, and reaching out to the most marginalised and vulnerable to bring them under the ambit of mainstream education schemes.

The goal calls for providing all learners the knowledge and skills needed to promote sustainable development. The cost of such an intervention has not been separately assessed here, but included in the section on overall costs of creating awareness on sustainable development.

TARGET 4.1

4.1 By 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes

Summary of Target 4.1				
Government bodies working on Target	**Programmes/ Schemes of government**	**Indicator/ Thrust area**	**Finance required***	**Gap**
Department of School Education and Literacy, Ministry of Human Resource Development. State education departments.	Sarva Shiksha Abhiyan, Mid-day Meal Scheme, Rashtriya Madhyamik Shiksha Abhiyan and others.	Expected years of schooling per child[4]	INR 76 lakh crores USD 1200 billion (2015-30)	None

** In 2014-15 prices*

Background

The Right to Education Act (RTE), 2009 mandates free and compulsory education for all children aged 6-14 in India. According to the ASER 2014, India is now close to universal enrolment for the age group 6-14, with the percentage of children enrolled in school at 96 per cent or above for the last six years (Pratham Education Foundation, 2014). However, in the 15-16 age group, there is still a considerable number of children who are out of school, including drop-outs (16.6 per cent).

This study considers the cost of ensuring universal access to and completion of elementary and secondary education, for which it uses the expected years of schooling per child as an indicator[5]. In 2013-14, the expected years of schooling per child was 12.1 (out of a maximum of 15 years, which includes 3 years of pre-school and 12 years of elementary, secondary and senior secondary school).

The study recognises that India faces a massive learning crisis. According to ASER 2014, only a fourth of all children in Standard III could read a Standard II text fluently. This number rises to just under half in Standard V. Even in Standard VIII, around 25 per cent of the children could not read a Standard II level text. The cost of ensuring effective learning outcomes has been partly accounted for under Target 4.c, which focusses on increasing the supply of qualified teachers. It is assumed that effective teacher education, among other factors, will influence the learning outcomes of children. However, a separate assessment of finances required to improve learning outcomes of children has not been attempted in this study.

[4] Obtained from Human Development Reports (HDR) of the United Nations Development Programme (UNDP)
[5] Number of years of schooling that a child of school entrance age can expect to receive if prevailing patterns of age-specific enrolment rates persist throughout life

Basis for choosing indicator

The expected years of schooling per child is a representative indicator for most provisions of this target. The target calls for *complete, free, equitable* and *quality primary and secondary education,* as well as *effective learning outcomes*. A child spending 15 years in school and funded by public expenditure is *completing* his/her *pre-primary, primary and secondary* education *free of cost*. The indicator can only reach its target value if all children complete their education, therefore it accounts for *equitable* outcomes. The indicator does not account for *quality* and *effective learning outcomes*, but these considerations are accounted for partially in the financial assessment of Target 4.c.

Methodology

The annual public expenditure of the Centre and States (adjusted for inflation) per capita[6] on elementary and secondary education was obtained from government budget documents[7]. This expenditure was plotted against the indicator 'expected years of schooling per child'. The *finance required* was estimated by forecasting the public expenditure required to reach the target value of the indicator through a regression analysis, using the method of least squares.

The *gap* was estimated by projecting the future budget allocations for elementary and secondary education based on past trends in public expenditures, and subtracting these future allocations from the finance required.

Linkages

This target includes a provision for effective learning outcomes. This study assumes that a major influence on effective learning outcomes is the quality of teaching-learning processes in the classroom, which is in turn influenced by teacher quality. Therefore, this target is closely linked with target 4.c, which calls for increasing the supply of qualified teachers. The financial assessment of target 4.c considers the cost of effective teacher education, which will have a direct impact on effective learning outcomes for children.

TARGET 4.2

4.2 By 2030 ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education

[6] Population aged 5-19, as found in Census 2001 and 2011 and estimated for remaining years using the CAGR between 2001 and 2011

[7] Analysis of Budgeted Expenditure documents, Ministry of Human Resource Development

Summary of Target 4.2				
Government bodies working on Target	**Programmes/ Schemes of government**	**Indicator/ Thrust area**	**Finance required***	**Gap***
Ministry of Women and Child Development	Integrated Child Development Services (ICDS)	Restructuring of ICDS	INR 35 lakh crores USD 561 billion (2015-30)	INR 27 lakh crores USD 433 billion (2015-30)

** In 2014-15 prices*

Background

India runs several schemes for early childhood care and development, such as the mid-day meal scheme, National Rural Health Mission, National Children Fund and the Integrated Childhood Development Services Scheme. However, the current health and nutritional status of Indian children is dismal, as shown in the following table against the per child expenditure on ICDS. Even as recently as 2013, India's mortality rate for children under 5 years of age was 53 per 1000 live births[8].

Real public expenditure on ICDS and under 5 mortality rate in India		
Period	**Real public expenditure on ICDS per child (in rupees)* (2004-05=100)**	**Under 5 mortality rate (World Bank) (per 1000 live births)**
2006-07	323.66	72
2007-08	401.87	69
2008-09	444.30	66
2009-10	640.38	63
2010-11	692.89	60
2011-12	786.27	58

**Calculated by adding public expenditure (Centre + States) on ICDS (General) and ICDS (Supplementary Nutrition) and dividing by the child population (aged 0-6) in that year.*

Source: Ministry of Women and Child Development, Government of India.

[8] World Bank data

This section considers the public finance needed for the Integrated Child Development Services (ICDS). It considers ICDS in particular and not the other schemes, because

- This target calls for care in the early childhood phase. ICDS caters to children in the 0-6 age group exclusively, whereas the remaining schemes cater to all children, and the expenditure component of these schemes catering to children under the age of 6 is difficult to ascertain or project.
- ICDS is India's flagship scheme for early childhood care, and is one of the largest of its kind in the world. It takes care of all components of early childhood care including health and nutrition education for mothers, health services, supplementary food, and pre-school education for children.

Thrust area

This section focuses on the costs of restructuring the ICDS scheme. An Inter-Ministerial Group Report[9] states that the ICDS is poised to achieve universal coverage reaching 14 lakh habitations under the XII Five Year Plan. Such universal coverage is necessary to achieve the SDG target of early childhood development, care and pre-primary education for all children. However, according to the inter-ministerial group report, much remains to be done in improving the quality and efficiency of the service. There is need for comprehensive programmatic, management and institutional reforms. These relate to

- Enhancing nutritional impact,
- Reaching children under three years of age in the community,
- Changing caring and feeding behaviours in the family,
- Reaching the most deprived community groups,
- Responding flexibly to local needs for child care,
- Responding to community demand for early learning,
- Increasing ownership of *Panchayati Raj* Institutions, and
- Achieving an optimal balance between universalisation and quality.

A major challenge lies in implementation gaps that arise out of inadequate resource investment, inadequate funding, lack of convergence, lack of accountability of those managing and implementing the programme, lack of community ownership and the general perception about ICDS being a "feeding" programme and not an Early Childhood Development programme. Implementation experience and evidence from innovative models indicates that if the above issues and inadequacies are addressed appropriately, ICDS has the potential to ensure satisfactory nutritional and child development outcomes.

[9] http://planningcommission.nic.in/reports/genrep/rep_icds2704.pdf (accessed June 2015)

Methodology

The estimate of *finance required* was derived from the aforementioned Inter Ministerial Group report on ICDS Restructuring. The report proposes a three-pronged response to restructure and strengthen the ICDS: programmatic reforms, management reforms and institutional reforms, full details of which may be found in the Annexure.

The *gap* was estimated by projecting the future budget allocations for ICDS based on past trends in public expenditures, and subtracting these future allocations from the finance required.

TARGET 4.3

4.3 By 2030 ensure equal access for all women and men to affordable quality technical, vocational and tertiary education, including university

Summary of Target 4.3				
Government bodies working on Target	**Programmes/ Schemes of government**	**Indicator/ Thrust area**	**Finance required***	**Gap***
Department of Higher Education, Ministry of Human Resource Development. State education departments	Rashtriya Uchchatar Shiksha Abhiyan (RUSA) and other schemes in University education, technical education and scholarships	Gross enrolment ratio (GER) in higher education	INR 22 lakh crores USD 349 billion (2015-20)	INR 19 lakh crores USD 306 billion (2015-20)

** In 2014-15 prices*

Background

India's higher education system is the third largest in the world, next to the United States and China (World Bank, 2007). Indian higher education system has expanded at a fast pace by adding nearly 20,000 colleges and more than 8 million students in a decade from 2000-01 to 2010-11 (Choudaha, 2012).

However, India's GER[10] in higher education was only 21.1 as of 2012-13 (MoHRD, 2014). The Indian government has announced a target of achieving a GER in higher education of 30 per cent (which is close to current global GER average).

Thrust area

This section considers funding requirements for higher education, which includes university, scholarships and technical education. Skill-building interventions and vocational training are considered in the next section. Specifically, this study estimates the cost of achieving the government's target GER of 30 per cent by 2020. It does not consider investment requirements beyond 2020 because the GER targets are not yet specified. A further limitation of this study is that it does not consider the additional investments needed to take the Indian higher education system to global standards.

[10] GER is the number of actual students as a share of all potential students. In higher education, it is the number of students enrolled in higher education as a share of the total 18-23 aged population.

Methodology

The estimates of *finance required* and *gap* are both derived from a number of studies on the subject.

According to estimates of the National University of Educational Planning and Administration (NUEPA), India's target level of GER, 30 per cent by 2020, will come at a price of INR 9.5 lakh crores and require an additional 10,510 technical institutions, 15,530 colleges and 521 universities (Suneja, 2012) to be built from 2012 to 2020.

According to a FICCI-Ernst & Young report, higher education system in India needs an investment of INR 10 lakh crores by 2020 to create an additional capacity of 25 million (2.5 crore) seats. The private sector, which accounts for 52 per cent of the total enrolment, would invest INR 50,000 crores per year (FICCI/Ernst & Young).

This study uses an estimate of Bijendra N Jain, Vice Chancellor of BITS Pilani (Jain, 2014), who wrote "As the country dreams of double digit economic growth, we clearly need to increase the GER to 30 per cent by 2030, and grow the enrolment in universities to more than 5 crore students. This is no trivial task. If it costs INR 5 lakh to create capacity for a single seat in a higher educational institution, the investment required for the anticipated growth will be over INR 12 lakh crores, and another INR 10 lakh crores to upgrade existing universities and colleges."

Jain, 2014 has estimated the cost of creating an additional 2.4 crore seats, as compared to FICCI-Ernst & Young's estimated need of an additional 2.5 crore seats. He estimates a total investment requirement for this anticipated growth as INR 12 lakh crores, whereas the FICCI-Ernst & Young report estimates INR 10 lakh crores. For the purpose of this study, we use a combination of both estimates, as shown below.

Finance required for higher education, 2015-20		
Investment		**Source of information**
Target GER in higher education by 2020	30 per cent	Government target
Total investment requirement (creating additional capacity, upgrading existing institutions)	INR 22 lakh crores	Bijendra N Jain estimate
Expected private investment	INR 50,000 crores per year INR 2.5 lakh crores from 2015-2020	FICCI-Ernst & Young estimate

Finance required for higher education, 2015-20		
Investment		**Source of information**
Expected availability of public investment (capital account of Education departments of states/UTs and Centre)	Negligible (capital expenditures have historically accounted for less than 5 per cent of total expenditures)	Analysis of Budgeted Expenditure documents of the Ministry of Human Resource Development, Government of India
Gap	INR 19.5 lakh crores	Total investment requirement – (expected private investment + expected availability of public funds)

It is assumed that the investment requirement and expected private investment are in 2014-15 and 2012-13 prices respectively (based on date of release/publishing of reports). Accordingly, in 2014-15 prices,

- The total investment requirement from 2015-20 is INR 22 lakh crores or USD 349 billion[11]
- The available private investment per year from 2015-20 is INR 55,179 crores or USD 8.7 billion
- The available private investment from 2015-20 is INR 2.76 lakh crores or USD 43.5 billion
- The finance gap from 2015-20 is INR 19 lakh crores or USD 306 billion.

Linkages

This target is closely linked to Target 4.4 on skill development. Higher education is an important contributor to skill development of the youth. Other skill development interventions that are outside the scope of university education have been considered under the next section on Target 4.4.

TARGET 4.4

4.4 By 2030, increase by x% the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship

[11] Exchange rate USD 1 = INR 63

Summary of Target 4.4				
Government bodies working on Target	**Programmes/Schemes of government**	**Indicator/ Thrust area**	**Finance required***	**Gap***
Ministry of Skill Development and Entrepreneurship	National Skill Development Corporation, UDAAN, Standard Training Assessment and Reward (STAR), etc.	Number and percentage of individuals in the workforce in need of skilling	INR 9 lakh crores USD 145 billion (2015-22)	Unknown

** In 2014-15 prices*

Background

Estimates indicate that only about 2 per cent of the existing workforce has undergone formal skill-training and about 15 per cent of the existing workforce has marketable skills, whereas 90 per cent of jobs in India are skill based and require vocational training (Simon M. , 2014). The government of India has announced a target of skilling 500 million individuals by 2022, of which the National Skill Development Corporation (NSDC) is responsible for skilling 150 million individuals.

Thrust area

The Draft National Policy for Skill Development and Entrepreneurship 2015, of the Ministry of Skill Development and Entrepreneurship, estimates that a total of 427.4 million people will require skilling between 2015 and 2022, of which 307.09 million individuals are part of the existing workforce and require skilling, re-skilling or up-skilling, while the remaining 119.50 million are fresh entrants in the workforce requiring skilling. This means that around 61 million people will require skilling each year from 2015 to 2022. However, according to the same report, India's current skilling capacity is only 7 million people per annum, which necessitates substantial involvement of the private sector in skilling workforce as well as a substantial expansion of the government's skilling capacities.

This study calculates the cost of skilling 427.4 million individuals by 2022. It is not clear what proportion of the workforce from 2022 to 2030 will be in need of skilling, or how much the private sector will participate in skilling the workforce, due to which this study restricts its estimates to the period 2015-22.

The cost of skilling 427.4 million individuals will be borne by the government, private sector as well as the beneficiaries of training. This study attempts to indicate the

total funding requirement without commenting on who will provide what proportion of the funds. Also, this study estimates the minimum funding that is required and feasible in the given time frame.

Methodology

The estimate of *finance required* and *gap* are calculated by building on the skilling requirements estimated in the Draft National Policy for Skill Development and Entrepreneurship. The table below shows the skilling needs and the additional skilling capacity requirement of India from 2015 to 2022.

Additional skilling capacity requirement		
Parameter	**Value**	**Source of information**
Skilling need	427.4 million	National Draft Policy for Skill Development and Entrepreneurship
Skilling target	500 million	Ministry of Skill Development and Entrepreneurship
Current skilling capacity	7 million per annum 49 million from 2015-22	National Draft Policy for Skill Development and Entrepreneurship
Additional skilling capacity requirement	378.4 million	Skilling need – current skilling capacity

There are three kinds of costs involved in this endeavour:

1. Expanding India's skilling capacity
   a. Expanding capacity to train trainers
   b. Expanding capacity to skill workforce
2. Encouraging private sector participation in skilling
3. Skilling
   a. Existing workforce
   b. New entrants

The details of each one of the above costs have been estimated in a report by PHD Chamber of Commerce and Industry and Technopak Advisors (PHD Chamber of Commerce and Industry, 2014). The detailed composition of the costs may be found in the Annexure. A summary of the costs is given below:

Finance required for skill development in India from 2015 to 2022		
Cost component	**Finance required (in 2014-15 prices)**	**Remarks**
Expanding capacity to train trainers	INR 6,000 to 7,500 crores	This will provide, through a PPP model, 300,000 to 400,000 trainers over a period of 15 years, who can then train around 7.5 to 10 million trainees per annum. It is expected that the private sector will also additionally invest in training trainers. Cost includes only initial capital investment.
Expanding capacity to skill workforce	INR 50,000 to 90,000 crores	This will provide capacity to train 5 to 6 million individuals per year. India's current capacity is 7 million individuals a year. The new investment allows a total of 12 to 13 million individuals to be trained per year (around 61 million people will require skilling each year from 2015 to 2022, which means that the remaining 48 million people need to be trained by the private sector)
Encouraging private sector participation in skilling	Unknown	The private sector needs to participate in skilling 48 million people from 2015 to 2022. It is not known whether the private sector has the capacity for this. This cost reflects the cost of investment in creating such capacity. Operational costs are considered below.
Skilling existing workforce and new entrants	INR 8,54,800 crores	Operational cost of training 427.4 million individuals, part of which will be borne by the government, part by the private sector and part by the beneficiary of training.
Total cost (in INR)	**INR 9,10,800 to 9,52,300 crores**	
Total cost (in USD)	**USD 145 to 151 billion**	

Roughly, the total minimum finance required in 2014-15 prices is INR 9 lakh crores or USD 145 billion.

Linkages

This target will contribute towards the achievement of Target 4.3 because it deals directly with technical and vocational education through skill development interventions. This target will also influence the achievement of Target 4.6 on youth and adult literacy and numeracy, as these are vital skills that many in the workforce will gain as they go through the skill development process.

TARGET 4.5, 4.6, 4.a, 4.b

4.5 By 2030, eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable, including persons with disabilities, indigenous peoples, and children in vulnerable situations

4.6 By 2030 ensure that all youth and at least x% of adults, both men and women, achieve literacy and numeracy

4.a Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all

4.b By 2020 expand by x% globally the number of scholarships for developing countries in particular LDCs, SIDS and African countries to enrol in higher education, including vocational training, ICT, technical, engineering and scientific programmes in developed countries and other developing countries

These targets are not separately assessed.

With respect to Targets 4.3 and 4.a, it is assumed that disparities in access to education will be mostly eliminated with the universalisation of education, early childhood development and enabling of access to skill development for all. However, it is recognised that there may be additional costs involved in covering the last mile: reaching out to the vulnerable and the marginalised, making school environments disability and gender-sensitive, training and capacity building of teachers and educators to handle special needs of children, etc. These costs are not included in the study.

Target 4.6 calls for 100 per cent youth literacy, which will be achieved if all children today are enrolled in education, so that by 2030, the entire youth population of the country will be literate. The cost of achieving adult literacy has not been calculated in this study.

With respect to Target 4.b, the finance required and gap estimated under Target 4.3 on university education already includes a component of scholarships. Therefore,

this target is not separately assessed. However, it is recognised that the number of scholarships currently given out to students in India may not match global standards and additional funding may be required to increase the number of scholarships, but these costs are not included in the study.

TARGET 4.c

4.c By 2030 increase by x% the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially LDCs and SIDS

Summary of Target 4.c				
Government bodies working on Target	**Programmes/ Schemes of government**	**Indicator/ Thrust area**	**Finance required***	**Gap***
Ministry of Human Resource Development	Centrally Sponsored Scheme for Teacher Education	Percentage of teachers receiving pre- and in-service training	INR 21,600 crores USD 3.5 billion (2015-30)	INR 2700 crores USD 0.5 billion (2015-30)

** In 2014-15 prices*

Background

The target calls for an increase in the supply of qualified teachers. A common measure of whether there are enough qualified teachers for all students is the pupil-teacher ratio (PTR), which is the number of pupils to one teacher.

India's current position in the supply of teachers (not necessarily well-qualified) can be assessed by looking at the pupil-teacher ratio (PTR) and the number of schools that satisfy PTR norms. The Right to Education Act mandates a ratio of thirty pupils to one teacher. The two tables given below indicate that India has enough teachers to meet PTR norms and ensure one teacher is available for every 30 students. However, as of 2014, roughly 50 per cent of schools were not meeting these norms. This necessitates a redistribution of teachers among schools.

Pupil-Teacher Ratio (Standard I-VIII) in government schools in India			
Period	**Number of students enrolled (Std. I-VIII)**	**Number of teachers (Std. I-VIII)**	**Pupil Teacher Ratio (Nationally)**
2005-06	168283332	4690176	35
2006-07	179342817	5218578	34
2007-08	185043293	5634589	33
2008-09	187727513	5789898	32
2009-10	187872996	5816673	32
2010-11	193051999	6403234	30
2011-12	199055138	6687983	30
2012-13	199710349	7354152	27
2013-14	198899659	7721903	26

Source: District Information System for Education

Percentage of government schools meeting PTR norms in India	
2010	38.9
2012	42.9
2014	49.3

Source: Annual Status of Education Report, 2014

A recent study (MoHRD, 2011) estimated around 7.74 lakh untrained teachers in India in 2012, which is more than 10 per cent of the total teachers at the time. As the below table indicates, the percentage of teachers who have received in-service training is abysmal and falling.

Percentage of teachers who have received in-service training in India	
Period	**Percentage of teachers who have received in-service training**
2005-06	40
2006-07	31.5
2007-08	36.8
2008-09	35.1
2009-10	35
2010-11	29.6
2011-12	34.2

Percentage of teachers who have received in-service training in India	
Period	**Percentage of teachers who have received in-service training**
2012-13	25.8
2013-14	22

Source: District Information System for Education

Thrust area

As mentioned before, the two main issues with respect to the supply of qualified teachers are meeting PTR norms and ensuring that teachers are well-trained and supported, both of which this study assumes to be critical to ensure effective teaching-learning processes in classrooms.

As demonstrated in the previous section, India has enough teachers to meet PTR norms, but as of 2014, roughly 50 per cent of schools were not meeting these norms. This necessitates a redistribution of teachers among schools, but without further data on the reasons for teacher surpluses and deficits in schools and the regional concentrations of teachers, a financial assessment of such a redistributive exercise is not attempted in this study.

This study focuses on the second issue of teacher education, and assesses the financial implications of strengthening India's teacher education infrastructure and processes to ensure that teachers are well-equipped to do their jobs. The Report of the Working Group on Teacher Education for the 12th Five Year Plan reviews the implementation of teacher education programmes including the functioning of District Institutes of Education Training (DIETs), State Councils for Educational Research and Training (SCERTs), Colleges of Teacher Education (CTEs) etc. and estimates the funding requirements to strengthen these institutions. The funding estimates include the cost of ensuring adequate infrastructure, plugging academic staff vacancies, updating curriculum, providing adequate in-service training programmes, and effective grant utilisation among other initiatives.

Methodology

The estimate of *finance required* is derived from the Report of the Working Group on Teacher Education for the XII Five Year Plan. The financial costs of revamping and strengthening systems to tackle these issues are also specified in the report, and are reproduced in the Annexure of the study.

To estimate the *gap*, the study looks at allocations towards teacher education in the XII Five Year Plan, and projects the allocations that will be made over the next two Five Year Plans. Assuming that the allocation in the XII Plan will be matched, if not

increased, in the subsequent two Plans, the gap is calculated by subtracting the expected availability of finance from the total finance required.

Linkages

This target will directly influence the 'effective learning outcomes' component of Target 4.1. Well-qualified teachers who receive on-going training and support will influence the learning outcomes of children.

Goal 5

Achieve gender equality and empower all women and girls

GOAL 5: ACHIEVE GENDER EQUALITY AND EMPOWER ALL WOMEN AND GIRLS

5.1 End all forms of discrimination against all women and girls everywhere

5.2 Eliminate all forms of violence against all women and girls in public and private spheres, including trafficking and sexual and other types of exploitation

5.3 Eliminate all harmful practices, such as child, early and forced marriage and female genital mutilations

5.4 Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies, and the promotion of shared responsibility within the household and the family as nationally appropriate

5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life

5.6 Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the ICPD and the Beijing Platform for Action and the outcome documents of their review conference

5.a Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance, and natural resources in accordance with national laws

5.b Enhance the use of enabling technologies, in particular ICT, to promote women's empowerment

5.c Adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and the empowerment of all women and girls at all levels

FINANCIAL ASSESSMENT OF GOAL 5

Financial Assessment of Goal 5				
Targets	**Classification**	**Linkages**	**Finance required***	**Gap***
5.1 end all forms of discrimination against all women and girls everywhere	Assessed together	Goals 2, 3, 4, 6, 7, 8, 9, 10, 16	INR 89 lakh crores USD 1408 billion (2016-30)	INR 69 lakh crores USD 1091 billion (2016-30)
5.2 eliminate all forms of violence against all women and girls in public and private spheres, including trafficking and sexual and other types of exploitation				
5.3 eliminate all harmful practices, such as child, early and forced marriage and female genital mutilations				
5.4 recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies, and the promotion of shared responsibility within the household and the family as nationally appropriate				
5.5 ensure women ś full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life				
5.6 ensure universal access to sexual and reproductive health and reproductive rights as agreed in				

Financial Assessment of Goal 5				
Targets	**Classification**	**Linkages**	**Finance required***	**Gap***
accordance with the Programme of Action of the ICPD and the Beijing Platform for Action and the outcome documents of their review conference				
5.a undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance, and natural resources in accordance with national laws	Not assessed			
5.b enhance the use of enabling technologies, in particular ICT, to promote women's empowerment				
5.c adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and the empowerment of all women and girls at all levels				
		Total	**INR 89 lakh crores USD 1408 billion (2016-30)**	**INR 69 lakh crores USD 1091 billion (2016-30)**

** In 2014-15 prices*

*** Finance required and gap are not to be added to the cumulative total of all goals as the goal is cross-cutting other goals.*

GOAL 5 ASSESSMENT SUMMARY

The goal calls for ending achieving gender equality by ending all forms of discrimination against women, and empowering women in all spheres of life.

In India, discriminatory attitudes towards women have existed for many generations. This is visible in a multitude of indicators: India's child (aged 0-6) sex ratio as of 2011 is 914 females per 1000 males, declining from 927 in 2001 (Times of India, 2011). Although literacy rates are increasing, women still lag behind men; the female literacy rate as of 2011 is only 65.46per cent, compared to 82.14per cent for males[12]. Social attitudes and mindsets discriminate against women in a variety of contexts.

No country in the world has achieved complete gender equality yet, but some countries are getting close. According to the World Economic Forum's Global Gender Gap Report 2014, Iceland ranks number 1 in the global ranking, with a score of 0.8594 in 2014 (highest possible score is 1, which indicates perfect equality). India, on the other hand, ranks 114 out of 142 countries. In fact, the trends observed in the Global Gender Gap Reports indicate that the year of gender equality in the workplace is at least 8 decades away (World Economic Forum, 2014)!

Clearly, India and the rest of the world have a long way to go before it can achieve gender equality. It would be extremely incorrect to assume that gender equality can be achieved by simply allocating more public funds for women, as social change requires much, much more than just finance. At a fundamental level, it requires a change in attitudes and mindsets of people and the political will to empower women, among countless other factors. Notwithstanding these considerations, this study presents a rough estimate of the finance required to achieve gender equality. This number must be interpreted with caution due to the inherent caveats in estimating such a number.

The sustainable development goal on gender is a cross-cutting goal that will influence and be influenced by the achievement or non-achievement of most of the other sustainable development goals. Gender equality is inextricably linked to the provision of equal opportunities in and access to education, employment, healthcare, food security, energy, water, sanitation and political empowerment. Therefore, the estimate of finance required and gap to achieve gender equality in India presented here includes components of finance from most other goals (because of which it would be incorrect to add the estimates presented here with the estimates for other goals, as that would lead to double counting).

The finance estimates are as follows: In 2014-15 prices, India must allocate a total of INR 89 lakh crores or USD 1408 billion of public finance for women from 2016 to

[12] Census of India 2011

2030. The anticipated gap in finance is roughly INR 69 lakh crores or USD 1091 billion.

TARGETS 5.1, 5.2, 5.3, 5.4, 5.5, 5.6

5.1 End all forms of discrimination against all women and girls everywhere

5.2 Eliminate all forms of violence against all women and girls in public and private spheres, including trafficking and sexual and other types of exploitation

5.3 Eliminate all harmful practices, such as child, early and forced marriage and female genital mutilations

5.4 Recognize and value unpaid care and domestic work through the provision of public services, infrastructure and social protection policies, and the promotion of shared responsibility within the household and the family as nationally appropriate

5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic, and public life

5.6 Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Programme of Action of the ICPD and the Beijing Platform for Action and the outcome documents of their review conference

Summary of Targets 5.1 to 5.6				
Government bodies working on Target	**Programmes/ Schemes of government**	**Indicator/ Thrust area**	**Finance required***	**Gap****
Ministry of Women and Child Development	Multiple schemes cutting across Ministries	Gender Gap Index	INR 89 lakh crores USD 1408 billion (2016-30)	INR 69 lakh crores USD 1091 billion (2016-30)

** In 2014-15 prices*

*** Finance required and gap are not to be added to the cumulative total of all goals as the goal is cross-cutting other goals.*

Background

India runs several schemes for its women. Although the Ministry of Women and Child Development is the nodal ministry to empower women, most of the other Ministries also run schemes for women.

The Gender Budget Statement was first introduced in the government budget of 2005-06. This Statement indicates, in two parts, the budget provisions for schemes that are substantially meant for the benefit of women. Part A details schemes in which 100 per cent provision is for women, Part B reflects schemes where the allocations for women constitute at least 30 per cent of the provision.[13] So far, 57 government Ministries/departments in India have set up Gender Budgeting Cells (Mishra & Tavares, 2015). In essence, the gender budget statements tell us the total budget allocation for women each year.

This section assesses the finance required to achieve gender equality in India. Part of the finance gap as estimated in this section will be plugged through investments in other SDGs. Therefore, the finance required and gap estimates presented here should not be added those of other goals to get an overall estimate, as that would involve double counting many costs.

Basis for choosing indicator

While no single measure can capture the complete situation, the Gender Gap Index, published every year in the World Economic Forum's annual Global Gender Gap Report (World Economic Forum, 2014) seeks to measure the relative gaps between women and men across four key areas. It aims to understand whether countries are distributing their resources and opportunities equitably between women and men, irrespective of their overall income levels. The four key areas are:

- Economic participation and opportunity – salaries, participation and leadership
- Education – access to basic and higher levels of education
- Political empowerment – representation in decision-making structures
- Health and survival – life expectancy and sex ratio

Index scores can be interpreted as the percentage of the gap that has been reduced between women and men, and allow countries to compare their current performance relative to their past performance.

This index reflects a majority of the provisions of the targets assessed in this section of the study: it reflects the degree of discrimination against women in all spheres, women's economic, social and political participation, women's health and survival statistics as well as women's education and empowerment.

[13] *Gender Budget, Expenditure Budget Volume 1, 2015-16,* http://wcd.nic.in/gb/material/Instructions/GBStatement-20.%20-%202015-16.pdf (accessed *June 2015)*

Methodology

The estimates of finance required for achieving gender equality presented in this report are drawn from a study (Grown, Bahadur, Handbury, & Elson, 2006) that estimates the per capita cost of achieving gender equality and gender mainstreaming (in line with MDG 3) in the five low-income countries of Bangladesh, Cambodia, Tanzania, Ghana and Uganda. The study takes into consideration costs of interventions that explicitly aim to reduce gender inequality or empower women, as well as interventions implemented within other MDG sectors (education, health etc.) That help achieve gender equality and empower women in that sector. This is much like the division of the Indian gender budget, wherein part A consists of schemes exclusively meant for women and part B reflects schemes in which allocations for women constitute at least 30 per cent of the provision. The only difference is that the study does not consider interventions outside the MDG sectors (education, health, rural development, urban development and slum upgrading, water and sanitation, and energy), whereas the Indian gender budget covers a large number of sectors ranging from education to policing to agriculture. Nevertheless, the estimates presented in the study are a useful starting point to arrive at a ballpark figure of the costs of achieving gender equality. Moreover, the countries this study focuses on, are in almost the same position as India in terms of gender equality parameters, as shown by the table below. This makes it possible to extend the findings of the report to India.

Global Gender Gap Index (Global Gender Gap Report 2014, World Economic Forum)					
Country	**Economic Participa-tion and Opportun-ity**	**Educatio-nal Attainment**	**Health and survival**	**Political Empower-ment**	**Gender Gap Index (Overall)**
Bangladesh	0.477	0.94	0.966	0.406	0.697
Cambodia	0.654	0.833	0.98	0.091	0.652
Ghana	0.677	0.91	0.967	0.11	0.666
Tanzania	0.708	0.875	0.973	0.317	0.718
Uganda	0.631	0.846	0.967	0.284	0.682
India	0.41	0.85	0.937	0.385	0.646

Considering the costs of a large number of interventions needed to achieve gender equality, the study estimates the average annual per capita costs of achieving gender equality in the five countries: USD 37.24 in Bangladesh, USD 46.69 in Cambodia, USD

51.90 in Ghana, USD 56.88 in Tanzania, and USD 52.00 in Uganda (all costs in 2003 USD prices), for a period of 10 years (from 2005 to 2015).

