

INDIA'S INTENDED NATIONALLY DETERMINED CONTRIBUTION:

WORKING TOWARDS CLIMATE JUSTICE

ॐ द्यौः शान्तिरन्तरिक्षं शान्तिः
पृथिवी शान्तिरापः शान्तिरोषधयः शान्तिः ।

“Om dyauh śāntir antariksam śāntih prithvi śāntih āpah śāntih osadhayah śāntih”

-- Yajur Veda 36.17

**{{Unto Heaven be Peace, Unto the Sky and the Earth be Peace, Peace be unto the
Water, Unto the Herbs and Trees be Peace}}**

INTRODUCTION

India has a long history and tradition of harmonious co-existence between man and nature. Human beings here have regarded fauna and flora as part of their family. This is part of our heritage and manifest in our lifestyle and traditional practices. We represent a culture that calls our planet Mother Earth. As our ancient text says; "Keep pure! For the Earth is our mother! And we are her children!" The ancient Indian practice of Yoga, for example, is a system that is aimed at balancing contentment and worldly desires, that helps pursue a path of moderation and a sustainable lifestyle. Environmental sustainability, which involves both intra-generational and inter-generational equity, has been the approach of Indians for very long. Much before the climate change debate began, Mahatma Gandhi, regarded as the father of our nation had said that we should act as *'trustees'* and use natural resources wisely as it is our moral responsibility to ensure that we bequeath to the future generations a healthy planet.

The desire to improve one's lot has been the primary driving force behind human progress. While a few fortunate fellow beings have moved far ahead in this journey of progress, there are many in the world who have been left behind. Nations that are now striving to fulfill this 'right to grow' of their teeming millions cannot be made to feel guilty of their development agenda as they attempt to fulfill this legitimate aspiration. Just because economic development of many countries in the past has come at the cost of environment, it should not be presumed that a reconciliation of the two is not possible.

It is possible for people to live in harmony with nature by harnessing its potential for the benefit of mankind without undue exploitation leading to irretrievable damage and consequences that block the progress of others. There is a need to evolve a set of precepts, a kind of commandments, especially for the youth of the world, that help in developing a unified global perspective to economic growth so that the disparity in the thinking of the 'developed' and 'developing' countries could be bridged. The removal of such barriers of thought and the creation of a regime where facilitative technology transfer replaces an exploitative market driven mechanism could pave the way for a common understanding of universal progress. If climate change is a calamity that mankind must adapt to while taking mitigation action withal, it should not be used as a commercial opportunity. It is time that a mechanism is set up which will turn technology and innovation into an effective instrument for global public good, not just private returns.

The challenge of climate change calls for extraordinary vision, leadership, compassion and wisdom. Human ingenuity and intellect will also play an important role in addressing this challenge. The cumulative accumulation of greenhouse gases (GHGs) historically since industrial revolution has resulted in the current problem of global warming. This is further compounded by the tepid and inadequate response of the developed countries even after the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) and delineation of obligations and responsibilities. As a result, an 'emission' ambition gap has been created calling for enhanced global actions to address it. India, even though not a part of the problem, has been an active and constructive participant in the search for solutions. Even now, when the per capita emissions of many developed countries vary between 7 to 15 metric tonnes, the per capita emissions in India were only about 1.56 metric tonnes in 2010. This is because Indians believe in nature friendly lifestyle and practices rather than its exploitation. By enhancing their efforts in keeping with historical responsibility, the developed and resource rich countries could reduce the burden of their action from being borne by developing countries that carry the additional responsibility of finding resources to meet their development needs and strive to improve their Human Development Index (HDI).

With the responsibility of ensuring a reasonable HDI for the country and the economic progress of its vast population, India has attempted to follow a path 'cleaner' than the one followed by many countries in the past. Today these countries may be in the forefront of

development, even providing a model of growth to other developing countries. However, if India compares the emission intensity of its GDP (Gross Domestic Product) in PPP (Purchasing Power Parity) terms at present with those countries at a similar level of development, it is seen that their emissions then were far more than India's at present. This is as much on account of India being open and innovative in embracing new technology and a cleaner way of doing things, as it is from the inherent principles of sustainability ingrained in its thought process.

If the world indeed is concerned about its new investments to be climate friendly, it must consider the opportunity provided by a country like India where economic growth could be achieved with minimum levels of emissions by employing new technologies and finance for achieving low carbon growth. Developed countries can certainly bring down their emission intensity by moderating their consumption, and substantially utilize their investments by employing them for development activities in countries housing a vast majority of people barely living at subsistence level. The ratio of emission avoided per dollar invested and economic growth attained would be relatively more favourable in case of investments made in India.

Mahatma Gandhi had once said, "One must care about the world one will not see". Indeed, humanity has progressed when it has collectively risen to its obligation to the world and responsibility to the future.

2015 Agreement

India is committed to engaging actively in multilateral negotiations under the UNFCCC in a positive, creative and forward-looking manner. Our objective is to establish an effective, cooperative and equitable global architecture based on climate justice and the principles of Equity and Common But Differentiated Responsibilities and Respective Capabilities, under the UNFCCC. Such an approach should be anchored in the vision inspired by Mahatma Gandhi's famous exhortation; "*Earth has enough resources to meet people's needs, but will never have enough to satisfy people's greed*". We must promote sustainable production processes and also sustainable lifestyles across the globe. Habit and attitude are as much a part of the solution as Technology and Finance. It must be understood that poverty is a big

polluter; so is the extravagant way of life and a profligate pattern of consumerism a grave threat to environment.

As we put together the new global compact for enhanced actions, it is critical to ensure that it is comprehensive, balanced, equitable, and pragmatic. It should address all the elements including Adaptation, Mitigation, Finance, Technology Transfer, Capacity Building and Transparency of Action and Support. At the same time, the genuine requirements of developing countries like India for an equitable carbon and development space to achieve sustainable development and eradication of poverty needs to be safeguarded. Achievement of these goals requires adherence to the principles and provisions of the UNFCCC. As the Prime Minister of India, while addressing the United Nations on 25th September 2015, has said; “We all believe that international partnership must be at the centre of our efforts, whether it is development or combating climate change. And, the principle of common but differentiated responsibilities is the bedrock of our collective enterprise. When we speak only of climate change, there is a perception of our desire to secure the comforts of our lifestyle. When we speak of climate justice, we demonstrate our sensitivity and resolve to secure the future of the poor from the perils of natural disasters”.

India’s contribution takes into account its commitment to conservation of nature as well as the imperatives of meeting the competing demand of resources for addressing the challenges of poverty eradication, food security and nutrition, universal access to education and health, gender equality and women empowerment, water and sanitation, energy, employment, sustainable urbanisation and new human settlements and the means of implementation for enhanced action for achieving among others, the sustainable development goals for its 1.2 billion people.

I. NATIONAL CIRCUMSTANCES

Climate change is a major challenge for developing countries like India that face large scale climate variability and are exposed to enhanced risks from climate change. Few countries in the world are as vulnerable to the effects of climate change as India is with its vast population that is dependent on the growth of its agrarian economy, its expansive coastal areas and the Himalayan region and islands. It also entails tradeoffs with economic growth and social

development in the short run that needs to be factored in the policy matrix, where eradication of poverty is one of the foremost priorities.

India accounts for 2.4% of the world surface area, but supports around 17.5% of the world population. It houses the largest proportion of global poor (30%), around 24% of the global population without access to electricity (304 million), about 30% of the global population relying on solid biomass for cooking and 92 million without access to safe drinking water. The average annual energy consumption in India in 2011 was only 0.6 tonnes of oil equivalent (toe) per capita as compared to global average of 1.88 toe per capita. **It may also be noted that no country in the world has been able to achieve a Human Development Index of 0.9 or more without an annual energy availability of at least 4 toe per capita.** With a HDI of 0.586 and global rank of 135, India has a lot to do to provide a dignified life to its population and meet their rightful aspirations.

India is a developing country with a per capita GDP (nominal) of around USD 1408 per annum. However, this doesn't reflect the wide disparities amongst its people and regions. Around 363 million people (30% of the population) live in poverty, about 1.77 million people are houseless and 4.9% of the population (aged 15 years and above) are unemployed. The per capita electricity consumption stands low at 917 kWh, which is barely one third of the world's average consumption.

A recent national socio-economic census indicates that economic and social deprivations are much higher in terms of availability of proper houses, access to education, lifeline availability of energy, and stable sources of income. This is more so in rural India where 48% of the households lack basic socio economic services and were categorized as deprived. India also has the largest cattle and buffalo population in the world of about 300 million, which faces multiple challenges including diseases, inadequate supply of fodder etc. as a result of changing climate.

Given the development agenda in a democratic polity, the infrastructure deficit represented by different indicators, the pressures of urbanization and industrialization and the imperative of sustainable growth, India faces a formidable and complex challenge in working for economic progress towards a secure future for its citizens.

The following projected key macro indicators are a reflection of India's future needs as the economy grows in the coming years:

Indicator	India in 2014	India in 2030
Population (billion) ^a	1.2	1.5
Urban population (million) ^b	377 (2011)	609
GDP at 2011-12 prices (in trillion) ^c	INR 106.44 (USD 1.69)	INR 397.35 (USD 6.31)
Per capita GDP in USD (nominal) ^c	1408	4205
Electricity demand (TWh) ^c	776(2012)	2499

Source: a: Population Foundation of India; b: UN World Urbanization Prospects, 2014; c: Government of India.

Almost all the macroeconomic models predict that anticipated needs in the future will be large. Rapid urbanization in the country will be one of the most dominant trends in the coming years. It is expected that about 40% of the population in 2030 would be urban as against 30% currently. As population expands and incomes grow, this shift will likely be realized alongside demographic changes that will exponentially increase the demand for urban amenities like housing, energy, transport, water, waste disposal. It is estimated that more than half of India of 2030 is yet to be built. In a way, India's development process is doubly challenging. It not only has to complete the current unfinished development agenda, it has to strategise for future pressures that may increase the magnitude of this development gap. India realises that economic growth and development have to be guided by the key concerns of sustainability, because none of us have the luxury, any longer, of ignoring the economic as well as the environmental threat that a fast-deteriorating ecosystem poses to our fragile planet. India believes that development and environment are not adversaries but can go hand in hand, if environmental sensibilities can be imbibed. Equitable, inclusive and sustainable development would be the key to a new model of growth that India is committed to pursue, which can be fostered and facilitated by a collaborative approach among the Developing and the Developed countries.

II. POLICY FRAMEWORK

India's environment policy is anchored in the Constitution of India, Article 48-A of the Constitution states that *"The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country"*.

The Indian development process is guided by the aspiration of making India prosperous and progress on the path of *"Development without Destruction"*.

The broad policy framework on environment and climate change is laid down by the **National Environment Policy (NEP) 2006**, which promotes sustainable development along with respect for ecological constraints and the imperatives of social justice. The current development paradigm reiterates the focus on sustainable growth and aims to exploit the co-benefits of addressing climate change along with promoting economic growth. The **National Action Plan on Climate Change (NAPCC)** provides a sharper focus on required interventions. Currently, NAPCC is implemented through eight National Missions, outlining priorities for mitigation and adaptation to combat climate change. The broad policy initiatives of the government are supplemented by actions of the State Governments, Non-governmental Organizations (NGOs), initiatives of the private sector and other stakeholders. 32 States and Union Territories have put in place the **State Action Plan on Climate Change (SAPCC)** attempting to mainstream climate change concerns in their planning process.

Many other national strategies and policies supplement the above efforts. The **Energy Conservation Act** has been enacted to encourage efficient use of energy and its conservation. The **National Policy for Farmers** focuses on sustainable development of agriculture. The **National Electricity Policy (NEP)** underscores the focus on universalizing access to electricity and promoting renewable sources of energy, as does the **Integrated Energy Policy (IEP)**.