Given that the value of gender indicators in India is comparable to that of the other 5 countries (with that of Bangladesh being the closest), it is assumed that the finance needed to achieve gender equality in India would also be of the same order of magnitude as that in the other countries.

When converted into Indian rupees, the proposed finance requirement in the five countries works out to INR 2381 per capita per year (2004-05 prices). It is projected that India would require roughly the same amount of finance. In 2015-16, India's gender budget was only INR 350 per capita (in 2004-05 prices) (see Annexure).

The total *finance required* has been estimated by multiplying the per capita spending needed by the projected population in each year from 2015 to 2030, and then summing over 2015-30 (see Annexure).

To estimate *gap*, it has been assumed that India will continue to spend approximately INR 506 per capita per year (in 2004-05 prices) every year until 2030. This is the average expenditure per capita of the last five years (see Annexure). At this rate, taking into account projected population in the future, the total finance that is expected to be allocated until 2030 is calculated and subtracted from the required finance.

Linkages

Closing the gender gap is closely related to closing gender disparities in access to food, health, education, employment and other forms of social empowerment. Therefore, achievements in SDGs 2 (food security), 3 (health), 4 (education), 6 (water), 7 (energy), 8 (economic growth), 9 (infrastructure), 10 (reducing inequality) and 16 (peaceful societies) will certainly impact Goal 5.

TARGETS 5.a, 5.b, 5.c

5.a Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance, and natural resources in accordance with national laws

5.b Enhance the use of enabling technologies, in particular ICT, to promote women's empowerment

5.c Adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and the empowerment of all women and girls at all levels

Targets 5.a, 5.b and 5.c are means of implementation for achieving gender equality. The costs of such interventions are already accounted for in the analysis of the previous section, therefore these targets are not re-assessed here.

Goal 6

Ensure availability and sustainable management of water and sanitation for all

GOAL 6 ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all

6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and increasing recycling and safe reuse by x% globally

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity, and substantially reduce the number of people suffering from water scarcity

6.5 By 2030 implement integrated water resources management at all levels, including through trans boundary cooperation as appropriate

6.6 By 2020 protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

6.a By 2030, expand international cooperation and capacity-building support to developing countries in water and sanitation related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

6.b Support and strengthen the participation of local communities for improving water and sanitation management

FINANCIAL ASSESSMENT OF GOAL 6

Financial Assessment of Goal 6				
Targets	**Classification**	**Linkages**	**Finance required***	**Gap***
6.1 by 2030, achieve universal and equitable access to safe and affordable drinking water for all	Assessed independently	Goal 3, 11, 12, 14. Targets 6.3, 6.4, 6.5	INR 4 lakh crores USD 64 billion (2015-22)	None
6.2 by 2030, achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations	Assessed independently	Goals 3, 11 Target 6.1	INR 2 lakh crores USD 32 billion (2015-19)	INR 1.56 lakh crores USD 25 billion (2015-19)
6.3 by 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and increasing recycling and safe reuse by x% globally	Assessed independently	Goals 2, 7, 8, 9, 11, 12, 14	INR 6.5 lakh crores USD 103 billion (2015-30)	INR 6.2 lakh crores USD 98 billion (2015-30)
6.4 by 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity, and substantially reduce the number of people suffering from water scarcity	Considered under Goal 13	Goal 2, 7, 11		

Financial Assessment of Goal 6				
Targets	**Classification**	**Linkages**	**Finance required***	**Gap***
6.5 by 2030 implement integrated water resources management at all levels, including through transboundary cooperation as appropriate				
6.6 by 2020 protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	Considered under Goal 14			
6.a by 2030, expand international cooperation and capacity-building support to developing countries in water and sanitation related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies	Not assessed			
6.b support and strengthen the participation of local communities for improving water and sanitation management	Follows from other targets	6.1, 6.2		
		Total	**INR 13 lakh crores USD 199 billion**	**INR 8 lakh crores USD 123 billion**

** In 2014-15 prices*

GOAL 6 ASSESSMENT SUMMARY

Goal 6 deals with all aspects of water availability, access and use. The targets within this goal are closely linked to one another and also to other goals. For example, universal provision of drinking water (Target 6.1) and sanitation coverage (Target 6.3) can only be achieved if existing water bodies are sustainably used (Goal 12) and the quality of water in these bodies is kept at an acceptable standard (Target 6.3). Maintenance of water quality is in turn dependent on the way industry, agriculture and other sectors use and dispose of water. Industrial effluents and sewage are major sources of water pollution, but are also consequences of uncontrolled industrialisation and urbanisation. Goals 9 and 11 (on industrialisation and urbanisation respectively) must address these concerns.

The current government has announced an ambitious target of providing universal water and sanitation coverage to India by 2019. While India has almost achieved universal coverage of drinking water, it is far from achieving universal access to piped water supply and providing a quantity of water that is consistent with international norms. Similarly, sanitation in India is a major concern, with roughly 60 per cent of the rural population not having access to toilets. The government has a mammoth task set out for itself, not only in constructing toilets for all but also creating behaviour change so that people understand the risks of open defecation and begin to use these toilets.

Water pollution is another major concern in India. River Ganga is one of the most polluted rivers in India, however it is not the only one in need of immediate attention. Consider the state of Gujarat's water bodies. Even as Gujarat basks in the glory of its industrial development, the Golden Corridor in South Gujarat has gained international infamy for extreme land and water pollution, which has affected the lives of lakhs of residents living in the region. According to an annual research conducted by Blacksmith Institute in 2008, four sites from Gujarat figure in South Asia's 66 most-polluted sites (Centre for Science and Environment, 2000).

It is important to take an integrated, balanced approach to managing water resources. Water is a necessity in almost all sectors of the economy. The allocation of water among various uses should be carefully planned to ensure sustainability. Research and development efforts need to be targeted at improving water use efficiency as fresh water becomes a scarce resource.

This study estimates the finance required and gaps in achieving universal drinking water and sanitation coverage and initiating efforts to clean India's water bodies. Integrated water resource management and efforts to increase water use efficiency are considered under Goal 13. The total finance required is estimated at INR 13 lakh crores (USD 199 billion) and the gap at INR 8 lakh crores (USD 123 billion).

TARGET 6.1

6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all

Summary of Target 6.1				
Government bodies working on Target	**Programmes/ Schemes of government**	**Indicator/Thrust area**	**Finance required***	**Gap***
Ministry of Drinking Water and Sanitation	National Rural Drinking Water Programme	Number and percentage of households with access to improved sources of water Quantity of water provided	INR 4 lakh crores USD 64 billion (2015-22)	None

** In 2014-15 prices*

Background

According to the WHO-UNICEF Joint Monitoring Programme for Water Supply and Sanitation, as of 2012, 96.7 per cent of urban and 90.7 per cent of rural Indian population had access to improved[14] water sources. India is poised to achieve universal improved water coverage by 2030. However, providing universal rural drinking water coverage far from achieves the target of "universal and equitable access to safe and affordable drinking water for all". The current mechanism is plagued by a host of problems, such as falling water tables, dilapidated facilities due to lack of proper institutional arrangements to carry out operations and maintenance, bacteriological contamination of water, chemical contamination of water (particularly fluorides and arsenic), slip-back of habitations that were "fully covered" by government water schemes into the "partially covered" category due to deteriorating water quality and other problems, and social exclusion of backward communities due to discrimination. Moreover, even where water of good quality is available, per capita norms for water provision are not met (only 35 per cent of the rural population had access to 40 litres of water per capita per day or more in 2011[15]) and significant investments are needed to provide the new government norm of 70 litres per capita per day[16]. The XII Five Year Plan has set 55 litres of water

[14] As per the WHO/UNICEF Joint Monitoring Programme (JMP) for Water Supply and Sanitation, improved water sources could be any of the following: i) piped water into dwelling, plot or yard, ii) public tap/standpipe, iii) tube well/borehole, iv) protected dug well, v) protected spring, and vi) rainwater collection.

[15] Twelfth Five Year Plan (2012-17) Economic Sectors Volume II: Rural Drinking Water and Sanitation

[16] Twelfth Five Year Plan (2012-17) Economic Sectors Volume II: Rural Drinking Water and Sanitation

per capita per day as an interim norm for 2012-17, with 70 litres per capita per day being the longer-term goal.

Thrust area

This section of the study deals with water access in only rural areas. Urban water supply is considered under Goal 11.

The Strategic Plan of the Department of Drinking Water and Sanitation (MoRD, 2010) has outlined five strategic objectives to address the challenges in the rural drinking water sector and achieve its goals (the detailed list may be found in the Annexure):

1. Enable participatory planning and implementation of schemes and source sustainability
2. Water quality management
3. Sustainable service delivery (operation and maintenance)
4. Strengthening of decentralised governance
5. Building of professional capacity

The study focuses on the aforementioned aspects of drinking water supply and attempts an assessment of the finance required and gap in addressing these aspects.

Methodology

The estimate of *finance required* is derived from the Strategic Plan of the Department of Drinking Water and Sanitation. The Strategic Plan estimates the requirement of financial resources to achieve the aforementioned objectives and provide, by 2022, 90 per cent of the rural population with 70 litres per capita per day through piped water supply. Details of the estimate may be found in the Annexure.

To estimate *gap*, expected availability of finance was estimated by looking at past Five Year Plan allocations, and the estimated availability was subtracted from the finance required.

Linkages

Clean drinking water can prevent a host of water-borne diseases. Sufficient consumption of clean drinking water is crucial to maintain good health and well-being. Therefore, this target will influence the achievement of Goal 3 related to health. Availability of water supply is dependent on the effective management of water resources (Targets 6.4 and 6.5, Goal 13), sustainability of water use in production and consumption (Goal 12), infrastructure to provide piped water supply and other related services (Goal 11) and water quality management (Target 6.3, Goal 14).

TARGET 6.2

6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

Summary of Target 6.2				
Government bodies working on Target	**Programmes/ Schemes of government**	**Indicator/ Thrust area**	**Finance required***	**Gap***
Ministry of Drinking Water and Sanitation	Swachh Bharat Mission Jawaharlal Nehru National Urban Renewal Mission	Number and percentage of households with access to toilets	INR 2 lakh crores USD 32 billion (2015-19)	INR 1.56 lakh crores USD 25 billion (2015-19)

** In 2014-15 prices*

Background

According to a baseline survey done by the Ministry of Drinking Water and Sanitation in 2012, only 38.81 per cent of households in rural India had toilets (MoDWS, 2012). The Swachh Bharat Mission, launched by the government of India on 2nd October 2014, aims to provide universal access to sanitation and hygiene for all and eliminate open defecation.

This section is divided into two parts: rural and urban sanitation. This section only deals with access to toilets. Other aspects of sanitation and hygiene like piped water supply (Target 6.1 for rural areas), sewage systems, solid waste management etc. are dealt with under Goal 11 for urban areas.

Thrust area

This study considers access to toilets in rural and urban India. Rural sanitation is a mandate of the Ministry of Drinking Water and Sanitation under the Swachh Bharat Mission, while urban sanitation falls under the purview of the Ministry of Urban Development under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM).

It is important to note that the gap in finance estimated below for both rural and urban sanitation may be filled, at least partially, through a number of initiatives that

the government has announced for this purpose. The government plans to impose a special Swachh Bharat Cess, activate the Swachh Bharat Kosh to tap Corporate Social Responsibility (CSR) funds, and have states contribute more funds to the Mission by increasing the share of taxes and duties devolved to the states from the Centre this year. However, it remains to be seen to what extent these initiatives will close the gap in finance for the Mission, because of which these initiatives have been ignored in the estimation of the gap.

Methodology

An estimate of *finance required* to achieve complete sanitation coverage in India has been done by the government of India. The government has estimated a total of INR 1,34,000 crores for rural India and INR 69,000 crores for urban India to achieve universal sanitation coverage and eliminate open defecation completely by 2019 (Press Trust of India, 2014).

For rural sanitation, the gap was estimated by projecting the future budget allocations for rural sanitation coverage based on past trends in public expenditures, and subtracting these future allocations from the finance required.

For urban sanitation, of the total finance required (INR 69,000 crores), the central government will provide INR 14,623 crores for the project from 2015 to 2019, and the states and union territories would be required to contribute INR 4,874 crores. The remaining finance required amounts to INR 42,512 crores, which the government has set as the private sector investment target between 2015 and 2019 (Press Trust of India, 2014). Assuming that both the Centre and States will contribute their shares, the *gap* in urban sanitation is INR 42,512 crores.

Linkages

Proper sanitation and hygiene can prevent a host of diseases, and help maintain good health and well-being. Therefore, this target will influence the achievement of Goal 3 related to health. Toilets also require reliable water supply, which in turn depends on the fulfilment of Target 6.1, which calls for universal access to water, and Goal 11, which includes a component of urban water supply systems.

TARGET 6.3

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and increasing recycling and safe reuse by x% globally

Summary of Target 6.3				
Government bodies working on Target	**Programmes/Schemes of government**	**Indicator/ Thrust area**	**Finance required***	**Gap**
Ministry of Water Resources, River Development and Ganga Rejuvenation	Ganga Action Plan, Repair, Renovation & Restoration (RRR) of Water Bodies and other schemes	Water pollution	INR 6.5 lakh crores USD 103 billion (2015-30)	INR 6.2 lakh crores USD 98 billion (2015-30)

** In 2014-15 prices*

Background

Canals, rivers and lakes in India often serve as dumping grounds for sewage, solid and liquid wastes. Water pollution adversely affects not only aquatic plants and animals but also human beings and ecosystems. The River Ganga provides water to over 40 per cent of India's population in 11 states, while simultaneously receiving 2900 million litres of sewage daily, which creates substantial risks for human beings and the environment (IANS, 2012). The current target calls for improving water quality by reducing pollution.

Thrust area

This study considers the following aspects of improving water quality:

1. Cleaning up water bodies and reversing the damage already done
2. Preventing further pollution from industry through treatment of industrial waste and waste-water
3. Preventing further pollution from domestic waste water through effective sewage treatment systems
4. Solid waste management
5. Protecting water bodies by conferring "protected" status on them

This section deals with the cost of the first intervention, namely, cleaning up water bodies and reversing the damage already done.

The second intervention – preventing further pollution from industry through treatment of industrial waste and waste-water – need not be a substantial public expenditure. Indian norms already require industries to treat their hazardous waste before releasing them. In fact, there are already many private sector initiatives in

India that undertake waste management for industries.[17] The government only needs to incentivise more of such initiatives. The major portion of the cost of industrial solid waste and waste-water treatment will be borne by the private sector, and therefore those costs are not calculated in this study.

The third and the fourth interventions – preventing further pollution from domestic waste water through effective sewage treatment systems, and solid waste management – are specifically dealt with under Goal 11 as components of urban infrastructure and services. The fifth intervention, namely protecting water bodies by conferring "protected" status on them, is dealt with under Goal 14.

Therefore, this section deals with only the cost of cleaning India's inland water bodies. Further, due to limited availability of data, this study deals specifically with the financial implications of cleaning the River Ganga. No studies or reports could be found on the financial implications of cleaning up all of India's water bodies. To make an overall estimate, one would have to scale up the estimates for the Ganga River to other water bodies in India. The scaling factor would depend on the length of the river, extent of damage already done, nature of damage (chemical or bacteriological, toxic or non-toxic, exact composition of different kinds of pollutants) etc. Such research is beyond the present scope.

Methodology

The estimates of *finance required* for cleaning up the River Ganga are drawn from The Ganga River Basin Management Plan 2015 (GRBMP), prepared by Indian Institute of Technology Consortium (IITC), which suggests that nearly INR 6,00,000-7,00,000 crores are required to address the problem caused by the material dumped into the river (NDTV India, 2015).

To estimate the *gap*, the study analyses a number of reports. In its report on demands for grant for the year 2012-13 for the Union environment ministry, the Parliamentary Committee on Environment and Forests said in the last twenty years, the ministry has spent INR 39,226 crores on cleaning river Ganga and INR 1,306 crores on Yamuna but the quality of water in both the rivers is deteriorating day-by-day (Srivastava, 2012). The Union budget of the current fiscal year (2015-16) allocated a meagre INR 2,037 crores for the Ganga clean-up project (Khanna & Sethi, 2014). This shows that India can expect a significant finance gap in cleaning up its water bodies. If Indian union budget continues to allocate roughly INR 2000 crores a year for the next 15 years (2015-30), the total finance expected to be available is

[17] For example, Water technology company VA Tech Wabag recycles industrial and municipal waste water either for reuse as drinking water or to plough back for industrial use. Waste management company Hanjer Biotech Energies is turning solid waste into fuel to run power plants. Arora Fibres recycles discarded plastic bottles into polyester used as packaging material. Ramky Enviro Engineers Limited (REEL) operates 12 facilities that handle over a million tonnes of hazardous waste annually.

roughly INR 30,000 crores, which when subtracted from the total finance requirement of roughly INR 6.5 lakh crores, leaves a significant gap of INR 6.2 lakh crores.

Linkages

Access to clean drinking water, sanitation and hygiene is crucially dependent on the maintenance of the quality of water. Therefore, the achievement of the current target will influence the achievement of Targets 6.1 and 6.2. The causes of water pollution are many, but most of the causes originate in the way water is used and disposed of by agriculture, industry and domestic consumers. Release of industrial effluents into water and over-fertilisation in agriculture are a major cause of water pollution. Therefore, the achievement of the current target is crucially dependent on the pathways used to achieve Goals 2 (agriculture), 7 (energy), 8 (economic growth), 9 (infrastructure) and 11 (urbanisation). It is important to employ SCP practices as outlined in Goal 12 to ensure that development in other sectors does not deteriorate water quality. Lastly, the achievement of this target is also crucially linked to the achievement of Goal 14, which calls for sustainable use and protection of marine and other water resources.

TARGETS 6.4, 6.5, 6.6, 6.a, 6.b

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity, and substantially reduce the number of people suffering from water scarcity

6.5 By 2030 implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

6.6 By 2020 protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

6.a By 2030, expand international cooperation and capacity-building support to developing countries in water and sanitation related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies

6.b Support and strengthen the participation of local communities for improving water and sanitation management

Targets 6.4 and 6.5 in India will be implemented through the National Water Mission of the Ministry of Water Resources, River Development and Ganga Rejuvenation. The National Water Mission works to increase water use efficiency and implement

Integrated Water Resources Management in India. The National Water Mission is financially assessed under Goal 13.

Target 6.6 is considered under Goals 14 and 15, which together call for the protection of biodiversity and ecosystems, both terrestrial and aquatic.

Target 6.a is not assessed in this study. India, being a developing country, would be a recipient of capacity building and other forms of support from developed countries. India may also provide official development assistance to other countries. The net financial flows and their impacts are difficult to forecast.

Target 6.b calls for strengthening community participation in water and sanitation management. Community participation is an integral part of the water and sanitation coverage campaigns of the government. For example, under the National Rural Drinking Water Programme, funds are separately earmarked for capacity building of local communities and decentralised water governance. Therefore, Target 6.b will be achieved if Targets 6.1 and 6.2 are achieved. If there are additional administrative costs to strengthen community participation, such costs are not considered here.

Goal 7

Ensure access to affordable, reliable, sustainable and modern energy for all

GOAL 7: ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL

7.1 By 2030, ensure universal access to affordable, reliable and modern energy services

7.2 By 2030, increase substantially the share of renewable energy in the global energy mix

7.3 By 2030, double the global rate of improvement in energy efficiency

7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology

7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries and small island developing State.

FINANCIAL ASSESSMENT OF GOAL 7

Financial Assessment of Goal 7				
Targets	**Classification**	**Linkages**	**Finance Required***	**Gap***
7.1 By 2030, ensure universal access to affordable, reliable and modern energy Services	Assessed together	Goal 9, 10, 12	INR 54 lakh crores USD 854 billion (2015-30)	INR 26 lakh crores USD 406 billion (2015-30)
7.2 By 2030, increase substantially the share of renewable energy in the global energy mix				
7.3 By 2030, double the global rate of improvement in energy efficiency				
7.a By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology	Considered under finance for research and development			
7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries and small island developing State.	Not assessed	Targets 7.1, 7.2		
		Total	**INR 54 lakh crores USD 854 billion**	**INR 26 lakh crores USD 406 billion**

** In 2014-15 prices*

GOAL 7 ASSESSMENT SUMMARY

For ensuring access to energy in the Business As Usual (BAU) scenario, that is, a fossil fuel dominant energy mix, India would require finances of the order of INR 28 lakh crores as capital investment in production capacity. India may opt for two other scenarios. If India moderately increases the share of renewable energy and reduces the fossil fuel component from the current 60 per cent to 50 per cent, the financial requirement increases to INR 34 lakh crores of capital investment in production capacity. India may also opt for an energy mix with net-zero emissions by 2050, for which by 2030 it must reduce the fossil fuel energy component further from 50 per cent to 27 per cent. Such a scenario would cost INR 42.5 lakh crores as capital investment in production capacity. Additional investments have been estimated for transmission and distribution, and clean cooking fuel. The overall finance required is estimated at INR 54 lakh crores (USD 854 billion) with an expected gap of INR 26 lakh crores (USD 406 billion).

At first blush, it appears that renewable energy options are more expensive. However, it is important to remember that the costs presented here are only capital investment costs. Before a comparison can be made, other kinds of costs such as operations and management, financing costs etc. have to be considered. In fact, some studies suggest that after a comprehensive consideration of all costs, renewable energy options can actually free up money in the long term (Nelson, Morgan, Goggins, Sarah, & Zuckerman, 2014).

Moreover, there are certain key features of the energy sector that incentivise India to make choices of adopting alternative sources like renewable energy. Apart from the mitigation gains that will occur in renewable energy scenarios, there may be certain implications on India's trade flows. Due to the low quality of Indian coal, continuing the BAU scenario will require India to import coal from South Africa, Austria and other countries. In addition, India will also continue to import gasoline, which will increase its trade deficit. This will increase India's energy insecurity due to high dependence on foreign imports. Increasing market prices of coal and falling prices of renewable energy costs further provide a rationale for India to choose alternative energy sources beyond fossil fuels.

TARGETS 7.1, 7.2, 7.3

7.1 By 2030, ensure universal access to affordable, reliable and modern energy services

7.2 By 2030, increase substantially the share of renewable energy in the global energy mix

7.3 By 2030, double the global rate of improvement in energy efficiency

Summary of Targets 7.1, 7.2, 7.3				
Government bodies working on the target	**Programmes/ Schemes of government**	**Indicator/ Thrust Area**	**Finance Required***	**Gap***
Ministry of Coal, Ministry of Power and Ministry of New and Renewable Energy	Deendayal Upadhyaya Gram Jyoti Yojana, Jawahar Lal Nehru National Solar Mission, Renewable Energy Vision, Efficient Household Lighting programme	100 per cent village electrification, 24 x 7 access to electricity for all, generation capacity	INR 54 lakh crores USD 854 billion (2015-30)	INR 26 lakh crores USD 406 billion (2015-30)

**In 2014-15 prices*

Background

India still has to build approximately 80 per cent of the physical assets – infrastructure, commercial, residential estate – that it will require in 2030. With the expectation of India's GDP to grow at a rate of 7 to 8 per cent per year, India will need to expand its capacity to generate electricity to meet increasing industrial and residential demand, which will impel a corresponding increase in greenhouse-gas (GHG) emissions (Gupta, Mantry, & Srinivasan, 2012).

Inequities in terms of energy access have been widening over the years between urban and rural areas as well as across states. The number of households without electricity has decreased only marginally from 78 million in 2001 to 75 million in 2011 as per the Census of India data. In this context, we should note that development of renewable energy is an important precondition for improving energy access for people (Centre for Budget and Governance Accountability, 2015).

India will experience dramatic increases in demand for materials and energy, placing serious constraints on natural resources such as land, water, minerals and fossil fuels, and driving up energy and commodity prices. Increasing activity will lead to increasing generation of waste and pollution, particularly in the form of higher GHG emissions. Ultimately, these challenges could curb India's ability to grow, rendering its momentum unsustainable.

Thrust area

The study calculates primarily the investment requirements for enhancing India's generation capacity and transmission and distribution network to meet energy demand by 2030. These costs are investment costs and do not include operations and management, therefore they must be interpreted carefully. The study also calculates the cost of providing access to clean cooking fuel for all. Other areas of energy consumption, particularly the transport sector, are beyond the scope of the study.

Methodology

There were two costs calculated under these targets:

a. Sustainable electricity access for all, and doubling energy efficiency and renewable energy share in the mix by 2030
b. Access to clean and modern energy fuel for cooking

Sustainable electricity access for all, and doubling energy efficiency and renewable energy share in the mix by 2030

The Integrated Energy Policy makes a detailed assessment of the energy demand for the period until 2030-31 at varying levels of GDP growth. The India Energy Security Scenarios 2047 (IESS 2047), an exercise of the NITI Aayog (erstwhile Planning Commission), builds upon the assessment of the Integrated Energy Policy to generate energy demand and supply scenarios for India up to the year 2047 (GoI).

This study's methodology is to assess the requirement of additional electricity generation capacities, based on the assessed demand and current electricity generation capacities and using government targets for renewable and nuclear energy, thus arriving at three possible scenarios of energy mix. Scenario 1 would be a BAU scenario, which is a fossil fuel dominant energy mix. The second scenario would be an energy mix with a moderate component of renewable energy. The third would be a net zero emission energy mix by 2050. The costs for electricity generation capacity addition would be based on current prices for each of the technologies as determined by the Ministry of New and Renewable Energy. The gap in finance requirement, would be the difference in costs of a BAU energy mix vis-à-vis a net zero emission energy mix. The scenarios would factor in demand side management (energy efficiency measures) too. The actual gap could be much higher than estimated here, as there may be financial shortfalls in achieving even the BAU scenario. However, due to difficultly in predicting future investment in energy as sources of investment are very varied, gap within the BAU is not assessed in this study.

The costs of infrastructure for transmission and distribution of electricity are additionally calculated assuming that these costs are roughly 40% of the cost of the

generation infrastructure. This proportion has been derived from a study by Energy Technology Systems Analysis Programme (Energy Technology Systems Analysis Programme, 2014), which states that depending on the region, the cost for transmission infrastructure varies between 4 and 15 per cent of the total cost, and distribution infrastructure between 27 and 34 per cent of the total cost. An average cost of 40 per cent has been used for this study.

Access to clean and modern energy fuel for cooking

This study derives the estimates of finance required to provide clean and modern fuel for cooking to all by 2030 from the estimates of World Bank's ESMAP Division and that of United Nations Sustainable Energy for All.

Linkages

Access to and availability of clean and modern energy is closely linked with infrastructure development and production systems. This group of targets in Goal 7 is therefore closely related to India's choices of infrastructure growth strategies (Goals 9 and 11) and affects the achievement of sustainable production systems (Goal 12). This goal is also closely associated with climate mitigation as energy consumption is one of the primary emitters of GHGs, and thus has very strong linkages with Goal 13 on combatting climate change.

TARGETS 7.b

7.b By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries and small island developing State.

This target is beyond the present scope of the study. It looks at infrastructure and system for energy generation in developing countries. While some costs are included in the 7.1, 7.2 and 7.3, other costs like grid infrastructures are not taken into account under this study which may require additional finances.

Goal 8

Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

GOAL 8: PROMOTE SUSTAINED, INCLUSIVE AND SUSTAINABLE ECONOMIC GROWTH, FULL AND PRODUCTIVE EMPLOYMENT AND DECENT WORK FOR ALL

8.1 Sustain per capita economic growth in accordance with national circumstances, and in particular at least 7% per annum GDP growth in the least-developed countries

8.2 Achieve higher levels of productivity of economies through diversification, technological upgrading and innovation, including through a focus on high value added and labour-intensive sectors

8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage formalization and growth of micro-, small- and medium-sized enterprises including through access to financial services

8.4 Improve progressively through 2030 global resource efficiency in consumption and production, and endeavour to decouple economic growth from environmental degradation in accordance with the 10-year framework of programmes on sustainable consumption and production with developed countries taking the lead

8.5 By 2030 achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value

8.6 By 2020 substantially reduce the proportion of youth not in employment, education or training

8.7 Take immediate and effective measures to secure the prohibition and elimination of the worst forms of child labour, eradicate forced labour, and by 2025 end child labour in all its forms including recruitment and use of child soldiers

8.8 Protect labour rights and promote safe and secure working environments of all workers, including migrant workers, particularly women migrants, and those in precarious employment

8.9 By 2030 devise and implement policies to promote sustainable tourism which creates jobs, promotes local culture and products

8.10 Strengthen the capacity of domestic financial institutions to encourage and to expand access to banking, insurance and financial services for all

8.a Increase Aid for Trade support for developing countries, particularly LDCs, including through the Enhanced Integrated Framework for LDCs

8.b By 2020 develop and operationalize a global strategy for youth employment and implement the ILO Global Jobs Pact

FINANCIAL ASSESSMENT OF GOAL 8

Financial Assessment of Goal 8				
Targets	**Classification**	**Linkages**	**Finance required***	**Gap***
8.1 sustain per capita economic growth in accordance with national circumstances, and in particular at least 7% per annum GDP growth in the least-developed countries	Not assessed			
8.2 achieve higher levels of productivity of economies through diversification, technological upgrading and innovation, including through a focus on high value added and labour-intensive sectors	Considered under finance for research and development			
8.3 promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage formalization and growth of micro-, small- and medium-sized enterprises including through access to financial services	Assessed independently	Targets 8.1, 8.4, 8.5, 9.2, 9.3, 12.1	INR 148 lakh crores USD 2360 billion (2015-20)	INR 105 lakh crores USD 1672 billion (2015-20)
8.4 improve progressively through 2030 global resource efficiency in consumption and production, and endeavour to decouple economic growth from environmental	Follows from other targets	Goal 12		

Financial Assessment of Goal 8				
Targets	**Classification**	**Linkages**	**Finance required***	**Gap***
degradation in accordance with the 10-year framework of programmes on sustainable consumption and production with developed countries taking the lead				
8.5 by 2030 achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value	Not assessed			
8.6 by 2020 substantially reduce the proportion of youth not in employment, education or training	Not assessed			
8.7 take immediate and effective measures to secure the prohibition and elimination of the worst forms of child labour, eradicate forced labour, and by 2025 end child labour in all its forms including recruitment and use of child soldiers	Follows from other targets			
8.8 protect labour rights and promote safe and secure working environments of all workers, including migrant workers, particularly women migrants, and those	Not assessed			

Financial Assessment of Goal 8				
Targets	**Classification**	**Linkages**	**Finance required***	**Gap***
in precarious employment				
8.9 by 2030 devise and implement policies to promote sustainable tourism which creates jobs, promotes local culture and products	Not assessed			
8.10 strengthen the capacity of domestic financial institutions to encourage and to expand access to banking, insurance and financial services for all	Assessed independently	Targets 8.1, 8.3, 8.4, 8.5	INR 3150 crores USD 500 million (2015-20)	Unknown
8.a increase Aid for Trade support for developing countries, particularly LDCs, including through the Enhanced Integrated Framework for LDCs	Not assessed			
8.b by 2020 develop and operationalize a global strategy for youth employment and implement the ILO Global Jobs Pact	Not assessed			
		Total	**INR 148 lakh crores** **USD 2360 billion**	**INR 105 lakh crores** **USD 1672 billion**

** In 2014-15 prices*

GOAL 8 ASSESSMENT SUMMARY

India registered a GDP growth rate of 7.17 per cent in 2014 over the previous year (Statistica). Prospects in terms of the growth rate look promising; the World Bank has predicted a growth rate of 8 per cent for India by 2017 (Press Trust of India, 2015).

Target 8.1 calls for a sustained per capita economic growth at a level that is appropriate given national circumstances. Economic growth rate is controlled by a large number of factors not limited to the business cycle, investment, demographic changes, income equality, productivity of the workforce etc. Each of these factors is in turn dependent on other factors. Productivity of the workforce is dependent on the health, education and level of skills of the workforce as well as technology and the input mix used in production. Investment is dependent on factors such as political institutions, policy environment, ease of access to credit, ease of doing business and an endless list of other things. Economic growth also depends on fiscal and monetary policies of the government, as well as international trade. It is impossible to account for such complexities and provide a number for *finance required* to sustain economic growth, and therefore the exercise has not been attempted here. However, the study suspects that the achievement of all other SDGs – providing for universal education, healthcare, food security, skills, energy, sustainable industrialisation, urban and rural infrastructure etc. – would contribute substantially to the economic growth of the nation.

The cost of certain development oriented policies – in particular the cost of promotion of MSMEs, as has been outlined in target 8.3 – has been considered in this study. In addition to these costs, it is expected that the "Make in India" campaign recently announced by the present government will also significantly drive economic growth, income generation and employment in the country by attracting much needed investments.