Policies to promote actions that address climate concerns also include fiscal instruments like coal cess, cuts in subsidies, increase in taxes on petrol and diesel, market mechanisms including Perform Achieve and Trade (PAT), Renewable Energy Certificates (REC) and a regulatory regime of Renewable Purchase Obligation (RPO). The institutional arrangement for offtake of renewable power will be further strengthened.

III. INDIA'S PROGRESS IN COMBATING CLIMATE CHANGE

In recognition of the growing problem of Climate Change, India declared a voluntary goal of reducing the emissions intensity of its GDP by 20–25%, over 2005 levels, by 2020, despite having no binding mitigation obligations as per the Convention. A slew of policy measures were launched to achieve this goal. ***As a result, the emission intensity of our GDP has decreased by 12% between 2005 and 2010. It is a matter of satisfaction that United Nations Environment Programme (UNEP) in its Emission Gap Report 2014 has recognized India as one of the countries on course to achieving its voluntary goal.***

India has a definite plan of action for clean energy, energy efficiency in various sectors of industries, steps to achieve lower emission intensity in the automobile and transport sector, a major thrust to non-fossil based electricity generation and a building sector based on energy conservation.

India's on-going mitigation and adaptation strategies and actions are detailed in the following sections, along with the expected direction of activities in the near future.

1. MITIGATION STRATEGIES

1.1 CLEAN AND EFFICIENT ENERGY SYSTEM

Energy is a vital input for production and growth. Considering universal energy access and energy security as one of the fundamental development goals for the country, Government of India (GoI) has undertaken a two pronged approach to cater to the energy demand of its citizens while ensuring minimum growth in carbon emissions. On the generation side, the Government is promoting greater use of renewables in the energy mix mainly through solar and wind power and shifting towards supercritical technologies for coal based power plants. On the demand side, efforts are being made to efficiently use energy through various innovative policy measures under the overall ambit of Energy Conservation Act.

The energy intensity of the economy has decreased from 18.16 goe (grams of oil equivalent) per Rupee of GDP in 2005 to 15.02 goe per Rupee GDP in 2012, a decline of over 2.5% per annum.

1.1.1 Promotion of Clean Energy

India is running one of the largest renewable capacity expansion programs in the world.

Between 2002 and 2015, the share of renewable grid capacity has increased over 6 times, from 2% (3.9 GW) to around 13% (36 GW). This momentum of a tenfold increase in the previous decade is to be significantly scaled up with the aim to achieve 175 GW renewable energy capacity in the next few years. India has also decided to anchor a global solar alliance, InSPA (International Agency for Solar Policy & Application), of all countries located between the Tropic of Cancer and the Tropic of Capricorn.

- 1) **Wind energy** has been the predominant contributor to the renewable energy growth in India accounting for 23.76 GW (65.2%) of the renewable installed capacity, making India the 5th largest wind power producer in the world. With a potential of more than 100 GW, the aim is to achieve a target of 60 GW of wind power installed capacity by 2022.
- 2) **Solar power** in India is poised to grow significantly with Solar Mission as a major initiative of the Government of India. Solar power installed capacity has increased from only 3.7 MW in 2005 to about 4060 MW in 2015, with a CAGR of more than 100% over the decade. The ambitious solar expansion programme seeks to enhance the capacity to 100 GW by 2022, which is expected to be scaled up further thereafter. A scheme for development of 25 *Solar Parks*, *Ultra Mega Solar Power Projects*, canal top solar projects and one hundred thousand solar pumps for farmers is at different stages of implementation. Government of India is also promoting solarization of all the 55,000 petrol pumps across the country out of which about 3,135 petrol pumps have already been solarized.
- 3) **Biomass energy** constitutes about 18% of total primary energy use in the country and more than 70% of the country's population depends on it. However, it is currently used in an inefficient manner with high levels of indoor pollution. A number of programmes have been initiated for promotion of cleaner and more efficient use, including biomass based electricity generation. It is envisaged to increase biomass installed capacity to 10 GW by 2022 from current capacity of 4.4 GW.
- 4) **Hydropower** contributes about 46.1 GW to current portfolio of installed capacity, of which 4.1 GW is small hydro (upto 25 MW) and 41.99 GW is large hydro (more than 25 MW). Special programmes to promote small and mini hydel projects, new and efficient

designs of water mills have been introduced for electrification of remote villages. With a vast potential of more than 100 GW, a number of policy initiatives and actions are being undertaken to aggressively pursue development of country's vast hydro potential.

- 5) India is promoting **Nuclear Power** as a safe, environmentally benign and economically viable source to meet the increasing electricity needs of the country. With a 2.2% share in current installed capacity, total installed capacity of nuclear power in operation is 5780 MW. Additionally six reactors with an installed capacity of 4300 MW are at different stages of commissioning and construction. Efforts are being made to achieve 63 GW installed capacity by the year 2032, if supply of fuel is ensured.
- 6) **Clean Coal policies:** Coal based power as of now accounts for about 60.8% (167.2 GW) of India's installed capacity. In order to secure reliable, adequate and affordable supply of electricity, coal will continue to dominate power generation in future. Government of India has already taken several initiatives to improve the efficiency of coal based power plants and to reduce its carbon footprint. All new, large coal-based generating stations have been mandated to use the highly efficient supercritical technology. Renovation and Modernisation (R&M) and Life Extension (LE) of existing old power stations is being undertaken in a phased manner. **About 144 old thermal stations have been assigned mandatory targets for improving energy efficiency.** Coal beneficiation has been made mandatory. Introduction of ultra-supercritical technology, as and when commercially available is part of future policy. **Besides, stringent emission standards being contemplated for thermal plants would significantly reduce emissions.**
- 7) **National Smart Grid Mission** has been launched to bring efficiency in power supply network and facilitate reduction in losses and outages. **Green Energy Corridor** projects worth INR (Indian National Rupee) 380 billion (USD 6 billion) are also being rolled out to ensure evacuation of renewable energy.