A caveat is in order here; sustained investment and economic growth does not guarantee decent jobs and full and productive employment for all, as the jobless growth phenomenon that recently swept India demonstrates. India's remarkable economic growth rate of 8.7 per cent per annum between 2004-05 and 2009-10 has had little impact on job generation. The Economic Survey 2013 has cautioned that by 2020, India could be faced with up to 16.7 million 'missing jobs' (Mathew, 2014). India must ensure that the nature of its economic growth is sensitive to the needs of its huge population and is able to generate enough decent and productive work for all. It is hoped that the promotion of sustainable tourism, as outlined in Target 8.9, can contribute to this endeavour; however this study refrains from estimating the finance required for sustainable tourism due to lack of data or appropriate methodologies to estimate such a cost.

Another important need for India is to increase access to financial institutions and services. According to The Little Data Book on Financial Inclusion 2015[18], only about 53 per cent of adults in India (aged 15+) have bank accounts. Pointing out that total financial inclusion could be achieved with an investment of less than 0.1 per cent (USD 1.8 billion) of the GDP (which was USD 1.8 trillion in financial year 2013), British brokerage Barclays has estimated that this investment would deliver a return of up to 0.9 per cent of the GDP per annum (Press Trust of India, 2014).

Child labour is a social evil and completely unacceptable. The total number of working children in the country stood at 45.53 lakh according to Census 2011, indicating a 65 per cent reduction from the 1.26 crore children reported to be working by Census 2001 (Press Trust of India, 2014). It is hoped that the efforts targeted at the achievement of Goal 4, particularly Target 4.1 which calls for universal completion of secondary education by all children, will help pull children out of work and keep them in school. However, it is important to note that being enrolled in school does not mean that children are not working; absenteeism of children from school continues to be a problem as some of these absent children may be working. Therefore, efforts must go beyond enrolling children to retaining children in school. Moreover, it is important to understand that the lack of sufficient income generating opportunities is one of the causes that drive many families to send their children to work; the provision of decent and productive work for all adults as outlined in Targets 8.5 and 8.6 may help keep children in school. As for those engaged in unlawful trafficking of children and forcing child labour, the country needs to enforce existing laws through effective law enforcement and rehabilitation mechanisms. While some of these costs are accounted for in the other goals and targets of this study, a separate assessment of the costs of ending child labour has not been attempted here.

This section attempts an assessment of the costs of promoting MSMEs and expanding financial access to all households. The total finance required for the targets assessed in this section is roughly INR 148 lakh crores or USD 2360 billion, with a gap in finance of approximately INR 105 lakh crores or USD 1672 billion.

TARGETS 8.1, 8.5, 8.6, 8.7, 8.8, 8.9, 8.a, 8.b

8.1 Sustain per capita economic growth in accordance with national circumstances, and in particular at least 7% per annum GDP growth in the least-developed countries

[18] The Little Data Book on Financial Inclusion 2015

8.5 By 2030 achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value

8.6 By 2020 substantially reduce the proportion of youth not in employment, education or training

8.7 Take immediate and effective measures to secure the prohibition and elimination of the worst forms of child labour, eradicate forced labour, and by 2025 end child labour in all its forms including recruitment and use of child soldiers

8.8 Protect labour rights and promote safe and secure working environments of all workers, including migrant workers, particularly women migrants, and those in precarious employment

8.9 By 2030 devise and implement policies to promote sustainable tourism which creates jobs, promotes local culture and products

8.a Increase Aid for Trade support for developing countries, particularly LDCs, including through the Enhanced Integrated Framework for LDCs

8.b By 2020 develop and operationalize a global strategy for youth employment and implement the ILO Global Jobs Pact

These targets are not assessed independently in the study because either they are not quantifiable in economic terms or there is not sufficient data to conduct an analysis or these costs do not apply to India. In some cases, no appropriate methodology to make estimates could be found.

TARGET 8.3

8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage formalization and growth of micro-, small- and medium-sized enterprises including through access to financial services

Summary of Target 8.3				
Government bodies working on the target	**Programmes/Schemes of government**	**Indicator/ Thrust Area**	**Finance Required***	**Gap***
Ministry of Micro Small and Medium Enterprises	Assistance to Training Institutions Scheme, Performance and Credit Rating Scheme, International Cooperation Scheme, Marketing Assistance Scheme, Prime Minister Employment Generation Programme (PMEGP), Scheme for 'Providing Financial Assistance on Bar-Code' an NMCP Scheme, Scheme for 'Micro & Small Enterprises Cluster Development Programme (MSE-CDP), Scheme for 'Micro Finance Programme	Investment requirements of MSMEs to ensure 25per cent GDP growth by MSME sector by 2020	INR 148 lakh crores USD 2360 billion (2014-20)	INR 105 lakh crores USD 1672 billion (2014-20)

**In 2014-15 prices*

Background

India's MSMEs are likely to play a greater role than before in its holistic development (Varhad Group, 2013). These enterprises help to build a thriving entrepreneurial ecosystem, in addition to promoting the use of indigenous technologies. The sector has exhibited consistent growth over the last few years, but it has done so in a constrained environment often resulting in inefficient resource utilisation.

Even though the growth of MSMEs always outplayed the economic growth rate, it stands a long way from achieving its true potential. MSMEs are contributing towards 12-13 per cent of India's GDP. The projected desirable contribution to India's GDP from MSMEs ranges from 20-25 per cent according to the Varhad Group report.

Of the many challenges impeding the growth and development of MSMEs, inadequate access to financial resources is one of the key bottlenecks that make these enterprises vulnerable, particularly in periods of economic downturn.

Thrust area

Target 8.3 focuses on policy interventions and other instruments like financial services that can promote growth of MSMEs. The components of the target that are financially assessed under this study are the investment requirements of the MSMEs in India and the financial gap in the investment from the year 2014 to 2020, for ensuring that MSMEs contribute towards 25 per cent of GDP by 2020.

Methodology

A study by the Varhad Group (Varhad Group, 2013) calculated the investments required in MSMEs for the period of 2014-20 in order to have a turnover of INR 167 trillion[19]. The calculations are based on a proprietary model for the estimation of total fund requirement for Indian MSMEs for greenfield and brownfield expansion. The financial requirement is estimated to be INR 116 trillion (INR 116 lakh crore) as fixed investments along with INR 27 trillion (INR 27 lakh crore) working capital investments for the period of 2014-20. Thus, according to study, a total of INR 143 billion in 2014-15 prices is the financial requirement of the MSME sector in order to contribute 25 per cent to India's GDP by 2020.

The gap was estimated by projecting the future budget allocations for investments in MSMEs based on past trends in public expenditures, and subtracting these future allocations from the finance required.

Linkages

Target 8.3 is closely linked with other targets of Goal 8 which focus on increasing employment opportunities and ensuring sustained economic growth. Investments in MSMEs under this target substantially contribute to the GDP of the country. It shall at the same time increase job opportunities for youth and skilled population. Further, this target is also closely linked to Targets 9.2 and 9.3 as it aims to promote small scale industries and other enterprises, and aims for inclusive industrialisation. Investments in MSMEs have a potential to contribute to both of these targets. This

[19] 167 trillion includes additional demand of 17 trillion that is projected to incur with successful implementation of Public Procurement Policy

target is also closely linked with Target 12.1 which aims for sustainable production. Strategies for growth of MSMEs will therefore closely determine the achievement of this Target 12.1.

TARGET 8.10

8.10 Strengthen the capacity of domestic financial institutions to encourage and to expand access to banking, insurance and financial services for all

Summary of Target 8.10				
Government bodies working on Target	**Programmes/ Schemes of government**	**Indicator/Thrust area**	**Finance required***	**Gap***
Department of Financial Services, Ministry of Finance	Pradhan Mantri Jan-Dhan Yojana (PMJDY)	Percentage of adults with accounts at a financial institution	INR 3150 crores USD 500 million	Unknown

** In 2014-15 prices*

Background

According to World Bank data, as of 2014, about 53 per cent of the Indian population aged 15 and above had bank accounts.

Full financial inclusion provides the poor a platform to save money and earn interest, access formal credit avenues instead of resorting to moneylenders and paying exorbitant rates of interest, and access other financial services such as insurance and pensions. Electronic transfer of funds to beneficiaries can plug gaps and leaks in public subsidy and welfare schemes.

Of late, new kinds of financial institutions such as microcredit and micro-insurance institutions have come up to service the needs of the poor. Such institutions should be leveraged by the government to increase financial penetration.

Thrust area

The Indian government has recently initiated schemes to open bank accounts for large sections of the population and provide the poor with financial services such as insurance and pensions at affordable rates. The Pradhan Mantri Jan-Dhan Yojana aims to provide basic savings bank accounts, access to need based credit, remittances facilities, insurance and pension to the excluded sections, that is, Economically Weaker Sections (EWS) and Low Income Groups (LIGs). Until June

2015, banks opened 16.27 crore bank accounts under the scheme with total deposits garnered at INR 18,684 crores (Unnikrishnan, 2015). While the sheer number of bank accounts opened is impressive (the government has created a world record for the most number of bank accounts opened in a week (Lynch, 2015)), it is important to note that it does not speak to the actual use of services such as borrowing of credit or flow of remittances; nevertheless opening bank accounts is a starting point for complete financial inclusion.

This study provides an estimate of the cost of achieving full financial inclusion in India, which entails investing in customer service points to service the additional bank accounts that are to be created. The government hopes to leverage technology to achieve its objective. However, the study feels that complete financial penetration would require more than mobile technology; it would require the setting up of customer service points in remote locations. RBI's recent initiative to promote "small banks" is one step in this direction.

This study draws its estimate from an analysis done by British brokerage Barclays. Barclays estimated in August 2014 that an additional 56.7 crore new accounts would have to be opened, which would require the setting up of around 6 lakh customer service points (Press Trust of India, 2014). This study considers these costs in arriving at a financial estimate.

Barclays also described benefits of the Aadhar card, mobile banking and business correspondents model as a "transformational trinity" to achieve financial inclusion. Additional administrative expenses involved in the expansion of such initiatives have not been considered in this study.

Methodology

The estimates of *finance required* have been extracted from a study by Barclays, according to which full financial inclusion will require a capital expenditure of USD 500 million (INR 3150 crores) and an additional USD 1.3 billion in recurring annual operational expenses (Press Trust of India, 2014). The recurring service cost is about 0.1 per cent of GDP or 0.05 per cent of deposits and loans in the banking system. It appears that these estimates have been derived through "detailed modelling" done by Barclays analysts, but the full report does not appear to be in the public domain.

The present study proposes that the total investment required is as estimated by Barclays: around INR 3150 crores or USD 500 million. The *gap* is unknown due to uncertainties about the revenues that can be generated through this investment. The revenues depend on to what extent the poor people, upon being provided with access to financial services, will actually use these services.

Linkages

The achievement of this goal can drive economic growth (Target 8.1), MSMEs (Target 8.3), and productive employment (Targets 8.4 and 8.5) as it provides people with access to credit and also gives them a platform to save; both of which are necessities for growth.

Goal 9

Build resilient infrastructure promote inclusive and sustainable industrialization and foster innovation

GOAL 9: BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALIZATION AND FOSTER INNOVATION

9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all

9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and= double its share in least developed countries

9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including fordable credit, and their integration into value chains and markets

9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and increasing the number of research and development workers per 1 million people by [x] per cent and public and private research and development spending

9.a Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States

9.b Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities

9.c Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020

FINANCIAL ASSESSMENT OF GOAL 9

Financial Assessment of Goal 9				
Targets	**Classifica -tion**	**Linkages**	**Finance Required**	**Gap**
9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	Assessed independ -ently	Goal 9, 12	INR 119 lakh crores USD 1900 billion (2015-20)	INR 59.5 lakh crore USD 950 billion (2015-20)
9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries	Not assessed	Goal 8, 12		
9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including fordable credit, and their integration into value chains and markets	Not assessed.	Goal 8		
9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and	Consider -ed under finance for	Goal 12		

Financial Assessment of Goal 9				
Targets	**Classifica-tion**	**Linkages**	**Finance Required**	**Gap**
greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities	research and develop ment			
9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and increasing the number of research and development workers per 1 million people by [x] per cent and public and private research and development spending	Consider -ed under finance for research and develop-ment			
9.a Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States	Not assessed			

Financial Assessment of Goal 9				
Targets	**Classifica -tion**	**Linkages**	**Finance Required**	**Gap**
9.b Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities	Not assessed			
9.c Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020	Not assessed	Target 9.1,Goal 11		
Total			**INR 119 lakh crores** **USD 1900 billion**	**INR 59.5 lakh crores** **USD 950 billion**

GOAL 9 ASSESSMENT SUMMARY

Infrastructure projects are complex, capital intensive, and have long gestation periods that involve multiple and often unique risks to project financiers. Due to its non-recourse or limited recourse financing characteristic (i.e., lenders can only be repaid from the revenues generated by the project), and the scale and complexity, infrastructure financing requires a complex and varied mix of financial and contractual arrangements amongst multiple parties including the project sponsors, commercial banks, domestic and international financial institutions, and government agencies.

India's overall infrastructure needs will require financial investments of the order of INR 119 lakh crores (USD 1900 billion). The Indian Government is expected to invest 50 per cent of the total requirement and raise the additional INR 59.5 lakh crores (USD 950 billion) through other sources of finance, like investments by private sector, commercial banks etc. The finance expected to be raised by other sources may increase depending on the possible availability and allocations of public expenditure.

TARGET 9.1

9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all

Summary of Target 9.1				
Government bodies working on the target	**Programmes/ Schemes of government**	**Indicator/ Thrust Area**	**Finance Required***	**Gap***
Ministry of Road transport and Highways, Ministry of Railways, Ministry of Civil Aviation, Ministry of Shipping	Various projects and PPP model based investment under these ministries	Investment in Infrastructure	INR 119 lakh crores USD 1900 billion (2015-20)	INR 59.5 lakh crore USD 950 billion (2015-20)

**In 2014-15 prices*

Background[20]

Infrastructure is a critical determinant of investments, manufacturing depth, logistics, productivity, inclusive development, national integration and poverty reduction. Insufficient capacity across infrastructure sectors leads to a widening infrastructure gap, resulting in lower productivity, higher transport and logistics costs, reduced competitiveness, and slower growth.

Thrust area

Under Target 9.1, investments in infrastructure development are considered. The investments in such infrastructure includes roads and bridges, railways, ports, airports, transport and communication, civil aviation, power and irrigation sector.

Methodology

Based on projections provided in the Mid-Term Appraisal of the Eleventh Five Year Plan, in order to attain a 9 per cent real GDP growth rate, infrastructure investment should be on average almost 10 per cent of GDP during the Twelfth Plan. This translates into INR 41 lakh crore in 2006-07 prices, as estimated by the Planning Commission. Converting this investment requirement into nominal terms (based on expected inflation of 5 per cent) would imply an equivalent of INR 65 lakh crores (USD 1.03 trillion) in current prices. The Planning Commission suggests that 50 per cent of the investment will be met by budgetary resources; INR 32.5 lakh crores (USD 515 billion) need to be raised through debt and equity.[21]

Further, Boston Consulting Group projections (BCG, 2014) for India's financial requirement from 2010-2020 are USD 2.1 trillion (INR 133 lakh crores). This includes USD 1.1 trillion during the Twelfth Five Year Plan period (2012-17) and an additional USD 0.8 trillion from 2017-20. The total investments required for infrastructure from 2015-2020 is of the order of USD 1.9 trillion, of which it is estimated that the public expenditure on infrastructure will be around 50 per cent (USD 0.95 trillion) and the rest will have to be raised from other sources.

It is important to mention that some of the costs under infrastructure investments like irrigation are also covered under Goal 2 while city roads and city transport costs are also components of Goal 11 on urban infrastructure. Therefore the estimates for the current goal are to be taken with caution due to overlaps with Goal 2 and Goal 11.

[20] Extracted from: Working sub-group on Infrastructure, *Infrastructure funding requirements and its sources over the implementation period of the Twelfth Five Year Plan 2012-17*, Working group on savings formulation of the Twelfth Five Year Plan, India, http://planningcommission.gov.in/aboutus/committee/wg_sub_infrastructure.pdf (accessed June 2015)

[21] Ibid

Linkages

Goal 9.1 looks at infrastructure investment which will have implications on Goal 8 as infrastructure influences economic growth. Further the strategies and resources utilised in developing such infrastructure are associated with Goal 12 that looks at sustainable means of production. In order to combat climate change (Goal 13) and conserve our terrestrial and marine ecosystems (Goals 14, 15), India will have to ensure that its processes under Goal 9.1 are sustainable and in coherence with natural systems.

TARGET 9.2, 9.3, 9.4, 9.5, 9.a, 9.b, 9.c

9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and= double its share in least developed countries

9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including fordable credit, and their integration into value chains and markets

9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and increasing the number of research and development workers per 1 million people by [x] per cent and public and private research and development spending

9.a Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States

9.b Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities

9.c Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020

These targets are not assessed. Targets 9.2 and 9.3 are closely linked with Target 8.3 which aims to promote MSMEs for economic growth. These targets are therefore covered under the financial assessment of Target 8.3. Most of the finances required under Target 9.4 have to be borne by the private sector industries themselves; however public sector units and other systems costs may be involved. This target is also associated with finance assessment of India's low carbon economic growth under Target 12.1. Target 9.5 has implied costs of research and development which have been considered separately under this study. Targets 9.a and 9.b do not have direct financial implications to India as India is a developing country which is looking for investments to facilitate sustainable and resilient infrastructure. India may have certain financial costs to bear for South-South cooperation, the requirement of which is beyond the scope of the study. Under 9.c, infrastructure finance requirements for information and communication technology (ICT) have been taken under the infrastructure costs of Target 9.1. Other potential costs for expanding the access to ICT are beyond the scope of the study.

Goal 10

Reduce inequality within and among countries

GOAL 10: REDUCE INEQUALITY WITHIN AND AMONG COUNTRIES

10.1 By 2030 progressively achieve and sustain income growth of the bottom 40% of the population at a rate higher than the national average

10.2 By 2030 empower and promote the social, economic and political inclusion of all irrespective of age, sex, disability, race, ethnicity, origin, religion or economic or other status

10.3 Ensure equal opportunity and reduce inequalities of outcome, including through eliminating discriminatory laws, policies and practices and promoting appropriate legislation, policies and actions in this regard

10.4 AAdopt policies especially fiscal, wage, and social protection policies and progressively achieve greater equality

10.5 Improve regulation and monitoring of global financial markets and institutions and strengthen implementation of such regulations

10.6 Ensure enhanced representation and voice of developing countries in decision making in global international economic and financial institutions in order to deliver more effective, credible, accountable and legitimate institutions

10.7 Facilitate orderly, safe, regular and responsible migration and mobility of people, including through implementation of planned and well-managed migration policies

10.a Implement the principle of special and differential treatment for developing countries, in particular least developed countries, in accordance with WTO agreements

10.b Encourage ODA and financial flows, including foreign direct investment, to states where the need is greatest, in particular LDCs, African countries, SIDS, and LDCs, in accordance with their national plans and programmes

10.c By 2030, reduce to less than 3% the transaction costs of migrant remittances and eliminate remittance corridors with costs higher than 5%

GOAL 10 ASSESSMENT SUMMARY

A financial assessment of Goal 10 has not been attempted in this study because of the close link of the targets under Goal 10 with the targets in remaining goals.

Inequality is multi-faceted in nature. There is inequality in income; but there is also inequality in educational attainment, health status, employment, access to food, access to water, access to social security and in general access to opportunities and choices. These different aspects of inequality are interlinked; improved access to water and sanitation may help reduce inequality in health outcomes, improved educational attainment may help people find better jobs and reduce the inequality in employment and incomes, and so on. Therefore the achievement of Goal 10 will be closely linked to the achievement of all other goals.

The links between Goal 10 and other goals are as described below. It is important to note that each one of the below goals are, in a way, efforts to increase access of all to opportunities, which can serve as both the consequence and cause of reduced inequality.

Studies have shown that redistribution and the reduction of inequalities is essential for poverty reduction (Goal 1). Growth without reduction of inequalities does not reduce poverty, and can even increase the impacts of poverty by raising prices (ICSU, ISSC, 2015).

People's ability to meet their needs for food (Goal 2), remain healthy (Goal 3), acquire education (Goal 4), access clean water and sanitation (Goal 6), meet their energy needs (Goal 7) and have opportunities for productive, decent work (Goal 8) are closely linked to their economic, social and political status in society and therefore are determinants of and determined by inequality.

Gender gaps are one manifestation of inequality wherein one gender, most of the time women, finds itself disadvantaged in access to opportunities. Closing the gap between the genders (Goal 5) is both a cause and an effect of reduced inequality.

Industrial and urban infrastructure and access to technology, particularly ICT (Goals 9 and 11), have played an instrumental role in bring the marginalised into the mainstream economy and society by providing information, opportunities for job creation and amenities for a comfortable living.

Sustainable production and consumption (Goal 12) allows all to enjoy the bounties of nature and the environment, and thereby reduces inequality. Most of the time, the most marginalised are often dependent on nature for their survival; they depend on agriculture, forests, fisheries etc. for their livelihoods. The large-scale unprecedented production and consumption of resources in an unsustainable fashion has robbed many poor of income generating opportunities. This leads to increased inequality. Inequality also serves as the cause of unsustainable production and consumption, as

those who are economically or politically powerful overuse resources because the poor and vulnerable often do not have the power to contest their claims. This makes inequality a cause for environmental degradation.

The poor and vulnerable often bear the greatest brunt of climate change (Goal 13), deterioration of water and marine resources (Goal 14) and land degradation (Goal 15). Reduced inequalities will empower more people to assert their rights over natural resources, create and maintain systems for sustainable harvesting of natural resources such as fisheries and help in the achievement of these goals.

Peaceful and inclusive societies, justice for all, and inclusive institutions are inextricably linked to inequalities; neither is possible without the other (Goal 16).

The aforementioned links among the goals make it very difficult to look at inequality in isolation and conduct a financial assessment of India's needs and gaps. Investments in all the other goals will certainly influence inequality, and hopefully reduce inequality. However, if additional finance is required for inequality-specific interventions (such as administrative costs of redistributive taxation) such costs are not included in this study.

Goal 11

Make cities and human settlements inclusive, safe, resilient and sustainable

GOAL 11: MAKE CITIES AND HUMAN SETTLEMENTS INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE

11.1 By 2030, ensure access for all to adequate, safe and affordable housing and basic services, and upgrade slums

11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

11.3 By 2030 enhance inclusive and sustainable urbanization and capacities for participatory, integrated and sustainable human settlement planning and management in all countries

11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage

11.5 By 2030 significantly reduce the number of deaths and the number of affected people and decrease by y% the economic losses relative to GDP caused by disasters, including water-related disasters, with the focus on protecting the poor and people in vulnerable situations

11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality, municipal and other waste management

11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, particularly for women and children, older persons and persons with disabilities

11.a Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning

11.b By 2020, increase by x% the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, develop and implement in line with the forthcoming Hyogo Framework holistic disaster risk management at all levels

11.c Support least developed countries, including through financial and technical assistance, for sustainable and resilient buildings utilizing local materials

FINANCIAL ASSESSMENT OF GOAL 11

Financial Assessment of Goal 11				
Targets	**Classification**	**Linkages**	**Finance required***	**Gap***
11.1 by 2030, ensure access for all to adequate, safe and affordable housing and basic services, and upgrade slums	Assessed independently		INR 63 lakh crores USD 994 billion (2015-22)	INR 60 lakh crores USD 942 billion (2015-22)
11.2 by 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	Assessed together	Goal 6, 7, 12, 14, 15	INR 68 lakh crores USD 1073 billion (2015-30)	INR 16 lakh crores USD 260 billion (2015-30)
11.3 by 2030 enhance inclusive and sustainable urbanization and capacities for participatory, integrated and sustainable human settlement planning and management in all countries				
11.6 by 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality, municipal and other waste management				
11.7 by 2030, provide universal access to safe,				

Financial Assessment of Goal 11				
Targets	**Classifica-tion**	**Linkages**	**Finance required***	**Gap***
inclusive and accessible, green and public spaces, particularly for women and children, older persons and persons with disabilities				
11.4 strengthen efforts to protect and safeguard the world's cultural and natural heritage	Not assessed			
11.5 by 2030 significantly reduce the number of deaths and the number of affected people and decrease by y% the economic losses relative to GDP caused by disasters, including water-related disasters, with the focus on protecting the poor and people in vulnerable situations	Not assessed			
11.a support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning	Not assessed			
11.b by 2020, increase by x% the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to	Not assessed			

Financial Assessment of Goal 11				
Targets	**Classifica-tion**	**Linkages**	**Finance required***	**Gap***
disasters, develop and implement in line with the forthcoming Hyogo Framework holistic disaster risk management at all levels				
11.c support least developed countries, including through financial and technical assistance, for sustainable and resilient buildings utilizing local materials	Not assessed			
Total			**INR 131 lakh crores** **USD 2067 billion**	**INR 76 lakh crores** **USD 1202 billion**

** In 2014-15 prices*

GOAL 11 ASSESSMENT SUMMARY

Goal 11 calls for the sustainable development of cities and human settlements. Urbanisation in India has been on the rise. Population residing in urban areas in India, according to 1901 census, was 11.4 per cent. This count increased to 28.53 per cent according to 2001 census, and crossing 30 per cent as per 2011 census, standing at 31.16 per cent. People migrate to cities in the hopes of finding better economic opportunities, access to a larger range of public amenities and services, and prospects of a better life than in rural areas. Unfortunately, a large section of the population is marginalised, resorting to dwelling in slums without access to basic amenities such as clean water, sanitation and proper housing.

Congestion in Indian cities is clearly visible, particularly in metropolitan cities such as Mumbai and Delhi. This necessitates proper urban planning with provisions for necessary urban infrastructure and services, including urban water supply, urban transport, sewage, solid waste management, roads, traffic control, maintenance of public spaces etc.

The study conducts an assessment of India's financial needs to provide affordable housing to all Indians, and also provide the necessary urban infrastructure and services to allow citizens to live comfortably. The financial assessment includes the cost of building capacities of urban local bodies (ULBs) to administer these services efficiently.

The total finance required (in 2014-15 prices) amounts to INR 131 lakh crores or USD 2067 billion, with an anticipated gap of INR 76 lakh crores or USD 1202 billion.

TARGET 11.1

11.1 by 2030, ensure access for all to adequate, safe and affordable housing and basic services, and upgrade slums

Summary of Target 11.1				
Government bodies working on Target	**Programmes/ Schemes of government**	**Indicator/ Thrust area**	**Finance required***	**Gap***
Ministry of Housing and Urban Poverty Alleviation	Rajiv Awas Yojana	Shortage in urban housing	INR 63 lakh crores USD 994 billion (2015-22)	INR 60 lakh crores USD 942 billion (2015-22)

** In 2014-15 prices*

Background

The shortage of urban houses in India stood at approximately 19 million units in 2012 and it is expected to grow at a CAGR of 6.6 per cent for 10 years till 2022 (Press Trust of India, 2015). Of this, approximately 95.6 per cent of the shortage is expected to be from the EWS) and LIG households, who cannot afford houses costing above INR 15 lakh, according to a KPMG report (KPMG, 2014). The report also estimates that supported by the strong growth in household income in urban areas, it is expected that income growth may push a significant number of EWS and LIG households into a higher category. Thus, by 2022, majority of housing demand is expected to be from LIG and MIG segments of households, constituting 50 per cent of the total housing demand.

The Rajiv Awas Yojana (RAY) scheme of the Ministry of Housing and Urban Poverty Alleviation envisages a "Slum Free India" with inclusive and equitable cities in which every citizen has access to basic civic infrastructure and social amenities and decent shelter. The scheme is expected to cover about 250 cities, mostly with population of more than one lakh, across the country by the end of 12th Five Year Plan (2017) (Press Trust of India, 2011).

Thrust area

The study presents national level investment estimates needed to cover the existing housing shortage and the future housing requirement (2015-22) in rural and urban India for EWS and LIGs. Supporting urban infrastructure and services are not accounted for in these estimates as they are considered separately in the next section (Targets 11.2, 11.3, 11.6, 11.7).

Methodology

The estimates of *finance required* have been derived from the KPMG report, which estimates the housing shortage in each segment income group (EWS, LIG, MIG, HIG and higher) from 2015 to 2022, and accordingly calculates investment requirements. For each income group, the report specifies an estimated size of house needed and unit cost. The details may be found in the annexure

The *gap* was estimated by projecting the future budget allocations for housing based on past trends in public expenditures, and subtracting these future allocations from the finance required.

TARGETS 11.2, 11.3, 11.6, 11.7

11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons

11.3 By 2030 enhance inclusive and sustainable urbanization and capacities for participatory, integrated and sustainable human settlement planning and management in all countries

11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality, municipal and other waste management

11.7 By 2030, provide universal access to safe, inclusive and accessible, green and public spaces, particularly for women and children, older persons and persons with disabilities

Summary of Target 11.2, 11.3, 11.6, 11.7				
Government bodies working on Target	**Programmes / Schemes of government**	**Indicator/Thrust area**	**Finance required***	**Gap***
Ministry of Urban Development	Jawaharlal Nehru National Urban Renewal Mission, others	Availability of and access to urban infrastructure and services, capacity building for urban local bodies	INR 68 lakh crores USD 1073 billion (2015-30)	INR 16 lakh crores USD 260 billion (2015-30)

** In 2014-15 prices*

Background

Cities and towns in India are visibly deficient in the provision of infrastructure and services. The urban population is on the rise and it is necessary to invest in sectors such as urban water supply, sanitation, transport, traffic control, sewage, streetlights etc. and also in the capacities of ULBs to handle the administration of these services.

Thrust area

To financially assess Target 11.2, this section considers urban roads, traffic support infrastructure and other forms of urban transport. To financially assess target 11.3, this section considers the costs of building capacities of ULBs for planning, implementation and management of urban infrastructure and services (this cost may be an understatement as it does not consider the cost of enabling participatory planning and planning for sustainability). To financially assess Target 11.6, this study considers the cost of urban solid waste management. To financially assess Target 11.7, this study interprets "safe, inclusive and accessible, green and public spaces" as city spaces with well-developed water supply, sewerage, storm water drainage, street-lighting and renewal and redevelopment of urban spaces including slums. These aspects are necessary to make public spaces clean and green. Efficient management of water supply, sewerage and solid waste is necessary to keep public spaces safe from contamination and health hazards. These are aspects that also form a part of Goal 6 on water and sanitation, Goal 12 which includes a target on reducing waste generation, Goal 16 on peaceful and inclusive societies, and most importantly Target 11.1 of the current Goal. However, we include these aspects here because the aforementioned urban infrastructure and services are under the mandate of the

Ministry of Urban Development, which is the nodal Ministry for all the forms of urban development specified in this Goal.

Methodology

The estimates provided here have been estimated by a High Powered Expert Committee (HPEC) report on urban infrastructure and services (HPEC, 2011). The report estimates investment requirements in 8 urban infrastructure sectors (water supply, sewerage including treatment of waste water, solid waste management, storm water drains, street-lighting, urban roads, traffic support infrastructure and urban transport) from 2012 to 2030. In estimating the investment requirements, it assumes service norms in each of the infrastructure services sectors. These service norms seem to be in line with the requirements of the corresponding targets of the SDG in question. In addition to the urban infrastructure and services in the 8 aforementioned sectors, the report also estimates the cost of urban renewal and redevelopment, operations and management costs, and the costs of building capacities for ULBs for effective planning, implementation and management of these services.

Linkages

Urban infrastructure and services influence and are influenced by a number of other goals and targets. Urban water supply is closely linked to sustainable water use and management of water resources (Goal 6). Most urban infrastructure and services are energy-intensive sectors, which will have a direct impact on Goal 7 (energy); in the event of shortfall in energy supply, the urban sectors will also collapse. Urbanisation is associated with the generation of a considerable quantity of waste, which must be controlled and eventually reduced for the achievement of Goal 12 (sustainable consumption and production). Moreover, these urban services and infrastructure must be carefully planned so as to be delivered with minimal carbon footprint; otherwise they will have a direct impact on ecosystems, biodiversity and climate change (Goals 13, 14, 15).

TARGET 11.4, 11.5, 11.a, 11.b, 11.c

11.4 Strengthen efforts to protect and safeguard the world's cultural and natural heritage

11.5 By 2030 significantly reduce the number of deaths and the number of affected people and decrease by y% the economic losses relative to GDP caused by disasters, including water-related disasters, with the focus on protecting the poor and people in vulnerable situations

11.a Support positive economic, social and environmental links between urban, peri-urban and rural areas by strengthening national and regional development planning

11.b By 2020, increase by x% the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, develop and implement in line with the forthcoming Hyogo Framework holistic disaster risk management at all levels

11.c Support least developed countries, including through financial and technical assistance, for sustainable and resilient buildings utilizing local materials

These targets are not assessed in the study because they are either not directly quantifiable or sufficient data is not yet available to conduct a financial assessment.