The Government's goal of *Electricity for All* is sought to be achieved by the above programs that would require huge investments, infusion of new technology, availability of nuclear fuel and international support.

1.1.2 Enhancing Energy Efficiency

With the goal of reducing energy intensity of the Indian economy, Ministry of Power through Bureau of Energy Efficiency (BEE) has initiated a number of energy efficiency initiatives. The **National Mission for Enhanced Energy Efficiency (NMEEE)** aims to strengthen the market for energy efficiency by creating a conducive regulatory and policy regime. It seeks to upscale the efforts to unlock the market for energy efficiency and help achieve total avoided capacity addition of 19,598 MW and fuel savings of around 23 million tonnes per year at its full implementation stage. The programmes under this mission have resulted in an avoided generation capacity addition of about 10,000 MW between 2005 and 2012 with government targeting to save 10% of current energy consumption by the year 2018-19. Demand Side Management programmes have been launched to replace existing low-efficiency appliances:

- 1) During the last decade, there has been rapid transformation of **efficient lighting in India**. The sales of Compact fluorescent lamps (CFLs) have risen to about 37% of the total lighting requirements in 2014 from 7.8% in 2005. India has also launched an ambitious plan to replace all incandescent lamps with Light-emitting diode (LED) bulbs in the next few years leading to energy savings of upto 100 billion kilowatt hours (kWh) annually.
- 2) **Standards and Labeling Programme** launched by the Government of India enables consumers to make informed decision by providing information about the energy consumption of an appliance. Currently, 21 equipment and appliances are labeled. The programme has contributed to an increase of 25% to 30% in the energy efficiency of an average refrigerator or air-conditioner in 2014 compared to those sold in 2007. **Super-Efficient Fan** (that uses half as much energy as the average fan) programme has been launched. Further, two sets of **Corporate Average Fuel Consumption standards** for cars have been notified, with one coming into force in 2017 and the second set in 2022.
- 3) **Partial Risk Guarantee Fund for Energy Efficiency (PRGFEE)**, a risk sharing mechanism to provide financial institutions with a partial coverage of risk involved in extending loans for energy efficiency projects, and **Venture Capital Fund for Energy Efficiency (VCFEE)**, a trust fund to provide “last mile” equity capital to energy efficiency companies, have been established.
- 4) The **Energy Conservation Building Code (ECBC)** sets minimum energy standards for new commercial buildings. Eight states have already adopted and notified the ECBC, and

over 300 new commercial buildings have become compliant. The Code would be made more stringent to promote construction of even more (Near-Zero) energy-efficient buildings. “**Design Guidelines for Energy Efficient Multi-storey Residential buildings**” have also been launched.

- 5) In order to both recognize energy-efficient buildings, as well as to stimulate their large scale replication, India has developed its own building- energy rating system **GRIHA (Green Rating for Integrated Habitat Assessment)**, based on 34 criteria like site planning, conservation and efficient utilization of resources etc. A number of buildings including Commonwealth Games Village have been rated using GRIHA system. Indira Paryavaran Bhawan, the headquarters of Central Government’s Ministry of Environment, Forest & Climate Change is a model building of Government of India and has received LEED India Platinum and a 5 Star GRIHA rating. It is a ‘Net Zero Energy’ building with 100% onsite power generation.

1.2 ENHANCING ENERGY EFFICIENCY IN INDUSTRIES

Infrastructure sectors, viz. electricity, coal and cement have seen a growth rate of 4.5% in the year 2013-14. The recent initiatives like **Make in India, Digital India**, creating **National Industrial Corridors**, streamlining environment and forest approvals, labour reforms and undertaking other measures for the ease of doing business have also fuelled the spurt in their growth rates. Amidst all this, policies to enable industries reduce their energy consumption play a critical role as an instrument for sustainable environment through various interventions like:

- 1) **Perform, Achieve and Trade (PAT)**, as a market based energy efficiency trading mechanism, at present covers 478 plants (designated consumers) in eight energy-intensive industrial sectors accounting for one-third of total energy consumption in the country. The mandated decrease in the specific energy consumption under PAT programme has led to a decline of 4 to 5% in their specific energy consumption in 2015 as compared to that in 2012. Energy Saving Certificates (ESCerts) are issued to consumers who over-achieve the target. The scheme is to be widened and deepened to include additional sectors like railways, electricity distribution and refineries in the next cycle and would cover more than half the commercial energy consumed in India.

- 2) **Zero Effect, Zero Defect (ZED):** The **Make in India campaign** with ZED is a policy initiative to rate Medium & Small Industries on quality control and certification for energy efficiency, enhanced resources efficiency, pollution control, use of renewable energy, waste management etc. using ZED Maturity Assessment Model. **The scheme launched in 2015, envisages coverage of about 1 million medium and small enterprises.**

1.3 DEVELOPING CLIMATE RESILIENT URBAN CENTERS

Government of India in recent times has launched a number of schemes for transformation and rejuvenation of urban areas including **Smart Cities Mission, Atal Mission for Rejuvenation and Urban Transformation (AMRUT)** and **National Heritage City Development and Augmentation Yojana (HRIDAY):**

- 1) Under the **Smart Cities Mission**, 100 **smart cities** are planned with the objective to develop new generation cities, which will provide core infrastructure and a decent quality of life to its citizens by building a clean and sustainable environment. Smart solutions like recycling and reuse of waste, use of renewables, protection of sensitive natural environment will be incorporated to make these cities climate resilient.
- 2) **Atal Mission for Rejuvenation and Urban Transformation (AMRUT)**, a new urban renewal mission has been launched by Government of India for 500 cities with focus on ensuring basic infrastructure services such as water supply, sewerage, storm water drains, transport and development of green spaces and parks by adopting climate resilient and energy efficient policies and regulations.

1.4 PROMOTING WASTE TO WEALTH CONVERSION

India recognizes the dual benefits that can arise from efficient waste disposal leading to enhanced environmental benefits along with conversion to energy. Incentives are being granted to cities to take up waste to energy conversion projects.

- 1) The **Waste to Energy** capacity is sought to be enhanced. Government is also encouraging conversion of waste to compost by linking it with sale of fertilizers and providing market development assistance.

- 2) Government has invested significantly in **Solid Waste Management (SWM)** projects over the years and has provided INR 25 billion (USD 397 million) as grant in aid to states and Urban Local Bodies specifically for SWM through public-private partnerships.
- 3) Similarly, initiatives on waste water management would cover an additional population of 41 million and enhance recycling and reuse of treated water. There are about 816 Sewage Treatment Plants (522 operational and rest at different stages of construction and planning) having a combined capacity of 23,277 million of liters per day across 28 States and Union Territories.
- 4) Government of India has recently launched a one-of-its kind ‘**Swachh Bharat Mission**’ (**Clean India Mission**) with the objective of making the country clean and litter free with scientific solid waste management in about 4041 towns covering a population of 306 million. It aims to construct 10.4 million individual household toilets and 0.5 million Community and Public Toilets.

1.5 SAFE, SMART AND SUSTAINABLE GREEN TRANSPORTATION NETWORK

In the endeavor towards a low carbon economy, India is focusing on low carbon infrastructure and public transport systems like **Dedicated Freight Corridors** and energy efficient railways to reduce their environmental impact.

- 1) Indian Railways handles 3 million tonnes of freight and 23 million passengers daily and is the world’s third largest network. The endeavor is to increase the share of Railways in total land transportation from 36% to 45 %, thereby decreasing the load on less efficient diesel operated road traffic.
- 2) **Dedicated Freight Corridors (DFCs)** have been introduced across the country. In the first phase, two corridors viz. 1520 km Mumbai-Delhi (*Western Dedicated Freight Corridor*) and 1856 km Ludhiana-Dankuni (*Eastern Dedicated Freight Corridor*) are being constructed. The project is expected to reduce emissions by about 457 million ton CO₂ over a 30 year period. With a number of energy efficiency measures undertaken, Indian Railways has achieved 19.7% improvement in Specific Fuel Consumption for Freight Service Locomotives and 21.2% improvement for Coaching Service Locomotives during the last 10 years. Indian Railways is also installing solar power on its land and roof tops of coaches.

- 3) Recognizing its fuel efficiency, environmental friendliness and cost effectiveness, the Government is promoting growth of Coastal Shipping and Inland Water Transport. To enhance the inland waterways transport, Government has announced the implementation of **Jal Marg Vikas** for capacity augmentation of National Water Way -1. It is also proposed to establish integrated Waterways transportation grid with a view to connecting all existing and proposed National waterways with road, rail and ports connectivity. Another initiative in this direction is the **Sagarmala Project** with the objective to augment port-led development and promote efficient transportation of goods. **Bharatmala Project** which envisions constructing about 5,000 km of road network all along the coastal areas will further provide connectivity to these ports.
- 4) **The vision of Urban Transport policies is to focus on moving ‘people’ rather than ‘vehicles’, in which Mass Rapid Transit System (MRTS) would play an important role.**
- 5) **Around 236 km of metro rail have been made operational in the country. Further, about 550 km are under construction and 600 km under consideration for different cities across the country including Ahmedabad, Pune, and Lucknow. Delhi Metro, which has become India’s first MRTS project to earn carbon credits, has the potential to reduce about 0.57 million tonnes of CO₂e annually.** Delhi Metro has also initiated installation of 9 solar power generation facilities and plans to increase their number.
- 6) The mass-transit and urban transport projects initiated under the National Urban Renewal Mission also have positive climate change impacts in the long-run. About 39 urban transport and mass rapid transport projects have been approved and about 19 projects have been completed so far.
- 7) **Solar powered toll plazas** have been envisaged as a mandatory requirement for toll collection across the country.
- 8) India has recently formulated **Green Highways (Plantation & Maintenance)** Policy to develop 140,000 km long “tree-line” with plantation along both sides of national highways. 1% of total civil cost of projects is to be set aside to implement the policy.
- 9) With a view to facilitating international commuting by highways, Government of India has approved signing of the **Bangladesh, Bhutan, India and Nepal (BBIN) Motor**

Vehicle Agreement to promote safe, economical efficient and environmentally sound road transport in the sub-region and support regional integration.

- 10) **Faster Adoption and Manufacturing of Hybrid & Electric Vehicles** in India (FAME India) is a scheme formulated as part of the **National Electric Mobility Mission Plan 2020** (NEMMP) to promote faster adoption and manufacturing of hybrid and electric vehicles in the country by providing incentives.
- 11) Under the **Vehicle Fuel Efficiency Program**, Government of India in 2014 finalized country's first passenger vehicle fuel-efficiency standards. They will take effect beginning in April 2016, and set the efficiency targets for new cars. The standards will keep 50 million tons of CO₂ out of the atmosphere. **India aims to improve fuel standards by switching from Bharat Stage IV (BS IV) fuels to Bharat Stage V (BS V)/ Bharat Stage VI (BS VI) across the country in the near future.**
- 12) **National Policy on Biofuels** has adopted an aspirational target of 20% blending of biofuels, both for bio-diesel and bio-ethanol. The government also launched the **National Bio-diesel Mission** identifying *Jatropha curcas* as the most suitable tree-borne oilseed for bio-diesel production. With the intention of further promoting biofuels, India has begun consultations on allowing 5% blending of biofuels in diesel that would be consumed by bulk users such as the railways and defence establishments.