Goal 12

Ensure sustainable consumption and production patterns

GOAL 12: ENSURE SUSTAINABLE CONSUMPTION AND PRODUCTION PATTERNS

12.1 Implement the 10-year framework of programmes on sustainable consumption and production, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries

12.2 By 2030, achieve the sustainable management and efficient use of natural resources

12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses

12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment

12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle

12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities

12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature

12.a Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production

12.b Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products

12.c Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into

account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities

FINANCIAL ASSESSMENT OF GOAL 12

Financial Assessment of Goal 12				
Targets	**Classifica-tion**	**Linkages**	**Finance Required***	**Gap***
12.1 Implement the 10-year framework of programmes on sustainable consumption and production, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries	Assessed together	Goals 2, 6, 7, 8, 9, 11, 13, 14, 15	INR 62.5 lakh crores USD 992 billion (2015-30)	INR 62.5 lakh crores USD 992 billion (2015-30)
12.2 By 2030, achieve the sustainable management and efficient use of natural resources				
12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses	Assessed independ-ently	Goals 2, 11	INR 0.55 lakh crores USD 8 billion (present need)	INR 0.55 lakh crores USD 8 billion (present need)

Financial Assessment of Goal 12				
Targets	**Classifica-tion**	**Linkages**	**Finance Required***	**Gap***
12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment	Not assessed	Goals 6, 8, 9, 11, 14, 15		
12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse	Not assessed	Goals 6, 8, 9, 11, 13		
12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle	Not assessed			
12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities	Not assessed			

Financial Assessment of Goal 12				
Targets	**Classifica-tion**	**Linkages**	**Finance Required***	**Gap***
12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature	Consider-ed under finance for awareness			
12.a Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production	Not assessed			
12.b Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products	Not assessed			
12.c Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their	Not assessed			

Financial Assessment of Goal 12				
Targets	**Classifica-tion**	**Linkages**	**Finance Required***	**Gap***
environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities				
		Total	**INR 63 lakh crores USD 1000 billion**	**INR 63 lakh crores USD 1000 billion**

**in 2014-15 prices*

GOAL 12 ASSESSMENT SUMMARY

Sustainable Consumption and Production (SCP) is a pre-requisite for the world's development to remain within the safe limits of growth and planetary boundaries. It is fundamental in order to achieve sustainable development.

[All facts from Planning Commission Report (Planning Commission, GoI, 2014)]

India emitted 1,728 million tonnes CO_2 equivalent of GHGs, making it the sixth largest emitter in the world. India is, however, conscious of its global responsibility, and in December 2009, it announced that it would reduce the emissions intensity of its GDP by 20 to 25 per cent, from the 2005 levels, by the year 2020. This voluntary commitment, which India has made to the international community, shows India's resolve to ensure that its growth process is sustainable and based on low carbon principles.

India's per capita consumption is still fairly low as compared with the developed economies. India sees sustainable consumption as an instrument for social and

environmental gain. On one hand it will prevent the excessive burden on natural and environmental resources, while on the other it will also be a step towards a more equitable society. Sustainable consumption is a matter of great concern, with limited resources being wasted by a certain section of the world while depriving others of their basic necessities.

The cumulative costs of low carbon strategies have been estimated to be around INR 62.5 lakh crores (USD 992 billion), over the two decades between 2011 and 2030. If these costs were borne entirely by domestic resources, the cumulative loss in output (GDP) between 2011 and 2030 would be INR 100 lakh crores (USD 1,595 billion). India is striving to constantly improve resource and energy efficiencies in production patterns. India sees a leadership role that it can play across the world to promote and support countries, especially in the Global South in choosing sustainable patterns of production.

TARGETS 12.1, 12.2

12.1 Implement the 10-year framework of programmes on sustainable consumption and production, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries

12.2 By 2030, achieve the sustainable management and efficient use of natural resources

Summary of Targets 12.1, 12.2				
Government bodies working on the target	**Programmes/ Schemes of government**	**Indicator/ Thrust Area**	**Finance Required***	**Gap***
Ministry of Environment, Forest and Climate Change is the nodal ministry. Cross cutting into all the ministries.	All the programmes and schemes under Goal 2, Goal 6, Goal 7, Goal 8, Goal 9, Goal 11, Goal 13, Goal 14, Goal 15	Production Systems, Consumption patterns	INR 62.5 lakh crores USD 992 billion (2015-30)	INR 62.5 lakh crores USD 992 billion (2015-30)

**In 2014-15 prices*

[EXTRACTED FROM PLANNING COMMISSION REPORT (Planning Commission, GoI, 2014)]

Background

In the year 2007, India's CO_2 equivalent emission[22] of 1904.73 million tonnes was primarily due to fast growing sectors like cement production (growing at 6 per cent), electricity generation (growing at 5.6 per cent) and transportation (growing at 4.5 per cent).

Analysis of CO_2 emission across sectors reveals that 47.81 per cent of this was from the electricity generation, while 27.11 per cent was from manufacturing in the industrial sector (iron and steel, and cement production constituted 16.49 per cent of CO_2 emissions). CO_2 emission from transport sector was 138.9 million tons, i.e., 9.27 per cent of country's total CO_2 emission in the year 2007. The residential sector accounted for 49 per cent of the CO_2 emissions from other energy related activities, indicating a potential for reduction of emissions through the use of more energy efficient domestic appliances[23].

Measures, which reduce emissions intensity, impact the economy in a variety of ways. Such mitigation efforts, however, do not come cheap. They require additional investment, which in turn reduces investment available for other needs. An assessment of economic costs and benefits is, therefore, important. Energy efficient processes can increase the profitability of many value added activities, while also facilitating structural changes in the economy. This not only makes an economy more productive, but also sustains economic growth by relaxing the energy constraints in the long run. It is important to understand the macro-economic and inter-sectoral implications of different mitigation alternatives to ensure that the low carbon strategies being recommended are mutually consistent with each other.

Methodology

The estimates of finance required and gaps are derived from the aforementioned Planning Commission Study. Detailed methodology may be found in the Annexure.

Linkages

Targets 12.1 and 12.2 are strategic targets that provide a roadmap of model and approaches that a country must devise while accomplishing its social and economic goals. They are strongly correlated with strategies and methods of various goals with components of production systems like Goal 2 (Food Production Systems), Goal 7 (Energy Production) and Goals 8 and 9 (Industries and Manufacturing). At the same time, these targets aim for strategies that shall conserve our natural ecosystems and resources which are essential component for the health of our social and economic

[22] Here CO_2 equivalent is the sum total of CO_2, and CH_4 and N_2O converted in CO_2eq using Global warming potentials of 21 and 310 respectively)

[23] Ibid

systems. These targets will therefore impact Goal 6 (Water Resource Management), Goal 13 (Combating Climate Change) and Goal 14 and 15 (Conserving our marine and terrestrial ecosystems).

TARGET 12.3

12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses

Summary of Target 12.3				
Government bodies working on the target	**Programmes/ Schemes of government**	**Indicator/ Thrust Area**	**Finance Required***	**Gap***
Agricultural and Processed Food Products Export Development Authority (APEDA), National Horticulture Board (NHB)	Schemes to set-up re-cooling facilities and specialised storage facilities such as high humidity cold storage deep freezers, controlled atmosphere or modified atmosphere storage. 100 per cent FDI in the cold chain sector through the automatic route.	Food Storage Infrastructure and systems	INR 0.55 lakh crores USD 8 billion (present need)	INR 0.55 lakh crores USD 8 billion (present need)

**In 2014-15 prices*

Background

[Extracted from (Emerson Climate Technologies, 2013)]

The challenge of feeding India's billion plus people is not really about agriculture and food production but getting the food to the people. The biggest contributors to waste are the lack of refrigerated transport and adequate high quality cold storage facilities for both food manufacturers and food sellers (retailers).

Despite high production and an existing distribution network, India finds it difficult to feed its own people. This is due to considerable wastage. According to the Central Institute of Post Harvest Engineering and Technology (CIPHET), Ludhiana,

approximately 18 per cent of the country's fruits and vegetables, worth INR 133 billion, go to waste annually because of the lack of cold storage facilities.

What India lacks, and needs, is a well-developed, world-class cold chain infrastructure. Without it, India's problems are vast and likely to grow. As an example, waste is responsible for 50 per cent of the current cost of milk in India. The most susceptible food category to a lack of cold storage is fruits and vegetables where annual wastage is estimated to be 18% of the total production. Controlling the levels of waste is beyond the capability of individual farmers or consumers. The problem is wider and involves market schemes, availability of power supply, quality of roads and focused government intervention as well as a need for a more pronounced investment in the sector.

Methodology[24]

The Emerson report[25] analyses the current and the required cold storage units. According to the report, there are about 6,300 cold storage facilities in India, with an installed capacity of 30.11 million metric tonnes. It is estimated that cold storage capacity in India needs to double, to a total of 61.13 million metric tonnes of cold storage to minimize food wastage. An investment of INR 550.74 billion in new cold storage capacity by 2015–16 is required to keep up with the fruit and vegetable production increase.

India's cold storage market has a multitude of players, with over 3,500 companies in the value chain. Cold chain solution provider companies constitute 85 per cent of the market, while transportation services, such as refrigerated trucks (known as reefers), account for the remaining 15 per cent. In 2010, for the transportation of perishable products, there were 250 reefer transport operators running around 25,000 vehicles in India. Of these vehicles, 80 per cent were utilized for the transportation of milk, leaving only 5,000 vehicles for other produce such as fruit and vegetables. According to ASSOCHAM, during the period of 2009-2017, the cold chain industry in India is expected to grow at a CAGR of around 25.8 per cent to reach INR 64 billion.

Typically, a cold storage facility with a capacity of 6,000 metric tonnes requires an initial investment of around INR 50 million, excluding land. The high real estate cost also contributes significantly to the high lifecycle cost.

The primary challenge facing the cold chain industry is rising property prices; with increases of more than 280 per cent over the last decade. To build a cold storage facility with 1 million cubic feet of space requires an acre of land. Adding to increased costs and also unique to India, are the lack of two-way cargo movement

[24] Ibid.

[25] Ibid.

and back haulage of reefer trucks. Other cost contributors include interstate barriers, intercity and state taxes, and bad roads. Types of cold storage facilities and uneven distribution Most of the cold storage facilities in India are for single commodity use.. As multi-commodity cold storage facilities require different temperature conditions, they are not well-utilized in terms of capacity; therefore, they are neither efficient nor cost effective. As a result, smaller companies prefer to set up single commodity storage facilities.

Cold chain recognized as a sub-sector of infrastructure in the Union Budget 2012–13. Indian government has offered INR 3.2591 billion to set up 451 cold storages. Government collaborates with the Confederation of Indian Industry (CII) and Federation of Indian Chambers of Commerce and Industry (FICCI), growers, and cold chain equipment manufacturers, to set up the National Centre for Cold Chain Development (NCCD). The cold chain segment has huge opportunities for growth, given the market potential in the country. However, developing an efficient cold chain logistics system with the latest technologies and capacity is highly capital intensive. To address the need gap of 31 million metric tonne, 25 government intervention is required to build additional capacity. Sensing this need, the recognition of the cold chain as an infrastructure sub-sector in the 2012-13 Union Budget has led to the sector receiving substantial government aid.

In a significant move, the Government of India permitted 100 per cent FDI in the cold chain sector through the automatic route in the budget of 2011-12.Government agencies such as the Agricultural and Processed Food Products Export Development Authority (APEDA), National Horticulture Board (NHB) were set up to help provide financial assistance and drive exports for this space. APEDA, which achieved 29,929 metric tonnes of capacity by March 31, 2012 (as part of the XI Five Year Plan) had targeted an increase of 6,600 metric tonnes 28 in 2012-13. Also, APEDA has specific schemes to set-up re-cooling facilities and specialised storage facilities such as high humidity cold storage deep freezers, controlled atmosphere or modified atmosphere storage.

Linkages

Food storage system (Target 12.3) is linked with India's food production and distribution systems (Goal 2). While future productivity and diversity of food production systems will determine the requirement of food storage, the demand and distribution of food will influence the choices of food and thus impact the different kinds of food storage facilities required for different kinds of food. Additionally, food storage system is also linked with Goal 11 that builds infrastructure that enables better connectivity and other basic market and business requirements for setting up food storage units. However, the trends of urbanization

in Goal 11 can also drastically influence the costs of the land and thus increase the costs of setting up such food storage units.

TARGET 12.4, 12.5, 12.6, 12.7, 12.8, 12.a, 12.b, 12.c

12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment

12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle

12.7 Promote public procurement practices that are sustainable, in accordance with national policies and priorities

12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature

12.a Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production

12.b Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products

12.c Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities

These targets have not been considered in the study. The components of Target 12.4 include prevention of pollution to prevent contamination of air, water and soil. Some parts of this target are included under Goal 6 which looks at ways of prevention of industrial effluents in water bodies. Target 12.5 looks at waste regeneration and recycle of wastes from different systems. The solid waste management component of this target is assessed under Goal 11 which deals with solid waste management in urban areas. Target 12.6 is not seen as quantifiable, however administrative costs of

setting up such systems are explicit financial costs that can be visualised. Public procurement practices may also have some additional systems-strengthening costs but is beyond the scope of this study. Additional finances/investments may be required for 12.b to promote sustainable tourism and job creation but that is beyond the scope of the study too. It must be noted that India does not plan to completely phase-out the use of fossil fuels (12.c) such as coal. These sources will be essential to bring affordable basic power to those still beyond the grid, and cannot be leapfrogged due to the prohibitively high pricing and slow growth of renewable technology, despite the ambitious targets for renewable energy that the country has set for itself. Despite expansive scale, India continues to have relatively high energy prices. Relative to purchasing power, India's electricity prices are the same as Japan and considerably higher than even China, South Africa, Brazil and USA. It is therefore imperative that the cost of energy is lowered; the pushing of expensive renewable technology will be counter-productive.[26]

[26] Wilson, L., *Shrink that footprint,* http://shrinkthatfootprint.com/ (accessed June 2015)

Goal 13

Take urgent action to combat climate change and its impacts

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 mobilizing 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 operationalize the Green Climate Fund through its capitalization 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 marginalized communities

FINANCIAL ASSESSMENT OF GOAL 13

Financial Assessment of Goal 13				
Targets	**Classification**	**Linkages**	**Finance Required***	**Gap***
*13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries***	Assessed independently	Goals 2, 3, 4, 6, 7, 8, 9, 11, 12, 14, 15	INR 13 lakh crores USD 206 billion (2015-30)	INR 13 lakh crores USD 206 billion (2015-30)
13.2 Integrate climate change measures into national policies, strategies and planning	Assessed independently	Goals 2, 3, 4, 6, 7, 8, 9, 11, 12, 14, 15, Target 13.1	INR 4 lakh crores USD 61 billion (2015-30)	INR 4 lakh crores USD 61 billion (2015-30)
13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	Considered under finance for awareness			
13.a Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing 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 operationalize the Green	Not assessed			

Climate Fund through its capitalization 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 marginalized communities	Not assessed			
		Total	**INR 17 lakh crores** **USD 267 billion**	**INR 17 lakh crores** **USD 267 billion**

** In 2014-15 prices*

*** Includes only adaptation cost; mitigation and resilience costs are estimated separately but not included here to avoid double-counting of costs, as these costs cut across goals*

GOAL 13 ASSESSMENT SUMMARY

India is highly vulnerable to climate change with an extensive coastline and the massive glaciers that serve as life sources, and cap the country. The country has already faced frequent disasters such as cyclones on the east coast of Odisha, floods in Jammu & Kashmir and drought in Central India. The diverse nature of disasters requires varied capacity and responses.

The country needs to invest in protecting the lives of millions already impacted due to low development on parameters of health services, income options, education opportunities and dependence on weather-sensitive sectors for livelihoods. Considering the vast poverty in the country and poor being most vulnerable to environmental repercussions, India would require massive investment on climate change. This would ensure that adequate climate adaptive actions are taken to minimise human and resource loss due to climate disasters. It is therefore India's priority to strengthen adaptation measures.

This goal deals with policy and development planning in alignment with climate change action. India has prepared a comprehensive National Action Plan on Climate Change (NAPCC) and State Action Plans on Climate Change (SAPCC) with a view to achieve sustainable development with a focus on climate change. The assessment in

this goal only comprises of the finance required for processing development planning for climate change.

Climate change also has additional linkages with other goals. Since climate change is an impact of the emissions caused by our production and consumption systems, this goal is linked with goals on food security (Goal 2) , energy access (Goal 7), industries and infrastructure (Goal 9) and urbanisation (Goal 11). The strategies and processes under these goals will have implications on the achievement of this goal. The costs involved in these processes are covered under the respective goals. The current goal will specifically look at the costs of climate inclusive development planning and additional costs required for climate resilient action and mitigation in different social and economic sectors.

India is short of INR 17 lakh crores (USD 267 billion) in the requirement for climate adaptation and climate planning from 2015 to 2030.

TARGETS 13.1

13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

Summary of Target 13.1				
Government bodies working on the target	**Programmes/ Schemes of government**	**Indicator/ Thrust Area**	**Finance Required***	**Gap***
Multiple schemes across departments and Ministries		Adaptation	INR 13 lakh crores USD 206 billion (2015-30)	INR 13 lakh crores USD 206 billion (2015-30)

**In 2014-15 prices, includes only additional cost of adaptation*

Background

Strengthening resilience and adaptive capacity to climate-related hazards entails a number of costs across various sectors. These costs include those of sustainable agriculture techniques, renewable energy, emission reductions etc.

Thrust area

This section focuses on three kinds of costs: the costs of strengthening resilience, adaptive capacity and mitigation. Strengthening resilience in this study is understood as the process of increasing capacity to absorb future climate stresses. Mitigation refers to efforts to reduce or prevent emissions of greenhouse gases. Adaptation refers to efforts to adjust to changing climate conditions.

Relevant targets that could have an impact on climate change and that have been financially assessed in other goals have been listed below with their corresponding financial requirement and gaps. These targets broadly fall under two categories of climate change interventions: strengthening resilience to climate change, and climate change mitigation. An additional cost is the cost of strengthening adaptive capacity, which has been estimated separately. It is important to note that the first category of costs should not be added to the financial estimates of other goals and targets, as the former is derived from the latter and addition would lead to double counting. However, the cost of enhancing adaptive capacity is separate. Therefore, for the purpose of addition with financial estimates for other SDGs, only the adaptation costs are provided in the summary table of Target 13.1 and the summary table provided in the section titled "The Study".

This section considers the sum of these two categories of costs to be the overall minimum cost of achieving the current target. However, it is possible that there is a certain degree of overlap between adaptive costs and the costs of strengthening resilience or mitigation. Therefore, the total values indicated here may be an overestimate. However there are a number of climate-change impacting sectors that are not considered in the assessment. For example, cross-sectoral interventions such as addressing extreme weather events and coastal zone vulnerabilities are not included in the assessment. Overall, the estimates presented in this section are affected by an overestimation within the sectors assessed, which may be (partially) balanced by an underestimation due to exclusion of certain sectors.

Methodology

This section considers the two costs separately: a) strengthening resilience and mitigation, and b) adaptation

Strengthening resilience and mitigation

The following table shows the costs of strengthening resilience and mitigation across sectors in the goals that have been financially assessed in this study. Because of the cross-cutting nature of Goal 13, the estimates presented here should not be added with the estimates for other goals, as this would lead to double counting. Also, there may be additional investments needed for adaptation/resilience and mitigation in sectors outside the purview of the current section, for example in transportation and livestock – both of which have a huge effect on climate change.

Finance required and gaps in strengthening 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	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 municipal solid waste management, storm water drains and sewerage	2015-30	68	1073	16	260
12.3	Reducing food waste using food storage infrastructure	Present need	1	8	1	8
		Total	**102**	**1593**	**38**	**596**

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	Additional investments to reduce emissions across sectors	2015-30	63	992	63	992
14, 15	Expanding protected areas network	2015-27	31	489	30	481
		Total	**148**	**2335**	**119**	**1879**

Adaptation

The additional costs of adaptation to climate change are derived from a World Bank study (World Bank, 2010) that uses the following methodology to calculate global as well as developing country estimates of climate change adaptation.

The intuitive approach to costing adaptation involves comparing a future world without climate change with a future world with climate change. The difference between the two worlds entails a series of actions to adapt to the new world conditions. And the costs of these additional actions are the costs of adapting to climate.

The World Bank study focuses on the following sectors: agriculture, forestry, fisheries, infrastructure, water resources, health and ecosystem services. To capture an as large as possible range of model predictions on the effects of climate change on natural and social systems, the study chooses two climate scenarios: extreme wet and extreme dry.

Further details of the methodology and the assumptions used may be found in the annexure.

Overall, the study estimates (in 2005 prices) a cost of USD 17.1 billion per year between 2010 and 2050 for South Asia in the extreme wet scenario, and USD 15 billion per year in the extreme dry scenario. The corresponding costs for India may be calculated as follows.

- In 2014-15 prices, this is an amount of INR 1,28,502 crores per year in the extreme wet scenario, and INR 1,12,721 crores in the extreme dry scenario[27].
- The World Bank study estimates that this is the cost of adapting fully, from 2010 to 2050. However, the present study calculates finance needed until 2030. Therefore, the total cost for South Asia from 2015 to 2030 is INR 19,27,530 crores in the extreme wet scenario and INR 16,90,815 crores in the extreme dry scenario.
- India's population is approximately 1.2 billion, while the population of South Asia is approximately 1.7 billion. India houses approximately 70 per cent of the South Asian population. It is therefore assumed that India would require approximately 70 per cent of the finance requirements of South Asia[28].
- Therefore, India's finance requirement for climate adaptation is approximately between INR 12 lakh crores to INR 13.5 lakh crores, or on average INR 13 lakh

[27] Converting 2005 USD figures to 2014 USD figures, then converting from USD to INR using average exchange rate in 2014, USD 1 = INR 62

[28] India has the largest economy and population in the South Asia region. It houses multiple vulnerabilities due to its vast coastline, arid and semi-arid zones and mountains. It also faces the risk of swelling population size due to immigration from its neighbours. Therefore, it is assumed that India would require a bulk of the climate adaptation funds in South Asia, with 70 per cent being the minimum.

crores (rounded off) from 2015-30 in 2014-15 prices. This is equivalent to roughly USD 206 billion.

There are currently no significant public financial allocations for combating climate change. The NAPCC and SAPCC documents only indicate finances required. Therefore it is assumed the size of the finance gap for the current target is equal to the total finance required.

Linkages

As mentioned, climate change is closely linked to almost all sectors of the economy. The achievement of this goal will therefore be influenced by Goals 2 (sustainable agriculture), 3 (combating climate health risks), 4 (education on climate resilient practices), 6 (sustainable withdrawals of water and protection of ecosystems), 7 (renewable energy), 8 (low carbon economic growth), 9 (sustainable infrastructure), 11 (sustainable urbanisation), 12 (sustainable consumption and production), 14 (protection of marine ecosystems) and 15 (protection of terrestrial ecosystems).

TARGET 13.2

13.2 Integrate climate change measures into national policies, strategies and planning

Summary of Target 13.2				
Government bodies working on the target	**Programmes/ Schemes of government**	**Indicator/ Thrust Area**	**Finance Required***	**Gap***
Multiple schemes across departments and Ministries		Capacity building and building of institutional mechanisms for climate change	INR 4 lakh crores USD 61 billion (2015-30)	INR 4 lakh crores USD 61 billion (2015-30)

**In 2014-15 prices*

Background

Integrating climate change measures into national policies, strategies and planning requires appropriate training and capacity building of government officials at all levels. These training exercises would equip government bodies with knowledge about climate change, information about adaptation and mitigation measures for

various sectors, and the skills required to incorporate climate concerns into planning processes.

Thrust area

The study calculates cost of capacity building of government bodies to integrate climate change measures in planning, and the building of institutional mechanisms. It builds on estimates in State Action Plans on Climate Change (SAPCCs) developed by various states in India.

Methodology

Budget allocations for capacity and institutional strengthening were estimated explicitly in a few SAPCCs (Andhra Pradesh – 0.004 per cent, Jammu & Kashmir – 0.7 per cent, Nagaland – 3.1 per cent, Lakshadweep – 1.4 per cent, Mizoram – 0.75 per cent, Punjab – 0.1 per cent, Madhya Pradesh – 1.5 per cent 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[29].

The total finance required for climate resilience, adaptation and mitigation as calculated under Target 13.1 is INR 263 lakh crores (INR 102 lakh crores for resilience, INR 140 lakh crores for mitigation, and INR 13 lakh crores for adaptation). Therefore the cost of capacity building and institutional mechanisms is approximately INR 4 lakh crores or USD 61 billion (in 2014-15 prices) for 15 years from 2015-30. The gap is assumed to be the entire finance required as there is currently no earmarked fund available for this purpose; the NAPCC and SAPCC documents only indicate finances required and not finances available.

TARGET 13.a, 13.b

13.a Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing 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 operationalize the Green Climate Fund through its capitalization as soon as possible

[29] See, for example, the Madhya Pradesh SAPCC (State Knowlegde Management Centre on Climate Change (SKMCCC), EPCO, Department of Housing and Environment, GoMP, 2014).

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 marginalized communities

These targets have not been considered in the study. The implications of this target are yet unknown and Intended Nationally Determined Contributions (INDC) are currently being deliberated in India and the world. Target 13.b is not considered in the study because these costs do not apply to India. India is not mandated to support LDCs but this target may require additional finance if India supports LDCs for climate change action.

Goal 14

Conserve and sustainably use the oceans seas and marine resources for sustainable development

GOAL 14. CONSERVE AND SUSTAINABLY USE THE OCEANS, SEAS AND MARINE RESOURCES FOR SUSTAINABLE DEVELOPMENT

14.1 By 2025, prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris and nutrient pollution

14.2 By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration, to achieve healthy and productive oceans

14.3 Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels

14.4 By 2020, effectively regulate harvesting, and end overfishing, illegal, unreported and unregulated (IUU) fishing and destructive fishing practices and implement science-based management plans, to restore fish stocks in the shortest time feasible at least to levels that can produce maximum sustainable yield as determined by their biological characteristics

14.5 By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on best available scientific information

14.6 By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, and eliminate subsidies that contribute to IUU fishing, and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the WTO fisheries subsidies negotiation

14.7 By 2030 increase the economic benefits to SIDS and LDCs from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism

14.a Increase scientific knowledge, develop research capacities and transfer marine technology taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular SIDS and LDCs

14.b Provide access of small-scale artisanal fishers to marine resources and markets

14.c Ensure the full implementation of international law, as reflected in UNCLOS for states parties to it, including, where applicable, existing regional and international regimes for the conservation and sustainable use of oceans and their resources by their parties

Goal 15

Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

GOAL 15: PROTECT, RESTORE AND PROMOTE SUSTAINABLE USE OF TERRESTRIAL ECOSYSTEMS, SUSTAINABLY MANAGE FORESTS, COMBAT DESERTIFICATION, AND HALT AND REVERSE LAND DEGRADATION AND HALT BIODIVERSITY LOSS

15.1 By 2020 ensure conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements

15.2 By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests, and increase afforestation and reforestation by x% globally

15.3 By 2020, combat desertification, and restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation neutral world

15.4 By 2030 ensure the conservation of mountain ecosystems, including their biodiversity, to enhance their capacity to provide benefits which are essential for sustainable development

15.5 Take urgent and significant action to reduce degradation of natural habitat, halt the loss of biodiversity, and by 2020 protect and prevent the extinction of threatened species

15.6 Ensure fair and equitable sharing of the benefits arising from the utilization of genetic resources, and promote appropriate access to genetic resources

15.7 Take urgent action to end poaching and trafficking of protected species of flora and fauna, and address both demand and supply of illegal wildlife products

15.8 By 2020 introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems, and control or eradicate the priority species

15.9 By 2020, integrate ecosystems and biodiversity values into national and local planning, development processes and poverty reduction strategies, and accounts

15.a Mobilize and significantly increase from all sources financial resources to conserve and sustainably use biodiversity and ecosystems

15.b Mobilize significantly resources from all sources and at all levels to finance sustainable forest management, and provide adequate incentives to developing countries to advance sustainable forest management, including for conservation and reforestation

15.c Enhance global support to efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities

FINANCIAL ASSESSMENT OF GOALS 14 AND 15

Summary of Goals 14 and 15				
Government bodies working on Target	**Programmes/Schemes of government**	**Indicator/Thrust area**	**Finance required***	**Gap***
Ministry of Environment and Forests	Forests and Wildlife, National Afforestation and Ecodevelopment Board, National River Conservation Directorate etc.	Protected area network	INR 31 lakh crores USD 489 billion (2015-27)	INR 30 lakh crores USD 481 billion (2015-27)

** In 2014-15 prices*

Background

Both Goals 14 and 15 of the proposed SDGs contain within them a hint at a strategy that India is familiar with, for conserving biodiversity. Simply put, this is a strategy that is pursued through the creation, expansion and consolidation of a protected areas network that has resulted in remarkable achievements of conserving species as well as ecosystems in India. Although the protected areas network is a remarkable achievement for a poor country like India that has many other competing and urgent priorities, additional efforts need to be made to expand the network in order to conform to not only SDGs but also terms agreed upon under the Convention on Biological Diversity.

Thrust AREA

India has an existing network of 700 protected areas (ENVIS Centre on Wildlife & Protected Areas, 2015). However, since the average size of the protected areas in India is small, the percentage of the country's land area covered through this

network is only 5.06 per cent[30]. This is well below Target 11 of the Aichi Targets for Biodiversity Conservation that states, "By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes" (CBD, 2010). The Indian National Biodiversity Support and Action Plan states that "Ecologically representative areas on land and in inland waters, as well as coastal and marine zones, especially those of particular importance for species, biodiversity and ecosystem services, are conserved effectively and equitably, on the basis of protected area designation and management and other area-based conservation measures and are integrated into the wider landscapes and seascapes, covering over 20 per cent of the geographic area of the country, by 2020"[31].

Thus, India needs to expand its protected areas network and almost quadruple the area covered under the network. This study considers the cost of the same.

Methodology

While it is important for India to expand its protected area network, there are competing demands on land use and opportunity costs of conservation have been rising fast. Accordingly, this study considers two kinds of costs: the direct administrative costs that the government incurs annually in order to manage and conserve these protected areas, and the opportunity costs that arise out of taking away the land within a protected area from other competing uses. These 2 kinds of costs are used to determine the *finance required* for achieving Goals 14 and 15.

The *gap* was estimated by projecting the future budget allocations for three relevant budget heads (Forests and Wildlife, National Afforestation and Ecodevelopment Board and National River Conservation Directorate) in the Five Year Plans, assuming that future plans would at least match the allocation of the XII Five Year Plan, and subtracting these future allocations from the finance required.