1.6 PLANNED AFFORESTATION

India is one of the few countries where forest and tree cover has increased in recent years transforming country's forests into a net sink owing to national policies aimed at conservation and sustainable management of forests. As per the latest assessment, forests and tree cover has increased from 23.4% in 2005 to 24% of the geographical area in 2013. Government of India's long term goal is to bring 33% of its geographical area under forest cover eventually.

- 1) With its focus on sustainable forest management, afforestation and regulating diversion of forest land for non-forest purpose, India has been successful in improving carbon stock in its forest by about 5%, from 6,621.5 million tons in 2005 to 6,941 million tonnes in 2013.
- 2) Initiatives like **Green India Mission (GIM)** aim to further increase the forest/tree cover to the extent of 5 million hectares (mha) and improve quality of forest/tree cover on

another 5 mha of forest/non-forest lands along with providing livelihood support. It is expected to enhance carbon sequestration by about 100 million tonnes CO₂ equivalent annually.

- 3) These efforts have been further augmented by policies like National Agro-forestry Policy (NAP), REDD-Plus policy, Joint Forest Management; National Afforestation Programme and proposed devolution of about USD 6 billion under Compensatory Afforestation to states.

1.7 ABATEMENT OF POLLUTION

India has recently launched many programmes and schemes to address the problem of pollution:

- 1) **Continuous Emission Monitoring System (CEMS)** mandates the highly polluting industries to install 24X7 real time monitoring of emission and effluent discharge points.
- 2) **Common Effluent Treatment Plants (CETPs)** are being set up to treat the effluent emanating from the clusters of compatible small - scale industries.
- 3) The **Fly Ash Utilisation Policy** makes it mandatory to use only fly ash/ fly ash based products in construction of buildings, roads and reclamation / compaction of land within a radius of 100 km from a coal or lignite based thermal power plant, thus displacing the cement use. It also mandates utilisation of **Fly Ash** for backfilling or stowing of the mines.
- 4) Standards related to effluent discharge have been modified for over 2000 industries focusing on reducing quantity of waste water generation, conservation of water, promote **Zero Liquid Discharge (ZLD)** and use of treated effluent for irrigation.
- 5) In 2014, a **National Air Quality Index (AQI)** was launched for Indian cities. AQI is based on six pollutants and is notified every day serving as public information tool to disseminate information on air quality in qualitative terms.
- 6) Amendment of **Municipal Solid Waste Management (Management and Handling) Rules** is underway which will emphasize on proper segregation of waste at source; enhance waste processing and implementation of scientific landfills. Similarly, Bio-Medical Waste (Management & Handling) Rules, Plastic Waste Management Rules, e-waste (Management) Rules and Hazardous and Other Wastes (Management and

Transboundary Movement) Rules are being amended for a more scientific, technology driven, regulated and participative environment management.

1.8 CITIZENS AND PRIVATE SECTOR CONTRIBUTION TO COMBATING CLIMATE CHANGE

Citizens of India are an integral part of country's strategies to combat climate change. The Constitution of India vide Article 51-A lays down that it as a fundamental duty of every citizen to ***“protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures”***.

Policies like **Swachh Bharat Mission (Clean India Mission)**, cleaning of our rivers, achieving energy efficiency are all examples of policies which are contingent upon full participations of India's citizens for their successful implementation.

In addition to being involved in Government initiatives related to climate change and resource efficiency, **private sector** has also embarked on a number of voluntary actions. It plays a key role in sustainable development efforts in the country, some of which are enumerated below:

- 1) Companies Act 2013 directs companies having a certain level of profits, to spend 2% of their annual profit on **Corporate Social Responsibility (CSR)** activities. Estimates indicate that a fair share of the available CSR funding of about INR 220 billion (USD 3.5 billion) annually will be invested in environment initiatives from this window.
- 2) The Indian industry has also participated in voluntary carbon disclosure programmes whereby they report their carbon management strategy and GHG emissions. Latest Report by **Carbon Disclosure Project, India** indicates a reduction of 165 million metric tonnes of CO₂ equivalent by Indian industries. **“India GHG Programme”** is another voluntary programme to support development of India-specific emission factors and for corporates to measure their carbon footprints.
- 3) Indian industry has undertaken many initiatives to reduce their water consumption. A study of 100 companies over a 5 year period covering 12 sectors indicate that the Indian companies on an average have been reducing their specific water consumption by 2.8 to 3 % per year. A few companies have achieved ‘water positive’ status.

- 4) **Smart Power for Environmentally-sound Economic Development (SPEED)** is a program that aims at electrification of rural areas based on a decentralized renewable energy system.
- 5) India currently has about 2.68 billion sq. ft. of registered green building space across 3,000 projects (second largest in the world), of which 600 are certified and fully functional.
- 6) **GreenCo Rating System** is first of its kind in the world which assesses companies on their environmental performance across 10 different parameters to help them develop a roadmap to improve further.
- 7) **New Ventures India (NVI)** is an initiative to support cleantech entrepreneurs in developing their business plans and access finance and markets.
- 8) The **Small and medium-sized enterprises (SME) Cluster Programs for Energy Efficiency** covers more than 150 clusters all over the country and has resulted in substantial energy saving, quality improvement and improved competitiveness. Another initiative by SIDBI (Small Industry Development Bank of India) in 500 SMEs spread over 40 industrial clusters is expected to save annually 30,000 tonnes of GHG emissions.

2. ADAPTATION STRATEGIES

The adverse impacts of climate change on the developmental prospects of the country are amplified enormously by the existence of widespread poverty and dependence of a large proportion of the population on climate sensitive sectors for livelihood. Hence for India adaptation is inevitable and an imperative for the development process. It is of immediate importance and requires action now.

Vulnerabilities in India differ among states, among regions and among different groups of people within the same region due to substantial variations in topography, climatic conditions, ecosystems as well as diversity in its social structures, economic conditions and needs of different communities.

A range of actions have been introduced to address it. Out of the eight National Missions on Climate Change five mission focus on adaptation in sectors like agriculture, water,

Himalayan ecosystems, forestry, Capacity building and Knowledge management. Climate plans at the sub national level also focus significantly on adaptation.

Besides these targeted programmes, India has also implemented a series of schemes which strengthen adaptive capacities of the vulnerable communities. India's expenditure on programmes with critical adaptation components has increased from 1.45% of GDP in 2000-01 to 2.82% during 2009-10. Expenditure on human capabilities and livelihoods viz. poverty alleviation, health improvement and disease control and risk management, constitutes more than 80% of the total expenditure on adaptation in India.

India's adaptation policies in some of the crucial sectors are outlined below:

2.1 AGRICULTURE

Agriculture is the source of livelihood for nearly two-thirds of the population in India. It is predominantly rainfed covering about 60% of the country's net sown area and accounts for 40% of the total food production. Droughts and floods are frequent and the sector is already facing high degree of climate variability. The performance of agriculture sector has a direct bearing on food supplies and food security. India is projected to become the most populated country by 2030 and will need to produce an additional 100 million tonnes of food grains to feed the large population. In the agriculture sector, the need for comprehensive risk management and insurance is further enhanced due to these reasons.

Keeping in view the above challenges, Government of India is implementing policies/missions targeting various threats facing agriculture. Some of the important ones are **National Food Security Mission, Mission for Integrated Development of Horticulture, National Mission for Sustainable Agriculture, Paramparagat Krishi Vikas Yojana** to promote organic farming practices, **Pradhan Mantri Krishi Sinchayee Yojana** to promote efficient irrigation practices and **National Mission on Agricultural Extension & Technology**.

- 1) The **National Mission on Sustainable Agriculture (NMSA)** aims at enhancing food security and protection of resources such as land, water, biodiversity and genetics. The mission focuses on new technologies and practices in cultivation, genotypes of crops that have enhanced CO₂ fixation potential, which are less water consuming and more climate

resilient. India has developed 580 district level (covering many states) contingency plans based on early warning systems and other weather forecasting systems.

- 2) Government of India adopted a mega project called the **National Initiative on Climate Resilient Agriculture (NICRA)**. Its four main modules include Natural Resource Management, improving crop production, livestock and fisheries and institutional interventions.
- 3) A Scheme has been launched to provide in mission mode **Soil Health Card** to every farmer. Additionally, **100 mobile soil-testing laboratories** have been setup across the country.
- 4) **National Agroforestry Policy (NAP)** of India aims at encouraging and expanding tree plantation in complementarity and integrated manner with crops and livestock. It will help protect and stabilize ecosystems, and promote resilient cropping and farming systems to minimize the risk during extreme climatic events. It will also complement achieving the target of increasing forest/ tree cover.

2.2 WATER

India identifies water as the most critical component of life support system. The total catchment area is 252.8 million hectare (mha), covering more than 75% of the total area of the country. The adaptation strategies for the water sector focus on enhancing efficient use of water, ensuring access and tackling the adverse impact of Climate Change. The trans-boundary and regional issues also need to be factored in.

- 1) The main objective of India's **National Water Mission (NWM)** is “conservation of water, minimizing wastage and ensuring its more equitable distribution both across and within States through integrated water resources development and management”. One of the key goals of the mission is to enhance water use efficiency by 20%.
- 2) **Groundwater** is the major component of the total available water resources. Rapid expansion of groundwater use in India in the last three decades has resulted in a steep decline in the groundwater table in vast areas of the country. **Rainwater harvesting**, which offers a promising solution to replenish and recharge the groundwater is a significant component of Watershed Development Programme, taken up under different schemes of the central and state governments. Several municipal authorities, including

Delhi have amended their existing building bye-laws, making it compulsory for every large house or hotel (200 yards or more in area) to undertake rainwater harvesting.

- 3) **Neeranchal** is a recent programme by Government to give additional impetus to watershed development in the country.
- 4) Another important initiative relating to rivers is the **National Mission for Clean Ganga** which seeks to rejuvenate the river along its length of more than 2,500 km through multifarious activities such as pollution inventorization, assessment and surveillance and laying of sewage networks, treatment plants etc.
- 5) The total flood prone area in the country is about 45.64 million ha. Existing flood management mechanisms involve both Central and State Government.
- 6) Government of India has also set up the **National River Conservation Directorate** for conservation of rivers, lakes and wetlands in the country and improving the water quality which covers stretches of 40 rivers in 190 towns spread over 20 States.

2.3 HEALTH

Climate change will increase health related stress from extreme weather-related disasters such as wider spread of vector-borne diseases as malaria and dengue and increasing frequency of heat and cold waves.

India is now formulating a '**Health Mission**' under the ambit of NAPCC to evolve strategies for mitigating, containing and managing the adverse impact of Climate Change on health. The mission aims at analysing epidemiological data, identify vulnerable population and regions, build knowledge base and expertise, increase awareness and community participation.

Apart from the overall public health infrastructure at the national and sub national levels, the Government of India has launched programmes like **Integrated Disease Surveillance Programme (IDSP)**, **National Vector Borne Disease Control Programme (NVBDCP)** to deal with vector borne diseases like malaria, dengue etc. As part of this programme India aims to eliminate malaria by 2030.