Linkages

Land degradation and deteriorating quality of marine resources have a direct negative impact on economic growth. All sectors of the economy depend directly or indirectly on natural resources. Agriculture depends on land as a crucial input for production, and therefore the achievement of food security under Goal 2 is dependent on the effective management of land use. Protection of terrestrial

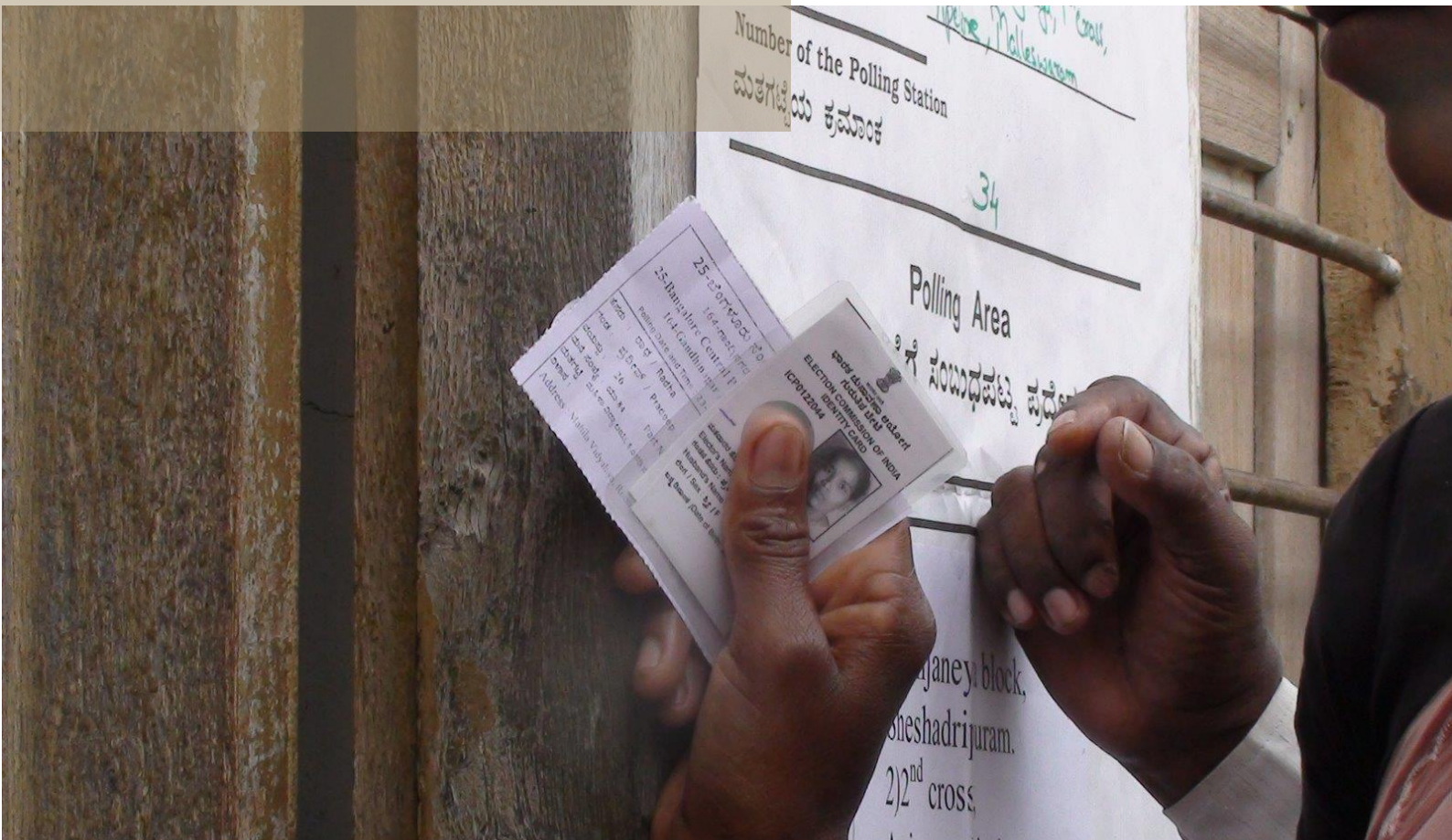
[30] Ibid

[31] Ibid

ecosystems as well as marine ecosystems is essential to preserve the rich biodiversity of our country, on which many depend for their livelihoods. Deteriorating quality of these ecosystems will prove detrimental to biodiversity-based livelihoods. It has been well-documented that if the damage to the ecosystem and environment is not stopped and reversed, economic growth (Goal 8) will suffer in the long run. Goals 14 and 15 should also be kept in mind while planning for Goals 9 (industries and infrastructure) and 11 (urbanisation) as these are the major sources of pollution. Goals 9 and 11 must be implemented in a sustainable fashion for the achievement of goals 14 and 15. Sustainable Consumption and Production (SCP) practices, as outlined in Goal 12, may be the way to reconcile considerations of environment as outlined in Goals 14 and 15 with the growing needs of infrastructure and industries as outlined in Goals 9 and 11.

Goal 16

Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels



GOAL 16: PROMOTE PEACEFUL AND INCLUSIVE SOCIETIES FOR SUSTAINABLE DEVELOPMENT, PROVIDE ACCESS TO JUSTICE FOR ALL AND BUILD EFFECTIVE, ACCOUNTABLE AND INCLUSIVE INSTITUTIONS AT ALL LEVELS

16.1 Significantly reduce all forms of violence and related death rates everywhere

16.2 End abuse, exploitation, trafficking and all forms of violence and torture against children

16.3 Promote the rule of law at the national and international levels, and ensure equal access to justice for all

16.4 By 2030 significantly reduce illicit financial and arms flows, strengthen recovery and return of stolen assets, and combat all forms of organized crime

16.5 Substantially reduce corruption and bribery in all its forms

16.6 Develop effective, accountable and transparent institutions at all levels

16.7 Ensure responsive, inclusive, participatory and representative decision-making at all levels

16.8 Broaden and strengthen the participation of developing countries in the institutions of global governance

16.9 By 2030 provide legal identity for all including birth registration

16.10 Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements

16.a Strengthen relevant national institutions, including through international cooperation, for building capacities at all levels, in particular in developing countries, for preventing violence and combating terrorism and crime

16.b Promote and enforce non-discriminatory laws and policies for sustainable development

GOAL 16 ASSESSMENT SUMMARY

This study does not assess independently the targets under Goal 16. Some of the targets will be influenced by progress in other goals, and this narrative attempts to throw light on some of these linkages.

Targets 16.1 to 16.5 and 16.a call for a reduction in violence, exploitation and trafficking of children, organised crime, corruption etc. And the promotion of the rule of law and justice. The study sees two forms of interventions that are needed together to achieve these ends: preventive interventions and curative interventions. Preventive interventions include interventions that improve people's standard of living, such as opportunities for employment and growth, labour rights, food security, health, education etc. Studies suggest that rising living standards make people less prone to committing crimes; a collapsing economy that impoverishes people breeds frustration and hopelessness, which often drives people to commit crimes (Kala, 2007). Therefore, it is probable that the achievement of the other SDGs will raise the standard of living of people and reduce the incidence of crime. The second form of interventions is curative interventions, which stem from law enforcement mechanisms such as the police, investigative and intelligence institutions and also the judiciary. Investments in strengthening these institutions may further help in reducing crime in India. While such costs are not calculated in this study, there are several studies that attempt to identify gaps and weaknesses in these institutions and suggest reforms; a financial assessment of these reforms would be useful (Pradhan, 2013).

Targets 16.6 and 16.7 call for effective, accountable and transparent institutions at all levels and democratic decision-making processes. Some schemes of the government, such as the Integrated Child Development Services (ICDS), National Rural Drinking Water Programme (NRDWP), Swachh Bharat Mission, Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) etc. Have provisions for community participation in the administration of the scheme. For example, in the NRDWP, *Panchayati Raj* Institutions (PRIs) are given the responsibility of managing the administration of the service, while in the case of the MGNREGS, the *panchayats* decide the work priority and have the power to decide on the public works that will be undertaken under their jurisdiction. For the achievement of targets 16.6 and 16.7, it is important to incorporate appropriate institutional arrangements and decision-making processes in government schemes in all sectors ranging from food to education to energy. Some of these costs are already accounted for in the sectors that have been financially assessed in this study. However, there may be additional costs in sectors that are not assessed in this study.

Target 16.9 calls for providing legal identify to all citizens. In India, the Aadhar card scheme is attempting just that. Implemented by the Unique Identification Authority

of India, the Aadhar scheme is considered one of the world's largest national identification number projects. Besides creating a biometric-based legal identity, it also assists in providing direct transfers of government subsidies to beneficiaries who are identified by their Aadhar cards. As of June 2015, 87.2 crore (872 million) have been enrolled in the project[32], which is over 72per cent of the population. The financial requirements and gaps for this initiative have not been assessed in this study.

Target 16.10 calls for public access to information and protection of fundamental freedoms. The current government has ambitious plans to expand access to ICT to the entire population; the cost of telecom and internet infrastructure for such an intervention has been estimated under Goal 9. India's Right to Information Act allows citizens to request information from public authorities, which are required to reply expeditiously or within thirty days. The Act also requires every public authority to computerise their records for wide dissemination. These are efforts to provide access to information to all citizens. The financial requirements and gaps for this initiative have not been assessed in this study.

Goal 16 is an important goal for harmonious co-existence of individuals in a democratic society. It is hoped that further studies will assess the reforms or additional systems needed to strengthen India's institutions, peace and inclusiveness.

[32] As reported in the web portal of UIDAI: https://portal.uidai.gov.in/uidwebportal/dashboard.do

Goal 17

Strengthen the means of implementation and revitalize the global partnership for sustainable development

GOAL 17: STRENGTHEN THE MEANS OF IMPLEMENTATION AND REVITALIZE THE GLOBAL PARTNERSHIP FOR SUSTAINABLE DEVELOPMENT

Finance

17.1 Strengthen domestic resource mobilization, including through international support to developing countries to improve domestic capacity for tax and other revenue collection

17.2 Developed countries to implement fully their ODA commitments, including to provide 0.7% of GNI in ODA to developing countries of which 0.15-0.20% to least-developed countries

17.3 Mobilize additional financial resources for developing countries from multiple sources

17.4 Assist developing countries in attaining long-term debt sustainability through coordinated policies aimed at fostering debt financing, debt relief and debt restructuring, as appropriate, and address the external debt of highly indebted poor countries (HIPC) to reduce debt distress

17.5 Adopt and implement investment promotion regimes for LDCs

Technology

17.6 Enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation, and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, particularly at UN level, and through a global technology facilitation mechanism when agreed

17.7 Promote development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed

17.8 Fully operationalize the Technology Bank and STI (Science, Technology and Innovation) capacity building mechanism for LDCs by 2017, and enhance the use of enabling technologies in particular ICT

Capacity building

17.9 Enhance international support for implementing effective and targeted capacity building in developing countries to support national plans to implement all

sustainable development goals, including through North-South, South-South, and triangular cooperation

Trade

17.10 promote a universal, rules-based, open, non-discriminatory and equitable multilateral trading system under the WTO including through the conclusion of negotiations within its Doha Development Agenda

17.11 increase significantly the exports of developing countries, in particular with a view to doubling the LDC share of global exports by 2020

17.12 realize timely implementation of duty-free, quota-free market access on a lasting basis for all least developed countries consistent with WTO decisions, including through ensuring that preferential rules of origin applicable to imports from LDCs are transparent and simple, and contribute to facilitating market access

Systemic issues

Policy and institutional coherence

17.13 enhance global macroeconomic stability including through policy coordination and policy coherence

17.14 enhance policy coherence for sustainable development

17.15 respect each country's policy space and leadership to establish and implement policies for poverty eradication and sustainable development

Multi-stakeholder partnerships

17.16 enhance the global partnership for sustainable development complemented by multi-stakeholder partnerships that mobilize and share knowledge, expertise, technologies and financial resources to support the achievement of sustainable development goals in all countries, particularly developing countries

17.17 encourage and promote effective public, public-private, and civil society partnerships, building on the experience and resourcing strategies of partnerships

Data, monitoring and accountability

17.18 by 2020, enhance capacity building support to developing countries, including for LDCs and SIDS, to increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts

17.19 by 2030, build on existing initiatives to develop measurements of progress on sustainable development that complement GDP, and support statistical capacity building in developing countries

GOAL 17 ASSESSMENT SUMMARY

Goal 17 provides the means of implementation of other SDGs. Some of the targets under Goal 17 call for developed countries to assist developing and least developed countries through transfers of finance, technology, capacity building support, etc. Other targets pertain to strengthening the means of implementation within each country. This section discusses India's requirements and gaps in the means of implementation of the goals, by building upon the discussion of each of the other 16 goals.

Finance

Target 17.1 talks of improving capacities for domestic tax and other revenue generation. India is notorious for its extremely complex tax regime. High tax rates, low tax base, high administrative costs of taxation, and the sheer number of different taxes make the system inefficient. There is scope for reforms, and plenty of studies have been conducted to determine what reforms are needed. It is hoped that further studies will financially assess these reforms.

The remaining targets under this section of goal 17 call for developed countries to assist developing countries through finance. India is not mandated to do so, although it provides financial assistance to some other countries. As a recipient of assistance, however, India must look to meet certain priorities. Poverty eradication is established as the top most priority of the post 2015 development agenda, ensuring that *no one is left behind.* Past experiences of India's development strategies indicate that economic growth along with targeted policies for the poor can result in poverty reduction. Poverty eradication will require economic growth that invests in skills based training, vocational education and promotion of business opportunities. It shall have to generate income and employment based initiatives like setting up Small and Medium Enterprises (SMEs). Given the fact that most of the poor belong to the rural areas of the country and have large dependence on agriculture, India would be required to do public investments in agriculture. In parallel, understanding that cities are the nuclei of economic growth, it is equally important to develop infrastructure and facilities in the urban space. As demonstrated in this study, India faces a substantial finance gap in achieving its SDGs. It is hoped that global finance to developing countries can fill at least part of this gap.

As for India's contribution to global finance, India has been a large contributor to South-South Cooperation and shall play a key role in strengthening the financial stability of South Asia. Further details are provided in the next sub-section.

Technology

Targets 17.6, 17.7 and 17.8 call for enhancing international cooperation in the development, transfer and dissemination of technologies to aid in the implementation of SDGs. India needs investments in technologies in almost all SDG-related sectors. In particular, India must leverage technologies to enhance agricultural productivity, improve healthcare systems, reverse environmental degradation and enable sustainable production processes. With food security as a fundamental concern and food waste, one of the biggest challenges that developing countries like India face, technology for infrastructure and capacity requirements for preventing food loss is of high priority. The "Make in India" campaign initiated by the current Indian government will require a significant amount of technology transfer. The need for sustainability even while expanding production capability requires technology. Goals 9 and 11 that focus on sustainable industrialisation and urban infrastructure respectively, are in need of new technologies to ensure that these initiatives involve minimal carbon footprints. The section 'Finance for Research and Development' in this study estimates the finance required for research and development, including the development of new technologies for the effective achievement of other SDG goals and targets. The estimated finance required for research and development as well as gap in finance has been provided in a later section in this study. It is hoped that assistance from developed countries in the form of technology assistance can help close the gap.

While India, being a developing country, is not mandated to provide such transfers to other countries, India is one of the four largest contributors, in terms of resource flows, in South-South Cooperation. To date, India is estimated to have provided over USD 3 billion of technical assistance to 156 developing countries[33]. Grants that India provides are mostly for rural development, education, health, technical co-operation and loans for infrastructure.

Capacity Building

Target 17.9 calls for targeted capacity building at all levels to strengthen the ability of public institutions to implement the SDGs. Some of the finances required to achieve this target have already been estimated under other goals. For example, the cost of building capacities of ULBs to administer urban services has been accounted for under Goal 11. The cost of engaging local institutions such as *panchayats* in the provision of drinking water and sanitation has been considered under Goal 6. The

[33] http://web.undp.org/evaluation/documents/thematic/ssc/chapter/chapter2-undp-ssc.pdf

cost of awareness generation on various aspects of sustainable development has been considered separately under the section 'Finance for Awareness'. Therefore target 17.9 is not separately assessed here.

Trade

Trade plays a decisive role in carving the economic growth of the country. Targets 17.10, 17.11 and 17.12 call for equitable multilateral trading systems, increased exports from developing countries and duty-free, quota-free market access for all. These targets are not directly quantifiable in financial terms, and therefore have not been financially assessed here.

Systemic issues

Targets 17.13 to 17.19 refer to addressing systemic issues that may hinder the achievement of SDGs in many countries. India needs to work substantially on improving policy and institutional coherence with SDGs. Further, India would need to develop monitoring and evaluation mechanisms in order to complement growth and development measures such as GDP growth with new indicators for sustainability. Some of these costs have been estimated elsewhere in the study. For example, the estimation of requirements and gaps in climate finance considers the cost of integrating climate concerns in planning processes. However, any additional investments that may be needed in other sectors have not been assessed here.

FINANCE FOR RESEARCH AND DEVELOPMENT

2.a Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries

3.b Support the research and development of vaccines and medicines for the communicable and non-communicable diseases that primarily affect developing countries, provide access to affordable essential medicines and vaccines, in accordance with the Doha declaration on the trips agreement and public health, which affirms the right of developing countries to use to the full the provisions in the agreement on trade-related aspects of intellectual property rights regarding flexibilities to protect public health, and, in particular, provide access to medicines for all

8.2 Achieve higher levels of productivity of economies through diversification, technological upgrading and innovation, including through a focus on high value added and labour-intensive sectors

9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and increasing the number of research and development workers per 1 million people by [x] per cent and public and private research and development spending

Thrust Area	Finance Required*	Gap*
Research and Development Expenditure as a percent to total GDP	INR 60 lakh crores USD 950 billion	INR 35 lakh crores USD 555 billion

**In 2014-15 prices*

Background

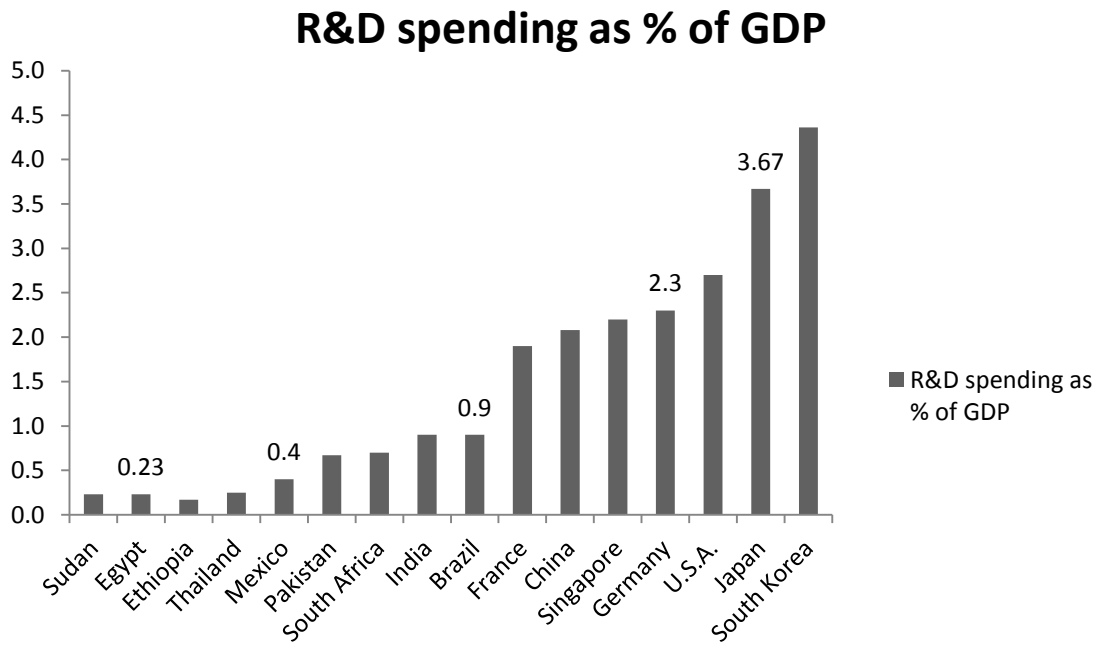
While R&D funding is not the sole indicator of how a nation, region or industry will perform, it certainly is a fundamental consideration among other factors like science, technology, engineering and mathematics, education levels, capital markets, healthcare, infrastructure, property rights and immigration policy.

In 2014, ten countries spent about 80 per cent of the total USD 1.6 trillion invested on R&D around the world; the combined investments by the U.S., China and Japan account for more than half of the total (Battelle, 2013).

Share of total global R&D spending (per cent)			
	2012	**2013**	**2014**
Americas (21)	34.5	34.0	33.9
US	32.0	31.4	31.1
Asia (20)	37.0	38.3	39.1
China	15.3	16.5	17.5
Japan	10.5	10.5	10.2
India	2.7	2.7	2.7
Europe (34)	23.1	22.4	21.7
Germany	6.1	5.9	5.7
Rest of world (36)	5.4	5.3	5.3

Source: Battelle, 2013, 2014 Global R & D Funding Forecast

India has been spending close to 0.85 per cent of its GDP since last three years[34], compared to US (2.7 per cent of its GDP), China (2.08 per cent of its GDP), Germany (2.9 per cent of its GDP) and France (1.9 per cent of the GDP) (see graph below).



Source: Wikipedia, "List of countries by research and development spending", retrieved August 2015 from https://en.wikipedia.org/wiki/List_of_countries_by_research_and_development_spending

[34] 0.9% of GDP in 2012, 0.85% (2013) and 0.9% (2014) respectively.

Given the progress made over the past two to three decades, India is projected to grow at a per capita annual growth rate of around 7 per cent on a sustained basis. This would mean a GDP of the range of USD 9 trillion (2011 prices) by 2035 (Mohan & Kapur, 2015).

The average expenditure on R&D as a per cent of GDP from 2000 to 2011 has been 0.84 per cent of the GDP (refer to table below). On the basis of the experiences of the other countries mentioned, India would have to raise its expenditure on R&D as a proportion of GDP from 0.8 per cent to around 2 per cent.

India's expenditure on R&D in relation to GDP			
Period	**R&D spending (current prices) (INR crores)**	**GDP at current prices (INR crores)**	**R&D as a percentage of GDP**
1990-91	3974.17	531814	0.75
1995-96	7483.88	1118586	0.67
1996-97	8913.61	1301788	0.68
1997-98	10611.34	1447613	0.73
1998-99	12473.17	1668739	0.75
1999-00	14397.60	1847273	0.78
2000-01	16198.80	1991982	0.81
2001-02	17038.15	2167745	0.79
2002-03	18088.16	2338200	0.77
2003-04	20086.34	2622216	0.77
2004-05	24117.24	2971464	0.81
2005-06	29932.58	3390503	0.88
2006-07	34238.39	3953276	0.87
2007-08	39437.77	4582086	0.86
2008-09	47353.38	5303567	0.89
2009-10	53041.30	6091485	0.87
2010-11	62053.47*	7157412^	0.87
2011-12	72620.44*	8279975#	0.88

Source:

1. *Data on R&D expenditure collected and compiled by Department of Science and Technology, Ministry of Science and Technology, GoI*
2. *Data on GDP by Economic Survey of India, 2011-12*

Notes:

1. *GDP figures are based on 2004-05 series*
2. ** estimated; ^ quick estimates; # advance estimates*

Methodology

The total national expenditure on Research and Development was obtained as a percentage of GDP. The GDP at factor price was projected till 2030 based on the trends of the past. The finance required was estimated as 2 per cent of total future GDP. The gap was estimated by assuming that the finance expected to be available would follow past trends, that is, it would be roughly 0.84 per cent of total future GDP.

FINANCE FOR AWARENESS

4.7 By 2030 ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development

12.8 By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature

13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

Background

Some of the SDG targets specifically call for ensuring that people have relevant information, awareness and skills needed to promote sustainable development. Besides these targets, there are also other targets for which awareness generation is a necessity. For example, citizens need to be aware of what to do in the event of natural disasters to ensure disaster preparedness of the country, in accordance with target 11.5. At the core of all tasks undertaken for sustainable development, it is of utmost importance to enable people to understand the importance of the environment and make concerted efforts to use resources sustainably.

Methodology

This study proposes that approximately 1 per cent of GDP be set aside for awareness generation. The Annexure shows projections of GDP into the future, based on past trends, and calculates 1 per cent of the GDP as the requirement for awareness generation. The total finance required works out to INR 30 lakh crores or USD 474 billion. Since these are new costs for creating awareness on sustainable development and there is currently no allocated public fund for this purpose, it is assumed that the gap is of the same size as the finance required.

These costs may be sourced from various Ministries, who may conduct awareness generation as part of their existing or new schemes. Some of these costs may also be sourced from the private sector.

Section III

Annexures

ANNEXURE TO TARGETS 2.1, 2.2

ESTIMATION OF FINANCE REQUIRED

Based on the projection by FAO Agriculture Outlook Report 2014, the effective food subsidy is projected to rise from INR 1674 per person per year in 2013 to INR 3076 per person per year by 2024. This subsidy is projected to cover 67 per cent of total population of the country. Assuming that the rate of growth of per-person subsidy is constant, the effective subsidy over these ten years is calculated. The future population was projected using an annual growth rate of 0.73 per cent, which is the compounded annual growth rate of the population from 2001 to 2011. Population figures were obtained from Census 2001 and 2011 data.

Total Projected Consumer Subsidy from 2013-24				
Period	**Consumer Subsidy per person (INR) (in 2013-14 prices)**	**Total Population (in millions)**	**67 per cent of total population (in millions)**	**Total Consumer Subsidy (in INR crores) (in 2013-14 prices)**
2013-14	1674.00	1239.44	830.43	139014
2014-15	1778.96	1254.32	840.39	149503
2015-16	1890.50	1269.37	850.48	160783
2016-17	2009.035	1280.68	858.05	172386
2017-18	2135.00	1292.09	865.70	184827
2018-19	2268.87	1303.60	873.41	198165
2019-20	2411.124	1315.21	881.19	212466
2020-21	2562.30	1326.93	889.04	227800
2021-22	2722.96	1338.75	896.96	244239
2022-23	2893.69	1350.68	904.95	261866
2023-24	3075.12	1362.71	913.02	280764
Total consumer subsidy requirement from 2015-24 (in 2013-14 prices) (in INR)				**19 lakh crores**
Total consumer subsidy requirement from 2015-24 (in 2014-15 prices) (in INR)				**20 lakh crores**
Total consumer subsidy requirement from 2015-24 (in 2014-15 prices) (in USD)				**320 billion**

The total consumer subsidy requirement on food from 2015-24 in 2014-15 prices is INR 20 lakh crores (USD 320 billion).

AVAILABLE DATA

Available data on public expenditure on food subsidy					
Period	**Total public expenditure on food subsidy (nominal) (INR crores)***	**Wholesale Price Index (2004-05=100)**	**Total real public expenditure (2004-05 prices) (INR crores)**	**Total population (millions)**	**Total real public expenditure per capita (2004-05 prices) (INR)**
2005-06	24240.24	103.4	23450.73	1097.80	213.61
2006-07	25133.58	109.6	22933.84	1115.79	205.53
2007-08	32708.16	114.9	28456.31	1134.07	250.92
2008-09	46294.03	124.9	37059.93	1152.64	321.52
2009-10	62120.34	127.9	48585.29	1171.53	414.72
2010-11	67626.36	140.0	48275.81	1190.72	405.43
2011-12	76920.52	153.3	50160.10	1210.22	414.47
2012-13	90749.96	164.9	55024.99	1224.74	449.28

** Source: Indian Public Finance Statistics 2013-14, Ministry of Finance, Government of India*

ESTIMATION OF GAP

It is assumed that future budget allocations to food subsidy will follow the past trends in expenditure.

Projected availability of public finance for food subsidy, 2015-24			
Period	**Total real public expenditure on food subsidy per capita* (2004-05 prices) (INR)**	**Projected population**	**Total expected availability of public finance for food subsidy (2004-05 prices) (INR crores)**
2005-06	213.62		
2006-07	205.54		
2007-08	250.92		
2008-09	321.52		
2009-10	414.72		
2010-11	405.43		
2011-12	414.47		
2012-13	449.28		
2013-14	508.60		
2014-15	547.30		
2015-16	586.00	1269369715	74385
2016-17	624.71	1280678515	80005
2017-18	663.41	1292088066	85718
2018-19	702.11	1303599264	91527
2019-20	740.81	1315213015	97433
2020-21	779.52	1326930233	103436
2021-22	818.22	1338751839	109539
2022-23	856.92	1350678764	115742
2023-24	895.62	1362711946	122048
Total real public expenditure expected to be available from 2015 to 2024 (in 2004-05 prices) (in INR)			**9 lakh crores**
Total real public expenditure expected to be available from 2015 to 2024 (in 2014-15 prices) (in INR)			**16 lakh crores**
Total real public expenditure expected to be available from 2015 to 2024 (in USD)			**254 billion**

Projections

The total real public expenditure expected to be available from 2015 to 2030 in 2014-15 prices is INR 16 lakh crores or USD 254 billion. Therefore the gap is INR 4 lakh crores (USD 63 billion).

ANNEXURE TO TARGETS 2.4, 2.5

AVAILABLE DATA

Available Data on Finance Required for Sustainable Agriculture, 2015-20				
Item	**Finance required per year, 2015-2020 (INR crores) (in 1999-00 prices)**	**Total finance required till 2020 (in 1999-00 prices)**	**WPI (2004-05=100)**	**Finance required (in 2004-05 prices) (INR crores)**
Irrigation	50000	250000	77.57	322290.00
New Irrigation	4800	24000	77.57	30939.80
Rainfed Farming	4800	24000	77.57	30939.80
Soil and water conservation	13195	65975	77.57	85052.20
Wasteland	19200	96000	77.57	123759.00
Animal Husbandry	30048	150240	77.57	193683.00
TOTAL	**122,043**	**610215**	**77.57**	**786664**

** Source: Samir Samantara & K. C. Badatya, 2012. A Perspective on Agricultural Credit for 2020*

The projection of credit is based on certain assumptions as mentioned below (Samantara & Badatya, 2012):

- Perspective Credit Plan is based on 4.1 per cent growth for agriculture GDP by 2020 (2009-10 to 2019-20). The base year GDP (1999-2000) level was INR 142915 crores. Capital output ratio as estimated during Tenth Plan (4.05) is assumed as constant.
- Technological change, research and other factors (total factor productivity + total input productivity) remain constant over the period.
- Growth of Gross Capital Formation (GCF) has been taken as 20.3 per cent of GDP agriculture. GCF from private sector has been assumed at 77.8 per cent of total GCF for agriculture (average of the share of private capital formation during 1999-00 and 2007-08).
- The private investment to be supported by bank credit is assumed at 63.33 per cent (as per Working Group Report on Agricultural Credit and Co-operation, Tenth Plan).
- Projected figures for crop loan has been computed on the basis of ratio of private investment and input cost (1:3.2) and correlation coefficient (0.98).

- Induced investment in thrust areas like irrigation, rain-fed farming, wasteland development, soil/water conservation, animal husbandry/dairy development and fisheries, etc. is assumed at INR 30,531 crores annually. Complementarity between public and private investment is assumed at 3.7.
- These assumptions are consistent with RBI's objective of 6.0 per cent inflation on a tapering basis.

ESTIMATION OF FINANCE REQUIRED

Using the above mentioned study, an assessment of finance required is done if the finance required per annum continues to follow the same trend till 2024. This assumption is based on the fact that these are primary initial investments, so per annum finance required beyond 2020 will at the very least be equal to the finance required till 2020.

Finance required for sustainable agriculture, 2015-24				
Item	**Finance required per year, 2015-2020 (INR crores) (in 1999-00 prices)**	**Total finance required till 2024 (in 1999-00 prices) (INR crores)**	**WPI (2004-05=100)**	**Finance required (in 2004-05 prices) (INR crores)**
Irrigation	50,000	450000	77.57	580121.18
New Irrigation	4800	43200	77.57	55691.63
Rainfed Farming	4800	43200	77.57	55691.63
Soil and water conservation	13195	118755	77.57	153093.97
Wasteland	19200	172800	77.57	222766.53
Animal Husbandry	30048	270432	77.57	348629.62
Total finance required (in 2004-05 prices) (INR)				**14 lakh crores**
Total finance required (in 2014-15 prices) (INR)				**26 lakh crores**
Total finance required (in 2014-15 prices) (USD)				**409 billion**

The total finance required from 2015 to 2024 in 2014-15 prices is INR 26 lakh crores.

ESTIMATION OF GAP

It is assumed that future budget allocations to the agriculture associated area i.e. irrigation, soil and water management and animal husbandry will follow past trends in expenditure.

Projected availability of public finance for agriculture, 2015-24	
Period	**Total real public expenditure on agriculture (in 2004-05 prices) (INR crores)**
2005-06	36454.76
2006-07	42126.29
2007-08	47345.53
2008-09	44795.35
2009-10	49617.21
2010-11	52038.76
2011-12	49790.45
2012-13	54896.01
2013-14	57114.00
2014-15	59331.99
2015-16	61549.98
2016-17	63767.97
2017-18	65985.96
2018-19	68203.95
2019-20	70421.94
2020-21	72639.93
2021-22	74857.92
2022-23	77075.91
2023-24	79293.89
Total real public expenditure expected to be available from 2015 to 2024 (in 2004-05 prices) (in INR)	**6 lakh crores**
Total real public expenditure expected to be available from 2015 to 2024 (in 2014-15 prices) (in INR)	**11.5 lakh crores**
Total real public expenditure expected to be available from 2015 to 2024 (in USD)**	**183 billion**

Projections

The total real public expenditure expected to be available from 2015 to 2030 in 2014-15 prices is INR 11.5 lakh crores or USD 183 billion. Therefore the gap is INR 14.5 lakh crores (USD 230 billion).

ANNEXURE TO TARGETS 3.1, 3.2, 3.3, 3.4, 3.5, 3.7, 3.8

AVAILABLE DATA

Available data on public expenditure on health and family welfare and Health Index						
Period	Total public expenditure on health (nominal) (INR crores)*	Wholesale Price Index (2004-05=100)	Total real public expenditure (in 2004-05 prices) (INR crores)	Total population (in millions)	Total real public expenditure per capita (in 2004-05 prices) (INR)	Health Index**
2005-06	34392.59	103.4	33272.41	1097.80	303.08	0.678
2006-07	40392.99	109.6	36857.72	1115.79	330.32	0.683
2007-08	47687.26	114.9	41488.22	1134.07	365.83	0.688
2008-09	58297.66	124.9	46669.24	1152.64	404.88	0.693
2009-10	71589.03	127.9	55990.89	1171.53	477.93	0.698
2010-11	83348.02	140.0	59498.88	1190.72	499.68	0.702

** Source: Mita Choudhury, H.K. Amar Nath, National Institute of Public Finance and Policy (NIPFP), 2012, An Estimate of Public Expenditure on Health in India*

*** Source: World Health Organisation*

ESTIMATION OF FINANCE REQUIRED

- Total real public expenditure on health (Centre and states) per capita for years 2005-11 was plotted against the health index for the same time period.
- A linear regression analysis using the method of least squares was done with health index as the independent variable and the public expenditure as the dependent variable. (R square = 0.97, standard error = 13.6. Checked for autocorrelation using the Durbin-Watson test, and found no autocorrelation.)
- The future target value of the indicator (health index) was set in such a manner as to increase gradually from the 2010-11 value of 0.702 to the target value of 0.90.
- The required expenditure per capita was then forecasted for each future value of the indicator from 2015 to 2030 (highlighted in the table below).
- The future population was projected using an annual growth rate of 0.73 per cent, which is the compounded annual growth rate of the population from

2001 to 2011. Population figures were obtained from Census 2001 and 2011 data.

- The forecasted requirements of per capita expenditures were multiplied with the projected population from 2015 to 2030. These were summed to find the total real finance required from 2015-30.

Estimation of finance required for health, 2015-30				
Period	**Total public expenditure on health per capita* (in 2004-05 prices) (INR)**	**Health Index**	**Projected population (millions)**	**Total funding required (in 2004-05 prices) (INR crores)**
2005-06	303.08	0.678		
2006-07	330.32	0.683		
2007-08	365.83	0.688		
2008-09	404.88	0.693		
2009-10	477.93	0.698		
2010-11	499.68	0.702		
2011-12	531.87	0.706		
2012-13	566.32	0.71		
2013-14	600.76	0.714		
2014-15	700.88	0.725625		
2015-16	800.99	0.73725	1269.36	101675.43
2016-17	901.10	0.748875	1280.67	115402.249
2017-18	1001.21	0.7605	1292.08	129365.59
2018-19	1101.32	0.772125	1303.60	143568.56
2019-20	1201.43	0.78375	1315.21	158014.34
2020-21	1301.55	0.795375	1326.93	172706.11
2021-22	1401.66	0.807	1338.75	187647.12
2022-23	1501.77	0.818625	1350.68	202840.64
2023-24	1601.88	0.83025	1362.71	218290.00
2024-25	1701.99	0.841875	1374.85	233998.51
2025-26	1802.10	0.8535	1387.10	249969.60
2026-27	1902.21	0.865125	1399.46	266206.70
2027-28	2002.32	0.87675	1411.93	282713.26
2028-29	2102.43	0.888375	1424.51	299492.81
2029-30	2202.54	0.9	1437.20	316548.90
Total finance required from 2015-30 (in 2004-05 prices) (in INR crores)				**3078439.80**
Total finance required from 2015-30 (in 2014-15 prices) (in INR crores)				**5541191.63**
Total finance required from 2015-30 (in USD billion)				**879.55**

Projections *Desired values of indicator*

The total finance required from 2015 to 2030 in 2014-15 prices is INR 55 lakh crores or USD 880 billion.

ESTIMATION OF GAP

It is assumed that future budget allocations to the Ministry of Health will follow past trends in expenditure.

Projected availability of public finance for health, 2015-30			
Period	**Total public expenditure on health per capita* (in 2004-05 prices) (INR)**	**Projected population**	**Total expected availability of public finance for health (2004-05 prices) (INR crores)**
2004-05	260.78		
2005-06	303.08		
2006-07	330.33		
2007-08	365.84		
2008-09	404.89		
2009-10	477.93		
2010-11	499.69		
2011-12	540.50		
2012-13	581.25		
2013-14	622.00		
2014-15	662.75		
2015-16	703.50	1269369715	89299.85
2016-17	744.25	1280678515	95314.06
2017-18	785.00	1292088066	101428.33
2018-19	825.74	1303599264	107644.00
2019-20	866.50	1315213015	113962.35
2020-21	907.24	1326930233	120384.74
2021-22	948.00	1338751839	126912.53
2022-23	988.74	1350678764	133547.07
2023-24	1029.49	1362711946	140289.75
2024-25	1070.24	1374852331	147141.97
2025-26	1110.99	1387100875	154105.15
2026-27	1151.74	1399458541	161180.72
2027-28	1192.49	1411926301	168370.13
2028-29	1233.23	1424505137	175674.85
2029-30	1273.98	1437196037	183096.36
Total real public expenditure expected to be available from 2015 to 2030 (in 2004-05 prices) (in INR crores)			**2018351.85**
Total real public expenditure expected to be available from 2015 to 2030 (in 2014-15 prices) (in INR crores)			**3633033.33**
Total real public expenditure expected to be available from 2015 to 2030 (in USD billion)			**576.67**

Projections

The total public finance expected to be available from 2015 to 2030 in 2014-15 prices is INR 36 lakh crores or USD 577 billion. Therefore the gap is INR 19 lakh crores or USD 305 billion.

ANNEXURE TO TARGET 4.1

AVAILABLE DATA

Available data on public expenditure on elementary and secondary education and expected years of schooling (all expenditures in INR crores)

Period	Public expenditure on elementary education*	Public expenditure on secondary education *	Total expenditure	Whole-sale Price Index (2004-05=100)	Total real public expenditure (in 2004-05 prices)	Population aged 5-19 (Derived from Census 2001 and 2011)	Total real public expenditure per capita (population aged 5-19) (in 2004-05 prices) (INR)	Expected years of schooling**
2004-05	41874.17	25110.62	66984.79	100.0	66984.79	361,210,694	1854.45	
2005-06	50181.99	27804.63	77986.62	103.4	75446.58	363,859,299	2073.51	10.0
2006-07	60062.84	31675.15	91737.99	109.6	83708.91	366,527,324	2283.84	10.2
2007-08	68709.52	35587.49	104297.01	114.9	90739.08	369,214,912	2457.62	10.5
2008-09	79000.85	45504.08	124504.93	124.9	99670.39	371,922,208	2679.87	10.8
2009-10	95573.49	59471.25	155044.74	127.9	121262.91	374,649,355	3236.70	10.8
2010-11	119581.45	70450.68	190032.13	140.1	135656.49	377,396,499	3594.53	11.1
2011-12 (RE)	143010.30	86617.74	229628.04	153.4	149741.14	380,163,787	3938.86	11.7
2012-13 (BE)	163103.79	97276.20	260379.99	164.9	157877.82	382,951,366	4122.66	11.7

** Sector-wise plan and non-plan actual expenditure of education departments of states/union territories and centre (revenue account) (The capital account expenditures are negligible, and normally only 1-2 % of total expenditure on education, and have therefore been ignored here. Moreover, education sector-wise capital expenditure details are not available).*

*** Source: Human Development Report, United Nations Development Programme*

ESTIMATION OF FINANCE REQUIRED

Required finance was estimated as follows.

- Total real public expenditure on education (elementary and secondary) (Centre and states) per capita (of population aged 5-19) for years 2005-14 was plotted against the expected years of schooling per child for the same time period.

- A linear regression analysis using the method of least squares was done with expected years of schooling as the independent variable and the public expenditure as the dependent variable. (R square = 0.94, standard error = 211.56. Checked for autocorrelation using the Durbin-Watson test, and found no autocorrelation.)
- The future target values of the indicator (expected years of schooling per child) was set in such a manner as to increase gradually from the 2013-14 value of 12.1 to the target value of 15.
- The required expenditure per capita was then forecasted for each future value of the indicator from 2015 to 2030 (highlighted in the table below).
- The future population in the age group of 5-19 was projected using an annual growth rate of 0.73 per cent, which is the compounded annual growth rate of this age group of the population from 2001 to 2011. Population figures were obtained from Census 2001 and 2011 data.
- The forecasted requirements of per capita expenditures were multiplied with the projected population aged 5-19 from 2015 to 2030. These were summed to find the total real finance required from 2015-30.

Estimation of finance required for elementary and secondary education, 2015-30

Period	Total real public expenditure on elementary and secondary education per capita* (in 2004-05 prices) (INR)	Expected years of schooling per child (UNDP - HDR)	Projected population aged 5-19	Total real funding required (in 2004-05 prices) (INR crores)
2005-06	2073.51	10		
2006-07	2283.84	10.2		
2007-08	2457.62	10.5		
2008-09	2679.87	10.8		
2009-10	3236.70	10.8		
2010-11	3594.53	11.1		
2011-12	(RE) 3938.86	11.7		
2012-13	(BE) 4122.66	11.7		

Estimation of finance required for elementary and secondary education, 2015-30				
Period	**Total real public expenditure on elementary and secondary education per capita* (in 2004-05 prices) (INR)**	**Expected years of schooling per child (UNDP - HDR)**	**Projected population aged 5-19**	**Total real funding required (in 2004-05 prices) (INR crores)**
2013-14	4472.74	11.7		
2014-15	4700.55	12.1		
2015-16	4959.10	12.3	391,437,345	194117.7
2016-17	5217.65	12.5	394,307,588	205735.9
2017-18	5476.20	12.7	397,198,877	217514.0
2018-19	5734.75	12.9	400,111,368	229453.8
2019-20	5993.30	13.1	403,045,214	241557.1
2020-21	6251.85	13.3	406,000,573	253825.4
2021-22	6510.40	13.5	408,977,602	266260.8
2022-23	6768.95	13.7	411,976,460	278864.8
2023-24	7027.50	13.9	414,997,308	291639.3
2024-25	7286.05	14.1	418,040,307	304586.2
2025-26	7544.60	14.3	421,105,618	317707.3
2026-27	7803.15	14.5	424,193,406	331004.5
2027-28	8061.70	14.7	427,303,836	344479.5
2028-29	8320.25	14.9	430,437,073	358134.4
2029-30	8449.52	15	433,593,284	366365.7
Total finance required from 2015-30 (in 2004-05 prices) (in INR)				**INR 42,01,246 crores**
Total finance required from 2015-30 (in 2014-15 prices) (in INR)				**INR 76,46,616 crores**
Total finance required from 2015-30 (in USD)				**USD 1,213.75 billion**

** Population aged 5-19*

Projections

Desired values of indicator

The total finance required from 2015 to 2030 in 2014-15 prices is roughly INR 76 lakh crores or USD 1200 billion.

ESTIMATION OF GAP

It is assumed that future budget allocations to the departments of education will follow past trends in expenditure.

Projected availability of public finance for elementary and secondary education, 2015-30			
Period	**Total real public expenditure on elementary and secondary education per capita* (in 2004-05 prices) (INR)**	**Projected population aged 5-19**	**Total expected availability of public finance for elementary and secondary education (in 2004-05 prices) (INR crores)**
2004-05	1854.45		
2005-06	2073.51		
2006-07	2283.84		
2007-08	2457.62		
2008-09	2679.87		
2009-10	3236.70		
2010-11	3594.53		
2011-12	(RE) 3938.86		
2012-13	(BE) 4122.66		
2013-14	4472.74		
2014-15	4789.25		
2015-16	5105.76	391437345	199858.35
2016-17	5422.26	394307588	213804.00
2017-18	5738.77	397198877	227943.42
2018-19	6055.28	400111368	242278.70
2019-20	6371.79	403045214	256811.95
2020-21	6688.30	406000573	271545.31
2021-22	7004.81	408977602	286480.93
2022-23	7321.32	411976460	301620.98
2023-24	7637.82	414997308	316967.66
2024-25	7954.33	418040307	332523.18
2025-26	8270.84	421105618	348289.79
2026-27	8587.35	424193406	364269.73
2027-28	8903.86	427303836	380465.30

Projected availability of public finance for elementary and secondary education, 2015-30			
Period	**Total real public expenditure on elementary and secondary education per capita* (in 2004-05 prices) (INR)**	**Projected population aged 5-19**	**Total expected availability of public finance for elementary and secondary education (in 2004-05 prices) (INR crores)**
2028-29	9220.37	430437073	396878.79
2029-30	9536.88	433593284	413512.54
Total real public finance expected to be available from 2015 to 2030 (in 2004-05 prices) (INR)			45,53,251 crores
Total real public finance expected to be available from 2015 to 2030 (in 2014-15 prices) (INR)			82,87,295 crores
Total real public finance expected to be available from 2015 to 2030 (USD)			1315 billion

** Population aged 5-19*

Projections

The finance expected to be available from 2015-30 in 2014-15 prices is approximately INR 83 lakh crores or USD 1315 billion. Therefore no financial shortfall is expected.

ANNEXURE TO TARGET 4.2

REFORMS REQUIRED FOR THE ICDS

The Report of the Inter Ministerial Group on ICDS Restructuring proposes the following reforms.

Programmatic Reforms	• Repositioning the AWC as a vibrant, child friendly ECD centre (Baal Vikas Kendra), which will ultimately be owned by women in the community • Re-designing & reinforcing of the package of ICDS services, including a new component of Child Care and Nutrition Counselling for mothers of children under three years • Enhancing Nutritional Impact • Strengthening Early Childhood Care and Education • Convergence with flagship programmes • Community Mobilisation and Monitoring
Management Reforms	• Decentralised programme planning, management and monitoring systems, with a results framework and flexible architecture • Improved Human Resource Management for Women and Child Development • Training and Capacity Building • Strengthening civil society partnerships for operating upto 10per cent of the ICDS projects • Increased public accountability by strengthening the role of PRIs, urban local bodies and village level functionaries in overseeing AWC functioning • Ensuring convergence with related sectors such as NRHM, TSC, NRDWP, SSA MGNREGA • Strengthening of ICDS Management Information System (MIS) • Improved Financial Management Systems
Institutional Reforms	• ICDS Missions at National, State and District levels with structure and systems • National Mission Steering Group (headed by Minister I/C WCD) and Empowered Committee with delegated authority • Memorandums of Understanding between Central/ State governments, and APIPs with agreed state specific monitorable outcomes for preventing under nutrition, promoting early child development; milestones of

	achievement and shared policy, programme and resource commitments. • Capacity Development including setting up of National /State ICDS Mission Resource Centres, professionalisation of technical and management support at different levels, linking service delivery and training resources through the mission, interstate and inter district sharing of innovative models /best practices and learning. • Powers will be devolved to Panchayati Raj Institutions and Urban Local Bodies • Community ownership of ICDS • Community owned ICDS accreditation system • High Focus/High Burden States/Districts will receive focused attention, addressing the higher burden of the challenges and development deficits, with intensified activities • Public Accountability, Reviews and Evaluation

ESTIMATION OF FINANCE REQUIRED

Finance required for restructuring and strengthening the ICDS under the XII Five Year Plan (2012-17), as per the Report of the Inter Ministerial Group on ICDS Restructuring:

ICDS Mission: Average Annual Requirement (INR crores)				
S. No.	**Major Heads**	**GoI liability**	**State liability**	**Total**
1	Recurring	30776	12641	43417
2	Non-recurring	3641	1227	4868
	Total	34417	13868	48285
S. No.	Recurring budget heads	Annual GoI liability	Annual states liability	% of total recurring budget (GoI liability)
1	Honoraria	9411	1046	30.58
2	SNP (GoI share)	10151	10151	32.98
3	Salary	5997	666	19.49
4	ECCE	926	103	3.01
5	Others*	508	75	1.65
6	Rent	818	91	2.66

ICDS Mission: Average Annual Requirement (INR crores)				
S. No.	**Major Heads**	**GoI liability**	**State liability**	**Total**
7	PSE and medicine kits	745	83	2.42
8	Flexi fund + uniform	301	33	0.98
9	Untied fund including crèches	755	265	2.45
10	Monitoring	326	36	1.06
11	Training (including IYCF training costs of INR 358 crores and ECCE training costs of INR 151 crores for 5 years)	325	36	1.06
12	Purchase, hiring, POL and maintenance	200	22	0.65
13	IEC and advocacy (including IYCF activities @ INR 32 crores per annum at project level)	219	24	0.71
14	Sneha Shivirs	94	10	0.31
	Total	**30776**	**12641**	**100**
*Others include TA, insurance (RSBY), grading and accreditation, other social security, administrative expenses and contingencies.				

Expenditures needed under the XII Five Year Plan (2012-17) (all expenditures in 2011-12 prices)			
Capital Expenditure required (2012-17) (A)	**Recurring Expenditure required per year (B)**	**Total Recurring Expenditure required (2012-17) (C)**	**Total Expenditure required (2012-17) (D=A+C)**
INR 24,340 crores	INR 43,417 crores	INR 2,17,085 crores	INR 24,15,515 crores

Assuming that the recurring expenditure will be required beyond the XII Plan period, we calculate below the additional funding requirement from 2017 to 2030.

Expenditures needed beyond the XII Five Year Plan (all expenditures in 2011-12 prices)	
Recurring Expenditure required per year (E)	**Total Recurring Expenditure required (2017-30) (F)**
INR 43,417 crores	INR 5,64,421 crores

Total expenditure required from 2012 to 2030 (=D+F) = ~ INR 30 lakh crores (in 2011-12 prices). In 2014-15 prices, this is an amount of INR 35 lakh crores or USD 561 billion.

ESTIMATION OF GAP

The anticipated availability of funds was calculated using the following available data.

Available data on ICDS expenditure					
Period	Public expenditure on ICDS (General) (Centre + States) (Nominal) (INR crores)	Public expenditure on ICDS (Supplemental Nutrition) (Centre + States) (Nominal) (INR crores)	Total public expenditure on ICDS (General + Supplementary nutrition) (Centre + States) (INR crores)	Wholesale Price Index (2004-05=100)	Total real public expenditure on ICDS (in 2004-05 prices) (INR crores)
2006-07	2618.34	3102.51	5720.85	109.59	5220.15
2007-08	2992.94	4433.83	7426.77	114.94	6461.34
2008-09	3967.37	4928.34	8895.71	124.92	7121.32
2009-10	4839.66	8242.96	13082.62	127.86	10232.12
2010-11	5306.91	10153.69	15460.60	140.08	11036.72

Details of expenditure by states and the Centre for subsequent years until 2015 were not available; therefore these expenditures were estimated using the trends observed from 2006-11. Using this data, the anticipated future allocations were projected as follows assuming that future allocations will follow past trends in expenditures.

Projected availability of public finance for ICDS, 2015-30		
Period	Total real public expenditure on ICDS (in 2004-05 prices) (INR crores)	
2006-07	5220.15	Available data
2007-08	6461.34	
2008-09	7121.32	
2009-10	10232.12	
2010-11	11036.72	
2011-12	12635.50	Estimations
2012-13	14175.89	
2013-14	15716.29	

2014-15	17256.68	
2015-16	18797.07	Projections
2016-17	20337.46	
2017-18	21877.85	
2018-19	23418.24	
2019-20	24958.63	
2020-21	26499.03	
2021-22	28039.42	
2022-23	29579.81	
2023-24	31120.20	
2024-25	32660.59	
2025-26	34200.98	
2026-27	35741.37	
2027-28	37281.77	
2028-29	38822.16	
2029-30	40362.55	
Total public finance expected to be available from 2015 to 2030 (in 2004-05 prices) (in INR)	**INR 4,43,697**	
Total public finance expected to be available 2015 to 2030 (in 2014-15 prices) (in INR)	**INR 8,07,566**	
Total public finance expected to be available from 2015 to 2030 (in USD)	**USD 128 billion**	

The total finance required from 2015-30 in 2014-15 prices is INR 35 lakh crores or USD 561 billion. The total finance expected to be available from 2015-30 in 2014-15 prices is INR 8,07,566 crores or USD 128 billion. Therefore, the gap is roughly INR 27 lakh crores or USD 433 billion.

ANNEXURE TO TARGET 4.4

The following shows a detailed estimate of costs of skill development in India. The costs of expanding skilling capacity have been estimated by the PHD Chamber of Commerce and Industry and Technopak Advisors (PHD Chamber of Commerce and Industry, 2014).

1. *Expanding skilling capacity*
    a. *Expanding capacity to train trainers:* Even with the current capacity to train and skill people, India requires at least 300,000 trainers today and about 400,000 trainers by 2035 to train its huge and ever increasing pool of workers. Thus, the most critical priority for the Indian government is to establish a world-class, or "China"-scale, infrastructure which can train tens of thousands of trainers annually for the next several decades. These trainers can then train 7.5 – 10 million fresh trainees every year in over 3,000 vocations as is relevant not only for India's current and emerging needs but also for such labour export markets as the Middle East and possibly Europe and Japan, and must also have the capability to teach/transfer such skills to fresh trainees. The report recommends to policymakers at both the state and central level to first set up a pan-India network of about 15 National Institutes of Skill Development (NISDs) along the lines of the network of IITs for creating a world class pool of trainers focused on the Indian labour market, whether domestic or exports, vis-à-vis the Indian Vocational Education Training landscape. Each such NISD can have a course mix based on the national, regional, and local industry requirements, and, in addition, cater to the international demand in, e.g., the Middle East and other countries. The institution must also have the capacity to train 1,500-2,000 trainers per annum. With a network of, for instance, 15 such NISDs, India can build a capacity of around 25,000-30,000 trainers per annum, but even at this capacity, it will take a minimum of 15 years for India to create a pool of over 400,000 trainers across all relevant vocational skills. These institutions will not only impart skills for further training from an employment standpoint, but will also provide basic financial and management skills relevant to self-employment or entrepreneurship. These NISDs need to be given importance and respect on par with IITs and IIMs. They must be established in fully residential campuses having an area of 250-300 acres, each with high quality infrastructure for faculty and student housing, classrooms, labs and workshops, guest houses, auditoriums, social amenities, etc., translating into a capital budget of about INR 400-500 crores for setting up each of these institutions, or about INR 6,000 – 7,500 crores for 15 such NISDs. In addition, land for these is expected to be provided by the state where the institution is to be set up. Further, additional funding has to be provided to meet the on-

going operational expenses for these NISDs since it is likely that tuition fees will not be sufficient to cover these.

b. *Expanding capacity to skill workforce:* The report also recommends that the government of India embark on establishing district/town level "Skills Development Centres" in tandem with the states and union territories. To start with, at least one such District Skill Centre (DSC) must come up in each of the 600-plus district headquarters across India and subsequently reach out to all towns having population of 50,000 or more, which number ~5,0*0*0 or so. At the very least, there must be at least 1 DSC for 100,000 population, based on the calculation that if the birth rate is about 23-24 per thousand, then there would be 2,400 births for a population of 100,000, and if 40per cent have to vocationally skilled, then a capacity to train about 1,000 people per year per 100,000 population is required. These *DSCs* should come up on land parcels of 2-4 acres, to be identified by the district administration and the initial investment in each such centre can be in the range of INR 10-15 crores, excluding the cost of land. Each of these centres should have the capacity to train/retrain about 1,000 people per annum on 15-20 locally employable and self-employable skills, for both men and women. It is envisaged that these centres will attract students from neighbouring villages as well, and therefore dormitories will be needed along with other facilities in these centres. The overall investment for setting up these 5,000-6,000 DSCs is estimated to be around INR 50,000 - 90,000 crores, not including operating costs, over a period of 5-10 years. These centres could also come up under a suitable PPP model on a franchisee basis in partnership with a large corporate entity or with local entrepreneurs.

c. *Encouraging private sector participation in skilling:* The aforementioned establishment and expansion of District Skill Centres will not be enough to provide the additional skilling capacity requirement of 378.4 million individuals. Undoubtedly, the private sector will have to be incentivised and encouraged to invest in India's skill development. However, it is currently not clear to what extent the private sector has capacities to skill individuals or how many individuals it has been skilling in the past. It is therefore important to understand and quantify the private sector's involvement in skill development, and then strategize ways to encourage the private sector to fill the gap in skilling the Indian workforce. Therefore, the financial implications of the private sector's involvement cannot be ascertained at this time.

2. *Skilling existing workforce and new entrants:* While there are a myriad of training programmes, costs and lengths, an average training programme takes 3 months, costs 10,000 rupees and, requires an additional 10,000 rupees to cover cost of living during the duration of the programme (Simon M. , 2014). Therefore, the cost of skilling 427.4 million individuals from 2015 to 2022 works out to INR 8,54,800 crores.

ANNEXURE TO TARGET 4.C

REQUIRED EXPENDITURE FOR TEACHER EDUCATION UNDER XII FIVE YEAR PLAN

The following table has been reproduced from the Report of the Working Group on Teacher Education for the Twelfth Five Year Plan, and it indicates the required expenditure for teacher education under the Plan.

Required expenditure for teacher education under Twelfth Five Year Plan (INR crores)								
	2012 -13	**2013 -14**	**2014 -15**	**2015 -16**	**2016 -17**	**Total**	**Total Recurring**	**Total non-recurring**
SCERTs/SIEs								
Strengthening physical infrastructure @ INR 2 crore per SCERT/SIE	30	16	16			62		62
Establishment of special cells @ INR 50 lakh per SCERT/SIE	7.25	7.25				14.5		14.5
Specific projects for academic activities @ INR 20 lakhs per SCERT/SIE per year	6.2	6.2	6.2	6.2	6.2	31	31	
Faculty development at INR 10 lakhs per SCERT per year	3.1	3.1	3.1	3.1	3.1	15.5	15.5	
Recurring assistance for salary @ INR 1 crore per SCERT/SIE)	15.5	31	31	31	31	139.5	139.5	
Training in DIETs for Educational Administrators, including Head Teachers (4 cycles per DIET pet year, INR 40,000 per cycle)	10.12	10.12	10.12	10.12	10.12	50.6	50.6	
Orientation/inducting training of teacher educators (14 days x INR 200 per participant per day)	0.27	0.27	0.27	0.27	0.27	1.34	1.34	
Colleges of Teacher Education (CTEs)								

Required expenditure for teacher education under Twelfth Five Year Plan (INR crores)								
	2012 -13	2013 -14	2014 -15	2015 -16	2016 -17	Total	Total Recurring	Total non-recurring
Existing CTEs: recurring expenditure on salary, programmes, activities, contingency and vehicle hiring (106 CTEs x INR 50 lakh per CTE per year)	53	53	53	53	53	265	265	
Non-recurring expenditure on civil works and equipment for existing CTEs (106 x INR 1 crore per CTE for strengthening infrastructure including equipment, library and laboratories)	50	28	28	0	0	106		106
Establishment of 30 new CTEs @ INR 1.5 crores per CTE for infrastructure and equipment	20	10	5			35		35
Establishment of 30 new CTES: recurring expenditure @ INR 50 lakh per CTE	3	10	15	15	15	58	43.5	14.5
Institutes of Advanced Study in Education (IASEs)								
Recurring expenditure on salary, programmes and activities @ INR 50 lakhs per IASE per year	16	16	16	16	16	80	80	
Non-recurring expenditure on civil works and equipment, repairs @ INR 1.25 crores per IASE as lumpsum per plan period	20	14	14			48		48
Establishment of 50 new IASEs @ INR 1.5 crore per IASE for infrastructure and equipment	25	25	25			75		75

Required expenditure for teacher education under Twelfth Five Year Plan (INR crores)								
	2012 -13	2013 -14	2014 -15	2015 -16	2016 -17	Total	Total Recurring	Total non-recurring
Establishment of 50 new IASEs: recurring expenditure towards salaries and programmes @ INR 50 lakhs per IASE	0	8	16	25	25	74	74	
Continuation of Support to District Institutes of Education Training (DIETs)								
Recurring expenditure on salary, programmes and contingency @ INR 120 lakhs per DIET per year	685	685	685	685	685	3425	3425	
Establishing 55 new diets @ INR 3.5 crores per DIET	70	70	30	22.5		192.5		192.5
Additional Central assistance for strengthening of infrastructure/renovation of buildings including equipment, library and laboratories of existing diets @ INR 1 crore per DIET	300	100	100	71		571		571
Recurring central assistance to new diets	20	40	64.9	64.9	64.9	254.7	254.7	
Establishment of Block Institutes of Teacher Education (BITEs)								
Establishment of 200 bites in high deficit states @ INR 2.75 crore per BITE	100	200	100	150		550		550
Establishment of 200 bites in high deficit states: recurring expenditure	0	35	45.5	70	70	220.5	220.5	
Establishment of BITEs in SC/ST and minority concentration areas: 196 BITEs @ INR 2.75 crores per BITE	100	200	100	139		539		539

Required expenditure for teacher education under Twelfth Five Year Plan (INR crores)								
	2012 -13	2013 -14	2014 -15	2015 -16	2016 -17	Total	Total Recurring	Total non-recurring
Establishment of BITEs in SC/ST and minority concentration areas: recurring expenditure for 196 bites @ INR 35 lakh per BITE	0	42	56	68.6	68.6	235.2	235.2	
Professional development of teacher educators								
Refresher courses: (50 institutes x refresher courses per institution per year x INR 2 lakhs per course)	2	2	2	2	2	10	10	
Technology in teacher education								
Deployment in diets	10	10	11.3	5	0	36.3		36.3
Content development (100 teacher modules @ INR 10 lakhs per module)	3	3	2	1	0	9		9
Costs for Hub(2) – for satellite receiving and sending	40	50	60	50	0	200		200
One time teacher educator training/orientation @ INR 1.5 lakhs per DIET.	6	6	6	2	0	20		20
Cost of additional support including maintenance and recurring costs @ INR 2 lakh per DIET per year	14.42	16.4	16.4	16.4	16.4	80.02	80.02	
Integrating elementary teacher education with higher education								
Upgrading of diets (non-recurring) @ INR 50 lakhs per DIET	5	10	10	0	0	25	0	25
Preparation of teacher educators								
Scholarship for M. Ed Programme	2.25	2.25	2.5	2.5	2.75	12.25	12.25	
30 Schools of Education								

Required expenditure for teacher education under Twelfth Five Year Plan (INR crores)								
	2012 -13	2013 -14	2014 -15	2015 -16	2016 -17	Total	Total Recurring	Total non-recurring
Non-recurring expenditure @ INR 2.5 crores per school	30	20	25	0	0	75		75
Recurring expenditure @ INR 2 crores per school	20	40	60	60	60	240	240	
Specialised Centres of Excellence (8 Centres)								
Non-recurring expenditure @ INR 2 crores per centre	4	2	2	0	0	8		8
Recurring expenditure @ INR 1 crore per school		4	8	8	8	28	28	
Grand Total	**1671.11**	**1775.59**	**1625.29**	**1577.59**	**1137.34**	**7786.91**	**5206.11**	**2580.8**

ESTIMATION OF FINANCE REQUIRED

- In order to address systemic issues in teacher education quality, a total expenditure of INR 7786.9 crores is required from 2012-2017, of which INR 2850.8 crores are non-recurring capital expenditures and INR 5206.11 crores are recurring expenditures.
- Assuming that the establishment of new teacher education institutions under the Twelfth Five Year Plan will be enough to train a sufficient number of teachers for India for the next 15 years, India can expect to incur a recurring cost of approximately INR 1041 crores per year on strengthening and maintaining its teacher education system.
- Therefore, total finance required (in 2011-12 prices) may be calculated as follows.

Finance required for teacher education in India, 2015-30 (all expenditures in 2011-12 prices)			
Capital expenditure between 2012-2017 (A)	**Recurring expenditure per year from 2015 to 2030 (B)**	**Total recurring expenditure from 2015 to 2030 (C)**	**Total finance required (A+C)**
INR 2580.8 crores	INR 1041.22 crores	INR 15618.33 crores	INR 18199.13 crores

In 2014-15 prices, the finance required is INR 21,600 crores or USD 3.5 billion.

ESTIMATION OF GAP

The Centrally Sponsored Scheme for Teacher Education has been revised for the XII Plan with an approved outlay of INR 6308.45 crore over the XII Plan to be shared between the Centre and the States in the ratio of 75:25 (90:10 for NER) to strengthen the teacher training institutes. Assuming that the approved outlay will be spent, and that the next two Five Year Plans will at least match, if not increase, the allocation of the XII Plan, a total of roughly INR 18,900 crores or USD 3 billion will be available for teacher education from 2012 to 2030.

In 2014-15 prices, this leaves a gap of INR 2700 crores or USD 0.5 billion.

ANNEXURE TO TARGETS 5.1, 5.2, 5.3, 5.4, 5.5, 5.6

AVAILABLE DATA

Available data on India's gender budgets and Gender Gap Index								
Period	Budget allocations of schemes in which 100 per cent provision is for women (Nominal) (INR crores)	Budget allocations of schemes in which women constitute at least 30% of allocations (Nominal) (INR crores)	Total budget allocations for women (Nominal) (Gender Budget)	Wholesale Price Index (2004-05=100)	Real budget allocations on schemes for women (in 2004-05 prices) (INR crores)	Population (in millions) (male + female)*	Real allocation per capita (in 2004-05 prices) (INR)	Gender Gap Index (Global Gender Gap Report, World Economic Forum)
2005-06	7,905.08	14,378.68	22,283.76	103.37	21557.97484	1097.803	196.38	
2006-07	9575.82	28,736.53	38,312.35	109.59	34959.18180	1115.787	313.32	0.601
2007-08	8340.44	31,177.96	39,518.40	114.94	34381.26585	1134.066	303.17	0.594
2008-09	11459.61	27,661.67	39,121.28	124.92	31317.90259	1152.644	271.71	0.606
2009-10	15715.68	56,857.61	72,573.29	127.86	56760.70392	1171.527	484.51	0.615
2010-11	19266.05	67,749.80	87,015.85	140.08	62117.20406	1190.719	521.68	0.615
2011-12	20548.35	78,251.02	98,799.37	153.35	64427.36876	1210.225	532.36	0.619
2012-13	22968.93	88,142.80	111,111.73	164.93	67371.06564	1224.748	550.09	0.644
2013-14	27248.19	97133.70	124,381.89	175.35	70933.49872	1239.445	572.31	0.655
2014-15	21887.61	98029.84	119,917.45	182.01	65885.69206	1254.318	525.28	0.646
2015-16	16657.00	61889.23	78,546.23	176.25	44565.23688	1269.370	351.09	

*Male and female population totals are considered here rather than only the female population. This is because the sector-specific study that is subsequently used to derive estimates of finance required uses per-capita costs, not per-female costs.

ESTIMATION OF FINANCE REQUIRED

Projected finance required and gap for gender equality, 2016-30					
Year	**Projected population (in millions)**	**Per capita spending required (in 2004-05 prices) (INR)**	**Projected finance required for gender equality (in 2004-05 prices) (INR crores)**	**Per capita spending projected (in 2004-05 prices) (INR)**	**Projected finance availability for gender equality (in 2004-05 prices) (INR crores)**
2016	1280.678515		3,05,057.62		64230.11
2017	1292.088066		3,07,775.38		64802.33
2018	1303.599264		3,10,517.34		65379.66
2019	1315.213015		3,13,283.74		65962.12
2020	1326.930233		3,16,074.78		66549.78
2021	1338.751839		3,18,890.69		67142.67
2022	1350.678764		3,21,731.68		67740.84
2023	1362.711946	INR 2382	3,24,597.99	INR 506	68344.35
2024	1374.852331		3,27,489.83		68953.22
2025	1387.100875		3,30,407.43		69567.53
2026	1399.458541		3,33,351.02		70187.30
2027	1411.926301		3,36,320.84		70812.60
2028	1424.505137		3,39,317.12		71443.47
2029	1437.196037		3,42,340.10		72079.96
2030	1450		3,45,390.00		72722.12
		Total	**INR 48,72,546 crores**	**Total**	**INR 10,99,288 crores**

Total finance required from 2016 to 2030 in 2014-15 prices is INR 89 lakh crores or USD 1408 billion. Total finance expected to be available from 2016 to 2030 in 2014-15 prices is INR 20 lakh crores or USD 317 billion. Therefore, gap expected is INR 69 lakh crores or USD 1091 billion.

ANNEXURE TO TARGET 6.1

STRATEGIC OBJECTIVES OF THE DEPARTMENT OF DRINKING WATER AND SANITATION FOR RURAL INDIA

(Reproduced here from the Strategic Plan of the department)

1. Enable Participatory Planning and Implementation of Schemes and Source Sustainability
   a. Participatory Integrated Water Resource Management at village, district and State levels including Conjunctive Use of rainwater, groundwater and surface water and provision of Bulk Water Supply as needed
   b. Water security planning and implementation by ensuring cost-effective, optimal scheme design to reduce O&M requirements
   c. Water Source Sustainability measures including Sustainability Plans implemented at block, watershed and village level including Water Harvesting and Groundwater Recharge measures
2. Water quality Management
   a. Source Protection with Water Safety Plan implemented at village level to prevent contamination before it happens
   b. Monitoring, Surveillance and Testing through Water Quality Testing including field test kits and district and sub-divisional water quality testing laboratories
   c. Treatment of water from contaminated sources with cost-effective, appropriate technologies, safe distribution and household hygiene
   d. Legal, Institutional and Regulatory measures to make water quality standards mandatory and enforceable in a phased manner
3. Sustainable Service Delivery (Operation and maintenance)
   a. Operation and Maintenance measures implemented at village level to ensure skills and finance for operation and maintenance, replacement, expansion and modernisation.
   b. Incentivise States to take measures for decentralising functions, funds, functionaries using a Management Devolution Index
   c. Focus on metering, bulk and individual, to reduce Unaccounted for Water
   d. Service agreements for handpump mechanics and piped water supply operators
4. Strengthening of Decentralised Governance
   a. Institutional Roles and Responsibilities to support water security planning and implementation (source sustainability, water quality and O&M)
   b. Convergence of different development programmes
   c. Results Based Financing of drinking water security plans
   d. Oversight and Regulation including value for money and monitoring of progress and performance

5. Building of Professional Capacity
    a. Training to capacitate new roles and responsibilities
    b. Technical support
    c. Outsourcing including handpump mechanics and piped water supply operators

ESTIMATION OF FINANCE REQUIRED

The financial resources required to achieve the goals set out in this Plan under the National Rural Drinking Water Programme (NRDWP) funding components for the period 2011-2022 have been worked out in the Strategic Plan on the following basis:

- 2009-10 per capita cost of piped water supply services of each State is calculated from IMIS with minimum cap of INR 2500 per capita plus INR 250 for household metering
- Cost escalation and population increase were not considered in this calculation
- The amount required to raise the coverage level from 40 litres per capita per day (lpcd) to 70 lpcd is assumed as 40% of present per capita cost.
- Community contribution of 6% of total cost; present NRDWP sharing pattern between Centre and States
- Apart from 10% for Operations & Maintenance, 10% Sustainability and 10% for Support and Administrative costs including calamities have been provided for.

According to the Strategic Plan, the finance required to increase service level of population covered with piped water supply at present from 40 lpcd to 70 lpcd is estimated at INR 37,471 crores (in 2011-12 prices). The finance required to cover remaining population with piped water supply at 70 lpcd to reach 90% coverage is estimated at INR 3,03,457 crores. The total finance required at the present per-capita cost and population to cover 90% of the rural population with piped water supply schemes at 70 lpcd is estimated at INR 3,40,928 crores. Assuming the NRDWP sharing pattern, the Central Share would be INR 2,01,898 crores, the State Share INR 1,18,575 crores, and community contribution INR 20,456 crores.

In 2014-15 prices, the total finance required from the Centre and States is roughly INR 4 lakh crores or USD 64 billion.

ESTIMATION OF GAP

At the macro level this level of funding appears to be within the feasible range. The total planned investments by Centre and States under the Eleventh Five Plan was about INR 1,00,000 crores. It is therefore feasible to invest the required higher amounts in the current and next two Plan periods and meet the requirement without incurring a funding gap.

ANNEXURE TO TARGET 6.2

AVAILABLE DATA

The following table indicates available data on public expenditures on rural sanitation.

Available data on public expenditures on rural sanitation						
Period	Expenditure on rural sanitation (Centre) (Nominal) (INR crores) (A)	Expenditure on rural sanitation (States) (Nominal) (INR crores) (B)	Expenditure on rural sanitation (Beneficiary) (Nominal) (INR crores) (C)	Total expenditure (A+B+C) (Nominal) (INR crores)	Wholesale Price Index (2004-05=100)	Real expenditure (in 2004-05 prices) (INR crores)
2005-06	283.52	283.47	152.61	719.61	103.37	696.17
2006-07	616.89	251.90	150.21	1018.99	109.59	929.81
2007-08	789.79	332.24	165.72	1287.75	114.94	1120.35
2008-09	834.59	482.25	147.89	1464.74	124.92	1172.57
2009-10	1334.07	688.89	206.57	2229.54	127.86	1743.76
2010-11	1174.57	485.60	136.38	1796.55	140.08	1282.49
2011-12	1335.73	489.17	191.64	2016.54	153.35	1314.99
2012-13	1521.21	440.50	144.79	2106.50	164.93	1277.25
2013-14	2113.26	574.93	268.82	2688.20	175.35	1533.05
2014-15	3082.32	1145.39	422.77	4227.71	182.01	2322.81

ESTIMATION OF GAP

The following table indicates projected allocation of central and state funds for Swachh Bharat Mission for rural sanitation.

Projected public expenditure on Swachh Bharat Mission, 2016-20	
Period	Past/projected finance (Centre + States + Beneficiary share) for rural sanitation (INR crores) (in 2004-05 prices)
2005-06	696.17
2006-07	929.81
2007-08	1120.35
2008-09	1172.57

Projected public expenditure on Swachh Bharat Mission, 2016-20	
Period	**Past/projected finance (Centre + States + Beneficiary share) for rural sanitation (INR crores) (in 2004-05 prices)**
2009-10	1743.76
2010-11	1282.49
2011-12	1314.99
2012-13	1277.25
2013-14	1533.05
2014-15	2322.81
2015-16	(BE) 1993.09
2016-17	2111.95
2017-18	2230.82
2018-19	2349.69
2019-20	2468.55
Total projected available finance from 2016-20 (in 2004-05 prices) (in INR)	**INR 11,154 crores**
Total projected available finance from 2016-20 (in 2014-15 prices) (in INR)	**INR 20,301 crores**
Total projected available finance from 2016-20 (in USD)	**USD 3.2 billion**

Projections

The total finance required for rural sanitation is INR 1,34,000 crores. The total finance expected to be available is INR 20,301 crores. The gap is therefore INR 113, 699 crores.

The total finance required for urban sanitation is INR 69,000 crores. The gap is INR 42,512 crores.

The total finance required for urban and rural sanitation is roughly INR 203,000 crores (USD 32 billion), while the total gap is INR 156,211 crores (USD 25 billion).

ANNEXURE TO TARGETS 7.1, 7.2, 7.3

AVAILABLE DATA

Available data on installed electricity generation capacity and anticipated requirement by 2030-31			
Technology	**Installed capacity as of April 2015 (in GW)**	**Proportion of total capacity**	**Anticipated requirement of electricity by 2030-31 (factoring in clean energy access for all) (in GW)***
Coal	165.23	61.32	778.00
Gas	23.06	8.56	
Diesel	1.11	0.41	
Nuclear	5.78	2.15	
Hydro	41.63	15.45	
Wind	23.44	8.62	
Solar	3.743	1.37	
Biomass	1.41	0.52	
Small Hydro	4.05	1.49	
TOTAL	**269.45**	**100**	

* At 8% GDP growth, as estimated by the Integrated Energy Policy

ESTIMATION OF FINANCE REQUIRED

Scenario 1 for fuel mix (Business As Usual)

In this scenario, the current fuel mix proportions are kept constant while enhancing production capacity to meet future electricity demand.

Technology	Proportion of total capacity	Total capacity required by 2030-31	Additional capacity required from 2015-31	Per MW cost of capacity installation (INR crores)	Cost of installing additional capacity (INR crores)
Coal	61.33	477.15	357.67	4.50	16,09,515
Gas	8.57	66.67			
Diesel	0.41	3.19			
Nuclear	2.15	16.73	10.95	25.00	2,73,750
Hydro	15.45	120.20	78.57	7.50	

Technology	Proportion of total capacity	Total capacity required by 2030-31	Additional capacity required from 2015-31	Per MW cost of capacity installation (INR crores)	Cost of installing additional capacity (INR crores)
					5,89,282
Wind	8.65	67.30	43.86	5.50	2,41,213
Solar	1.39	10.81	7.07	8.00	56,560
Biomass	0.53	4.12	2.71	4.50	12,195
Small Hydro	1.52	11.83	7.78	5.50	42,790
TOTAL	**100.00**	**778.00**	**508.61**		**28,25,306**

Scenario 2 for fuel mix (moderate share of renewable energy)

In this scenario, the share of coal, gas and diesel is reduced to around 50 per cent in the fuel mix, compared to over 60 per cent in BAU.

Technology	Proportion of total capacity	Total capacity required by 2030-31	Additional capacity required from 2015-31	Per MW cost of capacity installation (INR crores)	Cost of installing additional capacity (INR crores)
Coal + Gas + Diesel	50.42	392.27	202.87	4.50	9,12,915
Nuclear	3.00	23.34	17.56	25.00	4,39,000
Hydro	20.00	155.60	113.97	7.50	8,54,775
Wind	10.67	83.00	59.56	5.50	3,27,580
Solar	13.24	103.00	99.26	8.00	7,94,080
Biomass	1.41	11.00	9.59	4.50	43,020
Small Hydro	1.26	9.80	5.75	5.50	31,625
TOTAL	**100.00**	**778**	**509**		**34,02,995**

Scenario 3 for fuel mix (net zero emissions)

In this scenario, the proportion of coal, gas and diesel in the fuel mix is reduced still further to 27 per cent, compared to over 60 per cent in BAU.

Technology	Proportion of total capacity	Total capacity required by 2030-31	Additional capacity required from 2015-31	Per MW cost of capacity installation (INR crores)	Cost of installing additional capacity (INR crores)
Coal + Gas + Diesel	27.00	210.06	20.66	4.50	92,970
Nuclear	5.00	38.90	33.12	25.00	8,28,000
Hydro	25.00	194.50	152.87	7.50	11,46,525
Wind	15.00	116.70	93.26	5.50	5,12,930
Solar	22.00	171.16	167.417	8.00	13,39,280
Biomass	3.00	23.34	21.93	4.50	98,685
Small Hydro	3.00	23.34	19.29	5.50	1,06,095
TOTAL	**100**	**778**	**509**		**41,24,485**

Transmission and distribution

Transmission and distribution infrastructure is estimated to cost about 40% of the generation infrastructure under BAU. Accordingly, the cost of transmission and distribution infrastructure is INR 11,30,122 crores. (It is assumed that the cost of transmission and distribution infrastructure will not vary significantly with the production mix chosen, therefore to provide a minimalist estimate the cost has been calculated as a percentage of the cheapest scenario, i.e. scenario 1.)

If scenario 3 is considered the target scenario for achieving the current SDG, the total finance required for scenario 3, including transmission and distribution infrastructure costs, is INR 52,54,607 crores from 2015-30 in 2014-15 prices.

ESTIMATION OF GAP

In scenario 2, the gap is calculated as the difference in cost between scenario 2 and BAU. In scenario 3, the gap is the difference in cost between scenario 3 and BAU.

In this study, scenario 3 is assumed to be the target scenario for achieving the current SDG.

Therefore the gap is INR 24,29,301 crores from 2015-30 in 2014-15 prices.

ASSUMPTIONS

These calculations make the following assumptions:

1. All costs are in 2014-15 prices and are the approved costs of the Ministry of Power/Central Electricity Agency/Central Electricity Regulatory Authority.
2. These costs are primarily investment costs for creating additional electricity generation capacity, technology-wise.
3. The costs of providing clean cooking fuel for all is not covered under these estimates. They are estimated separately.
4. The capital costs for the various technologies are based on the averages of Benchmark Costs of the CERC for recent periods of time. The following are the costs assumed per MW (in INR)
   - Biomass: 4.50 crores
   - Small Hydro: 5.50 crores
   - Solar: 8.00 crores
   - Coal + Gas (combined): 4.50 crores
   - Wind: 5.50 crores
   - Large Hydro: 7.50 crores
   - Nuclear: 25.00 crores
5. For easier costing, it has been assumed that the demand assessment for the year 2030-31 is inclusive of considerations of efficiency and demand side management.
6. Additional costs of energy efficiency and demand side management have not been factored in, as they have a relatively faster pay back.

ESTIMATING THE COSTS OF PROVIDING CLEAN COOKING FUELS TO ALL INDIANS BY 2030

The International Energy Agency (IEA) projects that annual investments of USD 4.7 billion are needed globally to ensure universal access to clean cooking fuel through 2030. This translates to a total global requirement of USD 70.50 billion over the period from 2015 to 2030. The most recent Global Energy Assessment (IIASA, 2012) estimates that USD 36–41 billion will be needed annually to achieve universal access to electricity and modern cooking solutions by 2030, with at least 20% of the total being attributed to the costs of clean cooking. In other words, the Global Energy Assessment's estimates for providing modern and clean cooking access to all globally are approximately USD 7.2 billion annually and USD 108 billion over a period of 2015 to 2030. Worldwide, solid fuels—including wood, charcoal, coal, animal dung, and

crop waste—are the primary cooking and heating energy supply for a large number of people.

As per 2011 Census of India, the total number of households that do not have access to modern and clean energy fuels in India amounts to 17,50,15,279 households, or approximately 87,50,76,395 people. The table below gives a detailed account of the sources of fuel for cooking. Based on the conservative estimates of the International Energy Agency, an investment of USD 70.50 billion over the period of 2015 to 2030 is required to meet access to cooking solutions for 3 billion people worldwide. The amount required for India to provide clean and modern energy fuel for all works out to approximately USD 1.36 billion per year for the period of 2015 to 2030, or USD 20.4 billion in total from 2015-30. However, the economic returns because of the averted health and productivity costs of solid fuels in India will be able to recover the investment. The savings for India even in a low return scenario would be USD 6.96 billion, while in a moderate scenario the savings would be USD 35.67 billion. In a high return scenario, the savings are estimated to be USD 64.38 billion (Global Alliance for Clean Cookstoves, 2014).

Use of various cooking fuels in India

Fuel Type	Absolute number of households			Percentage of households		
	Total	Rural	Urban	Total	Rural	Urban
Fire-wood	120,834,388	104,963,972	15,870,416	49.0	62.5	20.1
Crop residue	21,836,915	20,696,938	1,139,977	8.9	12.3	1.4
Cowdung cake	19,609,328	18,252,466	1,356,862	7.9	10.9	1.7
Coal, Lignite, Charcoal	3,577,035	1,298,968	2,278,067	1.4	0.8	2.9
Kerosene	7,164,589	1,229,476	5,935,113	2.9	0.7	7.5
LPG/ PNG	70,422,883	19,137,351	51,285,532	28.5	11.4	65.0
Electricity	235,527	118,030	117,497	0.1	0.1	0.1
Bio-gas	1,018,978	694,384	324,594	0.4	0.4	0.4
Any other	1,196,059	1,040,538	155,521	0.5	0.6	0.2
No cooking	796,965	394,607	402,358	0.3	0.2	0.5

Source: Census of India 2011

The finance required for providing access to clean cooking fuel for all in India therefore works out to approximately INR 1,28,520 crores (USD 20.4 billion) from 2015-30 in 2014-15 prices.

Overall estimates of finance required and gap, including electricity access and access to clean cooking fuel, are INR 53,83,127 crores (USD 854 billion) and INR 25,57,821 crores (USD 406 billion) respectively.

ANNEXURE TO TARGET 8.1

AVAILABLE DATA

Available data on fixed investments in MSMEs in India			
Period	**Total expenditure (INR crores)***	**Wholesale Price Index (2004-05=100)**	**Total real public expenditure (2004-05=100) (INR crores)**
2006-07	500758	109.6	456930.78
2007-08	558190	114.9	485628.94
2008-09	621753	124.9	497734.22
2009-10	693835	127.9	542659.20
2010-11	773487	140.0	552162.05

** Source: Katyal, A.; Xaviour, B. 2015, A Study on MSMEs' Role in Propelling Economic Development of India & a Discussion on current HR issues in MSMEs' in India*

ESTIMATION OF GAP

It is assumed that investments in MSMEs will follow past trends in expenditure.

Projected availability of investments in MSMEs, 2015-20	
Period	**Total Investment in MSMEs* (in 2004-05 prices) (INR crores)**
2006-07	456930.7276
2007-08	485628.9421
2008-09	497734.2227
2009-10	542659.1933
2010-11	552162.0465
2011-12	581270.8932
2012-13	606020.1821
2013-14	630769.4710
2014-15	655518.7599
2015-16	680268.0488
2016-17	705017.3377

2017-18	729766.6266
2018-19	754515.9155
2019-20	779265.2045
Total real public expenditure expected to be available from 2015 to 2030 (in 2014-15 prices) (in INR crores)	**4304351.89**
Total real public expenditure expected to be available from 2015 to 2030 (in USD billion)	**682**

Projections

The total real public expenditure expected to be available from 2015 to 2030 in 2014-15 prices is INR 43 lakh crores or USD 682 billion. This leaves a gap of INR 65 lakh crores or USD 1026 billion.

ANNEXURE TO TARGET 11.1

AVAILABLE DATA

Available data on public expenditure on housing in India					
Period	**Centre + State expenditure on housing (Nominal) (INR crores)**	**Wholesale Price Index (2004-05=100)**	**Real public expenditure on housing (in 2004-05 prices) (INR crores)**	**Urban population (in thousands)***	**Real expenditure per capita (urban) (INR)**
2005-06	6300.83	103.37	6095.61	329520.00	184.98
2006-07	7800.00	109.59	7117.33	338059.00	210.54
2007-08	10034.37	114.94	8729.97	346639.00	251.85
2008-09	17301.26	124.92	13850.24	355288.00	389.83
2009-10	17535.82	127.86	13715.04	364028.00	376.76
2010-11	21520.82	140.08	15362.87	372900.00	411.98
2011-12	22012.51	153.35	14354.42	381929.00	375.84
2012-13 (RE)	24986.08	164.93	15149.97	391176.00	387.29
2013-14 (BE)	32426.43	175.35	18492.40	400635.00	461.58

*United Nations Population Department

ESTIMATION OF FINANCE REQUIRED

The following tables have been reproduced or adapted from the KPMG report.

Housing demand in India 2014-22			
Particulars	**Urban (million units)**	**Rural (million units)**	**Total (million units)**
Current shortage	19	40	59
Additional	28	23	51
Vacant houses	9	10	20
Core demand	37	53	90

Indian urban housing investment required, 2014-22							
Type of house	**Target income group**	**% of housing need**	**Typical area (sq feet)**	**Number of houses (million)**	**Cost of house (INR million)**	**Total investment (INR crores)**	**Total investment (USD billion)**
Social housing	EWS (1 BK)	40	Up to 300	18.4	0.5	31,28,000	497
LIG housing	LIG (1 BHK)	30	550-750	13.8	1.5-2.0	23,46,000	372
MIG	MIG (2-3 BHK)	20	800-1200	9.2	4.0-4.5	38,64,000	613
High end and luxury	HIG or rich class (above 2-3 BHK)	10	Above 1200	4.6	Above 5.0	46,00,000	730
Total				**46**		**139,380**	**2212**

The total investment required in the EWS and LIG housing categories is INR 54,74,000 crores or USD 869 billion. The investment required in MIG and higher groups is not considered in this study.

The report estimates a further requirement of USD 100-150 billion for rural housing. This study considers an average amount of USD 125 billion, i.e. INR 7,87,500 crores.

Therefore the finance required is a total of INR 62,61,500 crores or USD 994 billion.

As seen from the tables above, about 0.9 million houses are currently vacant, and the exact reason is unknown. If these houses are occupied, the finance required would reduce.

ESTIMATION OF GAP

Projected public expenditure on housing, 2015-22	
Period	**Past/projected real public expenditure (Centre + States) on housing (2004-05 prices) (INR crores)**
2005-06	6095.61
2006-07	7117.33
2007-08	8729.97
2008-09	13850.24

Projected public expenditure on housing, 2015-22	
Period	**Past/projected real public expenditure (Centre + States) on housing (2004-05 prices) (INR crores)**
2009-10	13715.04
2010-11	15362.87
2011-12	14354.42
2012-13	(RE) 15149.97
2013-14	(BE) 18492.40
2014-15	(Estimated) 19744.76
2015-16	21185.53
2016-17	22626.31
2017-18	24067.09
2018-19	25507.87
2019-20	26948.64
2020-21	28389.42
2021-22	29830.20
Total projected availability of public finance from 2015-22 in 2004-05 prices (in INR)	INR 1,78,555 crores
Total projected availability of public finance from 2015-22 in 2014-15 prices (in INR)	INR 3,24,985 crores
Total projected availability of public finance from 2015-22 (in USD)	USD 52 billion

Projections

The total finance required in 2014-15 prices from 2015-22 is INR 62,61,500 crores or USD 994 billion. The total public finance expected to be available in the same period is INR 3,24,985 crores or USD 52 billion.

The gap is therefore roughly INR 60 lakh crores or USD 942 billion.

ANNEXURE TO TARGETS 11.2, 11.3, 11.6, 11.7

ESTIMATION OF FINANCE REQUIRED

The following tables have been extracted from the HPEC report and indicate the finance required in 8 sectors of urban infrastructure and services.

Capital Expenditure Estimates by Sector		
Sector	**Total (in 2009-10 prices) (INR crores)**	**Relative share**
Water supply	320908	10.4
Sewerage	242688	7.8
Solid waste management	48582	1.6
Urban roads	1728941	55.8
Storm water drains	191031	6.2
Urban transport	449426	14.5
Traffic support infrastructure	97985	3.2
Street lighting	18580	0.6
Total	**3098141**	**100**

Capital expenditure estimates by city size class		
Class-wise estimates	**Total (in 2009-10 prices) (INR crores)**	**Relative share**
Class IA (> 5 million)	860136	27.8
Class IB (1 - 5 million)	690463	22.3
Class IC (100,000 -1 million)	883346	28.5
Class II (50,000 - 100,000)	174072	5.6
Class III (20,000 - 50,000)	280541	9.1
Class IV+ (< 20,000)	209583	6.8
Total	**3098141**	**100.0**

Since the eight sectors of urban infrastructure assigned to the Committee for estimating investment requirements broadly account for about 90 per cent of the total investment requirement, the estimates for these sectors as presented in the preceding section were scaled up to get the total investment requirement for urban infrastructure. Compared with the investment of INR 31 lakh crores for the eight sectors, the total investment in urban infrastructure is estimated at INR 34.1 lakh crores.

Further, the report is of the view that 12 per cent of the total urban infrastructure investment will be required over and above the estimated urban infrastructure investment for the purpose of renewal and redevelopment of certain urban areas, especially slums. This amounts to a sum of INR 4.1 lakh crore over the 20-year period.

For the infrastructure to be put in place, urban local bodies (ULBs) must have sufficient skill sets to design, develop, and manage the projects and the assets being created. The report is of the view that 2.5 per cent of the total capital requirement should be directed at building capacity to strengthen institutions and human resource capability in areas such as urban planning, regulation of land use, project preparation, implementation and management, finance and accounts, legal and administrative skills, regulatory aspects of urban management, etc. The capacity building investment is therefore INR 0.955 lakh crores.

The investment requirement for all urban infrastructure sectors, renewal and redevelopment including slums, and capacity building as derived from the estimation exercise for the 20-year period from 2012-13 to 2031-32 is estimated at approximately INR 39.2 lakh crore (in 2009-10 prices).

The operations and maintenance cost for catering to all urban infrastructure investment requirements have been proposed as follows.

Operations and maintenance expenditure by sector (in 2009-10 prices) (INR crores)

Sector	Total
Water supply	546095
Sewerage	236964
Solid waste management	273906
Urban roads	375267
Storm water drains	34612
Urban transport	302368
Traffic support infrastructure	36690
Street lighting	4717
Total of core sectors	**1812638**
Total of all sectors	**1993902**

Note: Urban transport is provided for only class IA and IB cities. Thus the total O and M costs in urban transport are only for class IA and IB cities.

Including operations and maintenance, the total expenditure required from 2012-13 to 2031-32 works out to INR 59.14 lakh crores (in 2009-10 prices). In 2014-15 prices, this is an amount of INR 84 lakh crores or USD 1336 billion.

Below, the details of the key assumptions made and the breakup of investment estimates in the HPEC report are presented here.

Water supply

Service standards for water supply

- 100 per cent individual piped water supply for all households, including informal settlements for all classes of cities;
- Continuity of supply: 24x7 water supply for all classes of cities; and
- Per capita consumption norm: 135 litres per capita per day for all classes of cities.

Key assumptions for water supply

- On an average, 80 per cent of distribution network pipes are to be replaced for delivering continuous water supply for all city size classes;
- For cities with population above 500,000, industrial water production is assumed to account for about 20 per cent of the total water production and demand is assumed to grow at 7 per cent per annum;
- For industrial and commercial water demand, estimates have been made only for production of water;
- Service backlogs are estimated, based on City Development Plans (CDP) and Census data;
- Storage requirement is assumed to be 45 lpcd (equivalent to one-third of the daily water demand);
- Cost of connection and metering per household is assumed to be Rs 2500;
- Surface water is considered as the source of water;
- For the estimation of replacement costs, the service life of assets is assumed to be 30 years; and
- In calculating the replacement costs, 2001 is taken as the base year. The 1991 production coverage is assumed to be 10 percentage points lower than that of 2001, and the 1981 coverage 10 percentage points lower than that of 1991.

Aggregate cost for water supply

Aggregate cost for water supply (in 2009-10 prices) (INR crores)	
Capital expenditure	
Investment for unmet demand	147699
Investment for additional demand	118757
Investment required for replacement	25844
Total capital investment for domestic requirement	292301
Capital investment for industrial and commercial requirements	28607
Total residential, industrial and commercial capital investment	**320908**
Operations and maintenance cost	**546095**
Aggregate cost	**867003**

Sewerage

Service standards and key assumptions for sewerage

- Underground sewerage network for all city size classes and 100 per cent collection and treatment of waste water;
- Sewage generated is assumed at 80 per cent of per capita water consumption, and 5 per cent sewage generation is assumed for infiltration from groundwater (113 lpcd);
- Service backlogs are estimated using data from the Census for network, and CDPs are used for assumptions on treatment.

Aggregate cost for sewerage

Aggregate cost for sewerage (in 2009-10 prices) (INR crores)	
Capital expenditure	
Investment for unmet demand	108443
Investment for additional demand	99364
Investment required for replacement	34881
Total capital investment for domestic requirement	**242688**
Operations and maintenance cost	**236964**
Aggregate cost	**479652**

Solid Waste Management

Service standards and key assumptions for solid waste management

- 100 per cent of solid waste collected, transported, and treated as per the Municipal Solid Waste 2000 Rules for all city size classes;
- Average per capita waste generation by city class (India Infrastructure Report 2006):
  - Class IA : 608 grams per person per day,
  - Class IB : 425 grams per person per day,
  - Class IC : 304 grams per person per day,
  - Class II : 255 grams per person per day,
  - Class III : 255 grams per person per day,
  - Class IV+ : 255 grams per person per day;
- Per capita solid waste generation is projected to increase at an annual growth rate of 1.3 per cent per annum in line with the existing literature (ibid.);
- 80 per cent of the total waste generated is processed;
- Service backlogs are estimated using CDPs.

Aggregate cost for solid waste management

Aggregate cost for solid waste management (in 2009-10 prices) (INR crores)	
Capital expenditure	
Investment for unmet demand	11400
Investment for additional demand	16924
Investment required for replacement	20258
Total capital investment for domestic requirement	**48582**
Operations and maintenance cost	**273906**
Aggregate cost	**322488**

Urban roads

Service standards and key assumptions for urban roads

- Gross population density is considered at city level;
- Service backlogs for the assumed road density by road categories are calculated using Comprehensive
- Mobility Plans (CMP)
- Construction cost (per lane km):
  - Major roads
- Arterial roads – INR 1.50 crore,
- Sub-arterial roads – INR 1.25 crore,

  - Collector roads – INR 1.00 crore,
  - Access road spaces – INR 60 lakh;
- Additional cost of one lane km is considered for major and collector roads to cater to other road infrastructure like pathways, parking spaces, and medians;
- Service life of five years has been assumed for major and collector roads;
- 25 per cent of the unit cost is assumed to compute the replacement cost for major and collector roads;
- Service life of access road spaces is assumed to be 20 years, and hence no replacement costs are considered for these categories for the estimation period;
- Annual O&M is assumed to be 2 per cent of the PCIC for all roads, covering both existing and new assets;
- Cost of drains, power cables, telecom conduits, lighting, etc. Is not included in the costs. The unit cost for roads also does not include land acquisition costs for road construction; and
- Estimate of the backlog is an area of limitation in the estimation exercise.

Aggregate cost for urban roads

Aggregate cost for urban roads (in 2009-10 prices) (INR crores)	
Capital expenditure	
Investment for unmet demand	606095
Investment for additional demand	576244
Investment required for replacement	546602
Total capital investment	**1728941**
Operations and maintenance cost	**375267**
Aggregate cost	**2104208**

Storm water drains

Service Standards and Key Assumptions for Storm Water Drains

- Drain network covering 100 per cent road length on both sides of the road for all cities:
  - Micro drains to cover all road types on both sides at Rs 30 lakh (average of different road types),
  - Macro drains (less than 30 m) of Rs 50 lakh to cover sub-arterial roads on one side of the road,
  - Macro drains (more than 30 m) of Rs 1 crore to cover arterial roads on one side of the road,

  - Natural drains to cover 20 per cent of arterial and sub-arterial roads at Rs 2.5 crore;
- Unit cost is for fully covered drains (RCC/piped drains) on both sides, except for natural drains which are open drains;
- Service life of the assets is assumed to be 20 years and accordingly no replacement cost is considered for the period;
- Population density, backlog, and road lengths follow the same assumptions as those for urban roads; and
- Annual O&M is assumed to be 1.5 per cent of the PCIC, covering both existing and new assets.

Aggregate cost for storm water drains

Aggregate cost for storm water drains (in 2009-10 prices) (INR crores)	
Capital expenditure	
Investment for unmet demand	96476
Investment for additional demand	94555
Total capital investment	**191031**
Operations and maintenance cost	**34612**
Aggregate cost	**225643**

Urban transport

Service Standards and Key Assumptions for Urban Transport

- Rail-based and road-based MRTS for Class IA and IB cities, and city bus services for other city size classes;
- Population density is the same as assumed for urban roads; Rail-based MRTS includes elevated metro, monorail, suburban, and light rail systems;
- Road-based MRTS includes Bus Rapid Transit System only;
- Total MRTS (rail and road) network length:
  - Class IA: 0.5 km per sq. Km area,
  - Class IB: 0.3 km per sq. Km area;
- Network split of MRTS:
  - Class IA: 30 per cent rail-based, 70 per cent road-based,
  - Class IB: 20 per cent rail-based, 80 per cent road-based;
- Average construction cost per km for rail-based MRTS: Rs 150 crore;
- Average construction cost per km for road-based MRTS: Rs 15 crore (two lane);
- Cost of rail-based MRTS includes rolling stock, while road-based MRTS does not include rolling stock;

- For rail-based MRTS, service life is assumed to be 10 years for traction and signalling; replacement cost is taken at 35 per cent of the unit cost;
- No replacement costs are assumed for road-based MRTS within the estimation period;
- Annual O&M for rail-based MRTS: 8 per cent of PCIC, including rolling stock;
- Annual O&M for road-based MRTS: 3 per cent of PCIC, excluding rolling stock; and
- O&M costs cover both existing and new assets.

Aggregate cost for urban transport

Aggregate cost for urban transport (in 2009-10 prices) (INR crores)	
Capital expenditure	
Investment for unmet demand	215548
Investment for additional demand	154665
Investment required for replacement	79213
Total capital investment	**449426**
Operations and maintenance cost	**304386**
Aggregate cost	**753812**

Estimate for Rolling Stock (Buses)

Rolling stock (buses) has not been included in this exercise. However, based on discussions with the Ministry of Urban Development, Government of India, and sector experts, it is estimated that a total of about 1.5 lakh buses costing approximately Rs 60,000 crore will be required to provide road-based public transport (bus rapid transit and city bus service) to all cities and towns in the country over the next 20-year period.

Traffic support infrastructure

Service standards and key assumptions

Service Standards		
ITS & ATC	For Class IA cities	One ITS and ATC for every 1 million population
Vehicular and pedestrian underpasses	For Class I cities	• 1 vehicular underpass for every 8 sq. km area • 1 pedestrian underpass for every 1 km of arterial road length
Parking systems	For Class I cities	20 per cent of total number of cars and two-

		wheelers in Class I cities
Bus terminals	For Class I and II cities	1 terminal for every 1 million population
Bus depots	For Class I, II and III cities	1 deport for every 70 buses
Unit cost and service life of assets		
	Unit costs	**Service life**
ITS & ATC	INR 40 crores	5 years
Vehicular and pedestrian underpasses	INR 2.5 crores	10 years
Parking systems*	INR 50,000 to INR 8,00,000 per equivalent car space	-
Bus terminals	INR 3 crores	-
Bus depots	INR 7.5 crores (> 70 buses) INR 5 crores (< 70 buses)	10 years

*Parking systems considered include normal parking, multi-level parking, semi-automated parking and fully-automated parking.

- Service backlog for traffic support infrastructure assumed to be 100 per cent;
- No replacement costs are assumed considered for terminals and parking systems for the period of estimation;
- Vehicle ownership of cars is assumed at 25 per 1000 population and two-wheelers at 125 per 1000 population;
- Assumed that existing buses have enough depot facilities; and
- Annual O&M requirements:
  - ITS & ATC: 10 per cent of PCIC,
  - Vehicle and pedestrian underpasses: 5 per cent of PCIC,
  - Parking: 2 per cent of PCIC,
  - Depots: 3 per cent of PCIC,
  - Terminals: 3 per cent of PCIC.

Aggregate cost for traffic support infrastructure

Aggregate cost for traffic support infrastructure (in 2009-10 prices) (INR crores)	
Capital expenditure	
Investment for unmet demand	42393
Investment for additional demand	26912

Aggregate cost for traffic support infrastructure (in 2009-10 prices) (INR crores)	
Investment required for replacement	28680
Total capital investment	**97985**
Operations and maintenance cost	**36690**
Aggregate cost	**134675**

Street lighting

Service Standards and Key Assumptions for Street Lighting

- Illuminance of 35 Lux (35 lumens per sq. Km) for all road categories for all city size classes;
- Spacing between street lights:
  - 40 m for major roads,
  - 45 m for collector roads,
  - 50 m for access road spaces;
- Lighting considered for two sides for arterial and sub-arterial roads, and one side for collector roads and access road spaces;
- For existing road network, it is assumed that street lighting is adequate;
- Light Emitting Diode (LED) lamps considered at Rs 5400 per lamp;
- Lamp post cost considered at Rs 10,000 per post;
- No replacement cost has been factored in; and
- Annual O&M is assumed to be 2.2 per cent of PCIC, covering both the existing and new assets.

Aggregate cost for street lighting

Aggregate cost for street lighting (in 2009-10 prices) (INR crores)	
Capital expenditure	
Investment for unmet demand	9594
Investment for additional demand	8986
Total capital investment	**18580**
Operations and maintenance cost	**4717**
Aggregate cost	**23297**

To reiterate, in 2014-15 prices, the total finance required this is an amount of INR 84 lakh crores or USD 1336 billion.

ESTIMATION OF GAP

The following table indicates projections of real public expenditure

Projected public expenditure on urban development, 2015-30	
Period	**Past/projected real public expenditure (Centre + States) on urban development (2004-05 prices) (INR crores)**
2005-06	7707.33
2006-07	11193.83
2007-08	14526.93
2008-09	19484.88
2009-10	25345.99
2010-11	21201.96
2011-12	22239.75
2012-13	(RE) 31917.08
2013-14	(BE) 33157.28
2014-15	35845.47
2015-16	38864.01
2016-17	41882.54
2017-18	44901.08
2018-19	47919.62
2019-20	50938.16
2020-21	53956.69
2021-22	56975.23
2022-23	59993.77
2023-24	63012.31
2024-25	66030.84
2025-26	69049.38
2026-27	72067.92

Projected public expenditure on urban development, 2015-30	
Period	**Past/projected real public expenditure (Centre + States) on urban development (2004-05 prices) (INR crores)**
2027-28	75086.46
2028-29	78105.00
2029-30	81123.53
Total projected availability of public finance from 2015-30 (in 2004-05 prices) (in INR)	**INR 8,99,907 crores**
Total projected availability of public finance from 2015-30 (in 2014-15 prices) (in INR)	**INR 16,37,905 crores**
Total projected availability of public finance from 2015-30 (in USD)	**USD 260 billion**

 *Projections*

Total projected availability of public finance in 2014-15 prices from 2015 to 2030 is INR 16 lakh crores or USD 260 billion.

Total finance required in 2014-15 prices from 2015 to 2030 is INR INR 84 lakh crores or USD 1336 billion.

Therefore the gap is roughly INR 68 lakh crores or USD 1073 billion.

ANNEXURE TO GOAL 12

[Extracted from (Planning Commission, GoI, 2014)]

A combination of bottom-up and top-down approaches is used to create the Low Carbon Growth Model. This macro-model is a multi-sectoral, dynamic optimization model that is bottom-up in the sense that it includes many available technology options, and top-down in the sense that it covers the whole macro-economy.

The model endogenises income distribution with ten expenditure classes, both in urban and rural areas.

The demand function is empirically estimated as a Linear Expenditure System (LES) which fits the NSS data well. An LES also ensures that expenditure of a given consumer on different goods and services adds up to her total expenditure. The distribution of consumption expenditure into 20 expenditure classes helps in assessing the inclusiveness of a low carbon strategy.

On the supply side, there are 25 production sectors, and the output of some sectors can be produced by more than one activity, for example, electricity can be produced by 13 different activities. Finally, the model is solved simultaneously for a number of time periods, with the objective of maximizing present discounted value of private consumption. The model uses actual data for the Indian economy and endogenously solves for major macroeconomic variables like output, consumption, investment, energy demand, energy supply mix, carbon emissions, etc. The model projects outcomes for all the years till 2030. The model is solved using the GAMS programme.

Scenarios

The model scenarios are run year by year from 2007-08 onwards to a few time periods beyond 2030-31 to minimise the impact of the terminal period. The model output is summarised through two extreme scenarios outlined below.

1. *Baseline, Inclusive Growth (BIG):*

This scenario incorporates inclusive growth policies as outlined in the Twelfth Five Year Plan, and serves as the reference scenario.

2. *Low Carbon, Inclusive Growth (LCIG):*

This incorporates low carbon strategies while maintaining the inclusive growth interventions as introduced in the BIG scenario. It is important to mention that while inclusive actions remain unchanged between the two scenarios, low carbon strategies span the vector space between them. The Model can therefore be used to generate an infinite number of low carbon scenarios between the two extremes. However, for analytical simplicity in the sectoral chapters, we focus on more detailed analysis of the low carbon strategies that are in line with the LCIG scenario.

Based on these, the Expert Group set up targets for well-being indicators for 2030 to define inclusive growth. Thus, poverty is sought to be reduced to less than one per cent. Every household is to be provided a pucca house, minimum electricity consumption of one kwh per day, clean cooking fuel in the form of at least 6 cylinders of LPG per year, access to clean water

The BIG Model: Baseline Inclusive Growth

India's Twelfth Five Year Plan (2012-2017) aims at "Faster, More Inclusive and Sustainable Growth". Inclusion was also an objective of the earlier Five Year Plans. The Twelfth Plan lists a number of monitorable targets that seek to achieve inclusion in the long run.

These targets are sought to be achieved by a variety of means. Income transfers that simulate the ongoing entitlement and employment guarantee programmes are introduced as cash transfers, beginning with an amount INR 1,000 per person per year at 2007-08 prices, increasing to INR 2,000 by the end of the Twelfth Five Year Plan and to INR 3,000 thereafter. The coverage of rural and urban population is gradually increased over the Twelfth Plan period to reach the levels mentioned in the recently enacted National Food Security Act, i.e. Bottom 70 per cent of the rural, and bottom 50 percent of the urban population.

To provide a *pucca* house to every household by the year 2030, government demand for construction between 2011 and 2025 is correspondingly increased. The houses are then transferred free of cost to the poor households. Universal access to drinking water and sanitary latrines is similarly ensured as increased government expenditure till the end of the Thirteenth Five Year Plan. Government expenditure on Education and Health is increased by 2 percentage points of GDP from 2015 and maintained at that level thereafter. To ensure that every household has access to at least 1 kWh of electricity and 6 cylinders of cooking gas per year, the deficit from households' normal consumption, on both these counts, is made up by the Government.

Through these interventions, the Model achieves the inclusion objectives of India's growth policy as outlined in the Twelfth Five Year Plan. Since this is a national level model, regional and group specific measures are not introduced; the latter, however, do not require additional resources, but only modifications in governance interventions.

The additional expenditure required for the various inclusion measures are subtracted from total available savings, and investment is correspondingly reduced. The available savings are constrained by a marginal savings rate of 35 per cent. Apart from inclusive growth, other assumptions in the

BIG scenario are as follows:

- "Autonomous" Energy Efficiency Improvement (AEEI): AEEI at a rate of 0.5 per cent per year has been stipulated for energy inputs into the production activities for coal, petroleum products, natural gas and electricity. These reflect efficiency improvements observed in the past, without specific low carbon initiatives, and are autonomous to that extent. It is assumed that improvement up to 0.5 per cent per year have a payback period of less than one year and so no additional investment is required during the year.
- Total Factor Productivity Growth (TFPG): It is stipulated at 1 per cent for agricultural sectors and 1.5 per cent for non-agricultural sectors. These are the historically observed values. Since capital is the only factor in the model, TFPG reduces the capital output ratios.
- No carbon emission constraints or specific measures to reduce the emission intensity of the economy are introduced in the BIG scenario.

The LCIG: Low Carbon, Inclusive Growth

This scenario, while maintaining inclusive growth, introduces a number of additional measures:

- The rate of autonomous energy efficiency improvement (AEEI) in production activities is increased to 1.5 per cent per year from 2015 onwards. However, in the case of power sector, lower rates of AEEI have been taken to reflect the technological limits, that is, for coal, natural gas and petroleum products required as inputs for generation. AEEI in the power sector is assumed to be 1 per cent. AEEI for electricity used in the power sector itself is taken as 0.5 per cent, which reflects reduction in T&D losses from 20 per cent to 10 per cent, and also reduction in auxiliary consumption. One may note that in the Model, the power sector is vertically integrated, and includes generation, transmission and distribution facilities. Efficiency improvements beyond 0.5 per cent per year will require upfront investment, for which the payback period is assumed to be six years at a discount rate of 4 per cent.
- Many power generation technologies that do not emit CO2 are introduced. These include solar photovoltaics (PV), solar concentrated solar power (CSP) and wind, all with and without storage, and
- Biomass based power generation plants.
- Hydro and nuclear power development is accelerated.
- The share of generation by conventional coal plants in the total coal based power generation is restricted to increase by only 1.6 per cent per year from 2015 onwards. Additional generation from coal plants takes place from the new super critical plants with 20 per cent higher fuel efficiency and 25 per cent higher capital costs.

- Total factor productivity growth rates (TFPG) for all sectors are the same in both BIG and LCIG scenarios. However, to provide for the falling costs of renewables like wind and solar energy, higher TFPG rates are assumed for renewable power generation technologies up to 2025. After 2025, the TFPG rates for renewables are also the same as that for other non-agricultural sectors.
- A minimum penetration rate for renewable power is prescribed so that the share of renewables in total generation increases from around 7 per cent at the end of the Eleventh Plan (2012) to 18 per cent by 2030. The total share of non-fossil fuel based power increases from around 20 per cent in 2012 to 33 per cent by 2030. To put it simply, one-third of the total power generation by 2030 becomes fossil free.
- For the transport sector, some of the options assessed are the following:
    - The share of railways in freight movement is stipulated to increase by 2.5 per cent per year, from around one-third in the year 2011 to almost half by the year 2030.
    - Fleet efficiency norms on motorized vehicles double fuel efficiency by the year 2030.
    - Greater use of public and non-motorized transport by households is introduced by changing demand system parameters to reduce marginal budget shares for petroleum products by 0.2 per cent per year beginning 2015.
    - The use of electricity and natural gas will substitute petroleum products as alternative fuels in transport sector. This is stipulated by reducing petroleum products inputs in the transport sector by 1.5 per cent per year, and replacing them by increasing inputs of natural gas and electricity in the ratio 60:40 per cent respectively beginning 2015.
- To reflect the use of energy-efficient appliances, the marginal demand for electricity by households is assumed to fall by 2.0 per cent per year from 2015, thereby reducing overall, by 30 per cent, by the year 2030.
- An alternative service activity is introduced to reflect higher energy efficiency of commercial buildings, but with higher initial cost. The share of this activity is specified to increase from 1 per cent to at least 3.4 per cent by the year 2030 to reflect projections for the compliance of Energy Conservation Building Code (ECBC). To reflect energy savings from ECBC compliant public buildings, government consumption of energy is reduced appropriately.
- Higher AEEI rate of 1.5 per cent is assumed for the industrial sector based on various industry studies and the on-going 'perform, achieve and trade (PAT)' scheme, as estimated in Chapter 5.

Study Estimates

The model output has been summarised through the two endpoint scenarios: the BIG and the LCIG. Inclusiveness remains unchanged between the two scenarios, while the low carbon strategies span the vector space between them. These endpoint scenarios are summarized below:

1. *Baseline, Inclusive Growth (BIG):*
   An average 7 per cent GDP growth is sustained up to 2030. Rural poverty is expected to fall below 10 per cent, while urban poverty will be completely eliminated. The aggregate CO_2 emissions are expected to rise from 1,429 Mt in 2007 to 5,271 Mt in 2030 and per capita emissions are expected to rise from 1.3 tonnes of CO_2 per year to 3.6 tonnes of CO_2 per year by 2030. The total energy demand is expected to rise from 400 Mtoe in 2007 to 1146 Mtoe in 2030, while the power demand is expected to increase from 837 billion Units in 2007 to 3371 billion Units in 2030. The total demand for fossil

   Fuels is expected to be 1568 Mt of coal, 406 Mt of crude oil and 187 bcm of natural gas in 2030, which is a significant increase as compared to 556 Mt of coal, 156 Mt of crude oil and 43 bcm of natural gas in 2007. Emissions intensity in terms of kg CO_2 USD per GDP (2005 PPP) comes down from 0.43 in 2007 to 0.33 in 2030, a reduction of 22 per cent over 2007 levels.

2. *Low Carbon, Inclusive Growth (LCIG):*
   Although the average long term GDP growth is only marginally lower at 6.9 per cent, low carbon strategies require an additional investment worth 834 billion USD at 2011 prices *i.e. 992 billion USD in 2014-15 prices.* Cumulative investment in the energy sector between 2007 and 2030 is almost 50 per cent higher in the LCIG scenario as compared to the BIG scenario. A finance of this magnitude would be difficult to mobilize, particularly if the high growth is not sustained in the long run, and adequate assistance in the form of international finance and technology is not forthcoming. Outcomes, which measure inclusion and wellbeing, remain the same as in the BIG scenario. The total CO_2 emissions now increase much more moderately to 3,830 Mt and per capita emissions to 2.6 tonnes by the year 2030. The decline in emissions intensity of GDP nearly doubles to 42 per cent, over 2007 levels, by 2030. An emission accounting exercise shows that out of this total reduction, 3 per cent comes from GDP, 10 per cent from energy efficiency and 29 per cent from shift to energy sources which emit less carbon. The total energy demand, in 2030, will be lower at 1,108 Mtoe, while the power demand would still rise to 3,466 Billon Units due to improved access and modal shifts. About one third of power supply should be fossil free and aggregate demand of fossil fuels would be much lower at 1,278 Mt of coal, 330 Mt of crude oil and 208 bcm of natural gas.

To summarise, sustaining high growth is a double imperative. Not only is it necessary to find resources for inclusion, but also to mobilise resources for low carbon investment. Low carbon investments, on the other hand, sustain long run growth by relaxing the natural resource constraints. It is no longer possible to pursue growth policies that treat these imperatives as separate compartments. Fortunately, with the approval of the Twelfth Five Year Plan Document by the National Development Council, faster, sustainable and more inclusive growth has become an integral part of India's growth policy at both the Central and State levels.

ANNEXURE TO GOAL 13

The World Bank study's objectives are twofold: to develop a global estimate of adaptation costs for informing the international community's efforts in the climate negotiations, and to help decision-makers in developing countries assess the risks posed by climate change and design national strategies for adaptation. To address these objectives, the study was conducted on two parallel tracks: (1) a global track—a top-down approach, in which national databases were used to generate aggregate estimates at a global scale, drawing on a wide variety of sector studies; and (2) a country level track—a bottom-up approach, in which sub-national data were aggregated to generate estimates at economy wide, sectoral, and local levels. The current report integrates and summarizes the key findings of a global study report and seven country case study reports

For the global study, the following four steps were taken:

- Picking a baseline. For the timeframe, the world in 2050 was chosen, not beyond (forecasting climate change and its economic impacts become even more uncertain beyond this period). Development baselines were crafted for each sector, essentially establishing a growth path in the absence of climate change that determines sector-level performance (such as stock of infrastructure assets, level of nutrition, and water supply availability). The baselines used a consistent set of GDP and population forecasts for 2010–2050.
- Choosing climate projections. While there is considerable consensus among climate scientists that climate change is unequivocal, accelerating and human-induced (IPCC 2007), there is much less agreement on how climate change will affect natural and social systems. For that reason, two climate scenarios were chosen to capture as large as possible a range of model predictions—from extreme wet to extreme dry.
- Predicting impacts. An analysis was done to predict what the world would look like under the new climate conditions. This meant translating the impacts of changes in climate on the various economic activities (agriculture, fisheries), on people's behaviour (consumptions, health), on environmental conditions (water availability, forests), and on physical capital (infrastructure).
- Identifying and costing adaptation alternatives. Adaptation actions were selected to offset the predicted impacts and to restore welfare in each of the major economic sectors analysed—infrastructure, coastal zones, water supply and flood protection, agriculture, fisheries, human health, and forestry and ecosystem services. The costs of these actions together with the cost implications of changes in the frequency of extreme weather events were also estimated. But a cross-sectoral analysis of costs was not feasible.

For the country studies, two additional steps were taken:

- Evaluating economy wide impacts. A macroeconomic modelling framework—known as a Computable General Equilibrium (CGE) model—was used to facilitate the analysis of macroeconomic and cross-sectoral effects of the impacts and adaptation to climate change.
- Evaluating social impacts. A social component was used to gather information on preferred adaptation strategies and sequence strategies from a bottom-up, local–level perspective. It also provided new evidence on how vulnerability is socially differentiated, and on the importance of social accountability and good governance for achieving pro-poor, climate-resilient development. It went beyond planned adaptation, weighing the potential of adaptation taken by households, collective action, nongovernmental organizations, and the private sector.

For all of the studies, a number of concepts had to be agreed upon:

- How much to adapt. The studies assumed that countries would fully adapt—that is, adapt up to the level at which they enjoy the same level of welfare in the (future) world as they would have without climate change. This in principle overstates the costs of adaptation. Of course, governments can choose to not adapt at all, incurring all damage from climate change, or adapt to the point where benefits from adaptation equal their costs, at the margin ("optimal" adaptation).
- What exactly is "adaptation"? Countries face not only a deficit in adapting to current climate variation, let alone future climate change, but also deficits in providing education, housing, health, and other services. Thus, many countries face a more general "development deficit," of which the part related to climate events is termed the "adaptation deficit." This study makes the adaptation deficit a part of the development baseline, so that adaptation costs cover only the additional costs to cope with future climate change.
- Soft versus hard measures. "Hard" options (capital intensive) were favoured over "soft" options (institutions and policies)—because they are easier to quantify.
- Public versus private adaptation. The focus was on planned adaptation (deliberate public decision) rather than autonomous or spontaneous adaptation (households or communities acting on their own without public interventions but within an existing public policy framework).
- How to include benefits. Some countries and some sectors may benefit from changes in climate. The question is how to account for these gains. A number of different approaches were used to account for these gains.

- How to handle uncertainty. Total adaptation costs for a specific climate projection assume that policymakers know with certainty that a particular climate projection will materialise. Thus, the use of two extreme scenarios, wettest and driest, provides a range of estimates for a world in which decision-makers have perfect foresight. If decision-makers end up having to hedge their bets and consider both scenarios at the same time, costs will be higher.

ANNEXURE TO GOALS 14, 15

ESTIMATION OF FINANCE REQUIRED

The finance required is composed of two kinds of costs: the direct administrative costs that the government incurs annually in order to manage and conserve these protected areas, and the opportunity costs that arise out of taking away the land within a protected area from other competing uses.

Direct administrative costs

In the XI Five Year Plan, the approved outlay for three relevant budget heads viz. Forests and Wildlife, National Afforestation and Ecodevelopment Board, and National River Conservation Directorate was INR 8634 crores. In 2014-15 prices, this is an amount of INR 14,338 crores. This allocation was revised for the XII Five Year Plan to INR 13,872 crores[35]. In 2014-15 prices, this is an amount of INR 16,459 crores. This was an almost 15% increase, keeping in mind aspects of sustainable development. If one assumes that the Aichi Targets would be met by 2020 as envisaged (as well as the SDGs by 2030), the Indian Protected Areas network would have to be expanded by 4,80,288 sq km., i.e. A fourfold increase. This implies that there would need to be a fourfold increase in the allocations in these relevant heads of expenditure. Accordingly, the total finance required has been calculated, all in 2014-15 prices. This does not account for other increases in administrative costs such as on salaries and equipment, as well as recurrent expenditure other than salaries.

In 2014-15 prices,

Current Plan allocation = INR 16,459 crores.

Allocation required per Plan = INR 16,459 crores x 4 = INR 65,836 crores

Total finance required in the XII Five Year Plan (2012-17), XIII Five Year Plan (2017-22) and XIV Five Year Plan (2022-27) periods = INR 65,836 x 3 = INR 1,97,508 crores

Opportunity costs of the additional land taken over under the Protected Network

It is assumed here that market prices of land are a reliable proxy for the opportunity costs that may arise while expanding the Indian Protected Areas network. Various projects that require land acquisition can be a good indicator of how much these costs could be. For example, in a fairly recent report in the Indian Express, it was reported that the Maharashtra Industrial Development Corporation acquired over

[35] Found on the website of the Ministry of Environment, Forest and Climate Change: http://envfor.nic.in/division/introduction-2

3500 hectares of farm land from about 3000 farmers, paying a maximum remuneration of approximately INR 56.83 crores per sq km, and separate compensation for orchards (Iyer, 2015). Meanwhile, compensatory afforestation rates in India range from INR 5.8 crores to INR 9.2 crores per sq km (CAG, 2013). If one assumes that the lowest of these rates, say around INR 6 crores per sq km, is the opportunity cost for India to expand its protected areas network, the total opportunity cost is INR 28,81,728 crores.

The total finance required for Goals 14 and 15 are found by adding the administrative and opportunity costs, which gives a total of INR 30,79,236 crores (USD 489 billion).

ESTIMATION OF GAP

Assuming that the approved outlay of INR 16,459 crores (in 2014-15 prices) in the XII Five Year Plan will at least be matched, if not increased, in subsequent Five Year Plans, then the total expected finance available in the XII, XIII and XIV plan (2012-27) is INR 16459 x 3 = INR 49,377 crores (USD 7.8 billion.)

This leaves a gap of INR 30,29,859 crores or roughly INR 30 lakh crores (USD 481 billion).

ANNEXURE TO FINANCE FOR RESEARCH AND DEVELOPMENT

AVAILABLE DATA

Year	GDP (in 2004-05 prices)
1983	936,270
1984	973,357
1985	1,013,866
1986	1,057,612
1987	1,094,993
1988	1,206,243
1989	1,280,228
1990	1,347,889
1991	1,367,171
1992	1,440,504
1993	1,522,344
1994	1,619,694
1995	1,737,741
1996	1,876,319
1997	1,957,032
1998	2,087,828
1999	2,254,942
2000	2,348,481
2001	2,474,962
2002	2,570,935
2003	2,775,749
2004	2,971,464
2005	3,253,073
2006	3,564,364
2007	3,896,636
2008	4,158,676
2009	4,516,071
2010	4,918,533
2011	5,247,530
2012	5,482,111
2013	5476855.16

* Source: Planning Commission Database

ESTIMATION OF FINANCE REQUIRED AND GAP

- The future GDP of India till 2030 was projected assuming that growth would follow past trends.
- 0.84% of the projected GDP every year from 2015-30 is assumed to be available for Research and Development based on the data available.
- The study suggests that India spend 2% of its GDP on research and development. The gap is estimated by subtracting the projected availability at 0.84 % with requirement at 2% of the GDP.

Finance needed and gap for research and development, 2015-30

Year	GDP (in 2004-05 prices) (INR crores)	GDP (in 2014-15 prices) (INR crores)	0.84% of GDP (INR crores)	2% of GDP (INR crores)
1983	936,270			
1984	973,357			
1985	1,013,866			
1986	1,057,612			
1987	1,094,993			
1988	1,206,243			
1989	1,280,228			
1990	1,347,889			
1991	1,367,171			
1992	1,440,504			
1993	1,522,344			
1994	1,619,694			
1995	1,737,741			
1996	1,876,319			
1997	1,957,032			
1998	2,087,828			
1999	2,254,942			
2000	2,348,481			
2001	2,474,962			
2002	2,570,935			
2003	2,775,749			
2004	2,971,464			

Finance needed and gap for research and development, 2015-30				
Year	**GDP (in 2004-05 prices) (INR crores)**	**GDP (in 2014-15 prices) (INR crores)**	**0.84% of GDP (INR crores)**	**2% of GDP (INR crores)**
2005	3,253,073			
2006	3,564,364			
2007	3,896,636			
2008	4,158,676			
2009	4,516,071			
2010	4,918,533			
2011	5,247,530			
2012	5,482,111			
2013	5,476,855			
2014	5,825,819			
2015	6,197,017	11279084	94744	225582
2016	6,591,866	11997743	100781	239955
2017	7,011,873	12762191	107202	255244
2018	7,458,642	13575347	114033	271507
2019	7,933,877	14440314	121299	288806
2020	8,439,392	15360393	129027	307208
2021	8,977,116	16339096	137248	326782
2022	9,549,102	17380159	145993	347603
2023	10,157,533	18487553	155295	369751
2024	10,804,731	19665506	165190	393310
2025	11,493,165	20918514	175716	418370
2026	12,225,464	22251358	186911	445027
2027	13,004,421	23669126	198821	473383
2028	13,833,011	25177229	211489	503545
2029	14,714,396	26781422	224964	535628
2030	15,651,938	28487827	239298	569757
		Total	**2508012**	**5971457**

Projections

The total gap in financing research and development in India is around INR 35 lakh crores (USD 555 billion).

ANNEXURE TO FINANCE FOR AWARENESS

Estimation of finance required

The GDP at factor cost has been projected by assuming an exponential growth trend.

Finance required for awareness, 2015-30		
Year	**GDP at factor cost in 2004-05 prices**	**Finance required for awareness: 1% of GDP**
1983	936,270	
1984	973,357	
1985	1,013,866	
1986	1,057,612	
1987	1,094,993	
1988	1,206,243	
1989	1,280,228	
1990	1,347,889	
1991	1,367,171	
1992	1,440,504	
1993	1,522,344	
1994	1,619,694	
1995	1,737,741	
1996	1,876,319	
1997	1,957,032	
1998	2,087,828	
1999	2,254,942	
2000	2,348,481	
2001	2,474,962	
2002	2,570,935	
2003	2,775,749	
2004	2,971,464	
2005	3,253,073	
2006	3,564,364	
2007	3,896,636	
2008	4,158,676	

Finance required for awareness, 2015-30		
Year	**GDP at factor cost in 2004-05 prices**	**Finance required for awareness: 1% of GDP**
2009	4,516,071	
2010	4,918,533	
2011	5,247,530	
2012	5,482,111	
2013	5,476,855	
2014	5,825,819	
2015	6,197,017	61970
2016	6,591,866	65919
2017	7,011,873	70119
2018	7,458,642	74586
2019	7,933,877	79339
2020	8,439,392	84394
2021	8,977,116	89771
2022	9,549,102	95491
2023	10,157,533	101575
2024	10,804,731	108047
2025	11,493,165	114932
2026	12,225,464	122255
2027	13,004,421	130044
2028	13,833,011	138330
2029	14,714,396	147144
2030	15,651,938	156519
Total finance required from 2015-30 in 2004-05 prices (in INR)		**INR 1640435**
Total finance required from 2015-30 in 2014-15 prices (in INR)		**INR 30 lakh crores**
Total finance required from 2015-30 (in USD)		**USD 474 billion**

Projections

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About Technology & Action for Rural Advancement

The Society for Technology & Action for Rural Advancement (TARA) is a social enterprise which is an "incubation engine" of the Development Alternatives Group that has been providing development solutions in India and elsewhere. TARA as an "enabler", is instrumental in the creation of livelihood support systems, training and capacity building for the rural poor and marginalized communities. TARA as an "aggregator" bundles support service packages and connect these groups to market opportunities for BOP access and market development for ethical products and services. Governments, large Corporations and Civil Society networks benefit from TARA's expertise as a "manager" of environmental action, community development and service delivery programmes in areas such as affordable housing, renewable energy, water management, sustainable agriculture, and recycling. *www.tara.in*

About Development Alternatives

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.*www.devalt.org*