2.4 COASTAL REGIONS & ISLANDS

India has a long coastline of 7517 km including island territories, and encompasses total 73 districts in the 9 maritime states and 2 Union Territories. The coastal districts house 14.2% of India's total population. India has been identified as one of the countries which are most vulnerable to the impact of accelerated sea level rise due to global warming:

- 1) India has demarcated vulnerable areas on the coasts and declared them as **Coastal Regulation Zone (CRZ)** with restrictions imposed on setting up and expansion of industries, operations and processes in these areas.
- 2) India is also implementing programmes for **Integrated Coastal Zone Management (ICZM)**. The vision of the project is to build national capacity for implementation of comprehensive coastal management through ecological management, conservation and protection of critical habitats, coastal geomorphology and geology of coastal and marine areas, coastal engineering, socio-economic aspects, policy and legal issues and other related fields in the area of coastal governance.
- 3) Mapping and demarcation of coastal hazard lines for development of emergency response plans is being carried out in all the coastal states and union territories.
- 4) Another initiative to protect coastal livelihood is '**Mangroves for the Future (MFF)**' coordinated by International Union for Conservation of Nature (IUCN) in India.
- 5) Similar to Small Island Developing States, the 1,238 Indian islands are vulnerable to loss of coastal wetlands including mangroves and salt water intrusion in fresh water aquifers. With changing climate, islands are highly susceptible to frequent and more intense tropical cyclones and associated storm surge, droughts, tsunamis and volcanic eruptions, which will have adverse impact on economy of these islands and health of their inhabitants.
- 6) The Government notified the **Island Protection Zone (IPZ)** in 2011 with the objective of ensuring livelihood security to the local communities, conserving and protecting coastal stretches, and promoting development in a sustainable manner. The IPZ focuses on disaster risk reduction through bioshields with local vegetation (mangroves) and other soft protection measures, and the conservation of beaches and sand dunes.

2.5 DISASTER MANAGEMENT

The Indian subcontinent is among the world's most disaster prone areas. Almost 85% of India's area is vulnerable to one or multiple hazard. 23 States and Union Territories covering 45.64 million hectares of land are subject to floods, and are prone to flood disasters. India's annual average flood damage during the period 1996-2005 was INR 47.45 billion (USD 753.2 Million)

India has been able to establish a holistic disaster risk reduction and response apparatus at national, state and district levels with the aim of reducing existing levels of vulnerability, prevention, and mitigation of disasters and also to provide appropriate response, rehabilitation and reconstruction. Strategies include early warnings and communications, construction and sustainable maintenance of multi-purpose cyclone shelter, improved access and evacuation, enhanced capacity and capability of local communities to respond to disaster and strengthening disaster risk mitigation capacity at central, state and local levels

The link between Adaptation, Disaster Risk Reduction and Loss and Damage is important. It has been witnessed that the occurrence of flash floods, extreme weather events, droughts etc. has increased in frequency and become more unpredictable. The Sendai Framework for Disaster Risk Reduction has laid down a road map for required response. There is an urgent need for finance to undertake activities for early warning system, disaster risk reduction, loss and damage and Capacity building at all levels. The indigenous locally appropriate knowledge and technology may also be used for the purpose.

In order to achieve these goals, India has set up Disaster Relief Funds at all levels and launched the **National Disaster Relief Fund**, which is financed through the levy of a cess.

2.6 PROTECTING BIODIVERSITY & HIMALAYAN ECOSYSTEM

Biodiversity: India, a mega diverse country with only 2.4% of the world's land areas, harbours 7-8% of all recorded species, and 4 out of 34 global biodiversity hotspots. In order to protect the biodiversity from changing climate, India has developed a biogeographic classification for conservation planning, and has mapped biodiversity rich areas in the country. The protected area network has increased from 427 (3.34% of total geographical area) in 1988 to 690 (5.07% of total geographical area) in 2014.

Himalayan Ecosystem: The Himalayas form the most important concentration of snow covered region outside the polar region. It is highly sensitive to global warming. The detailed glacier inventory of Indian Himalayas indicates presence of 9579 glaciers in the Himalayas, some of which form the perennial source of major rivers.

The **National Mission for Sustaining the Himalayan Ecosystem** (NMSHE) addresses important issues concerning Himalayan Glaciers and the associated hydrological consequences, biodiversity and wildlife conservation and protection, traditional knowledge societies and their livelihood and planning for sustaining of the Himalayan Ecosystem. Government has also launched **National Mission on Himalayan Studies** to complement NMSHE with the objective of building a body of scientific and traditional knowledge along with demonstrating replicable solutions to the problems in thematic areas including natural resource management, capacity building, long-term ecological monitoring etc.

2.7 RURAL LIVELIHOODS SECURITY

The rural areas are highly prone to stress and pressures from natural resource exploitation. In this context, schemes for rural development and livelihood programmes are very relevant. The **Mahatma Gandhi National Rural Employment Guarantee Scheme in India (MGNREGS)**, with a budgetary annual allocation of about INR 347 billion (USD 5.5 billion) in 2015-16, aims at enhancing livelihood in the rural areas. A vast majority of works under this programme aim at strengthening natural resource base of the rural economy and are linked to land, soil, and water.

Another important programme of the Government is the **National Rural Livelihoods Mission** which has the objective to cover 70 million rural poor households, across 600,000 villages in the country through self-managed self help groups and federated institutions to support the rural communities in strengthening their livelihood.

2.8 ADAPTATION ACTIONS UNDER STATE ACTION PLANS ON CLIMATE CHANGE

All the 29 states and 7 Union Territories in India are preparing a State level action plan to deal with the challenges of climate change incorporating local needs and priorities. SAPCCs are envisioned to encompass the vision of the NAPCC and aligned with the 8 National

Missions. SAPCCs describe in detail the impact of climate and vulnerability assessment, adaptation, mitigation options and financing and capacity building needs to implement the identified interventions. Key sectors covered by SAPCCs include agriculture, water, habitat, forestry, health and disaster management among others.

2.9 KNOWLEDGE MANAGEMENT & CAPACITY BUILDING

India attaches great significance to knowledge creation and capacity building for climate change.

1. A network of 127 institutions called “**INCCA**” (Indian Network on Climate Change Assessment) has been set up to share knowledge and work in a collaborative manner on climate change issues.
2. The Department of Science & Technology has also initiated creation of **Climate Change Centers** at the state level especially in the Himalayan region. All the state governments have established links with local research institutions to ensure a continuous updating of their SAPCCs.
3. As a move towards competency based system, Government of India has also implemented **National Training Policy**, through which each Ministry and Department earmarks about 2.5% of its salary budget for training. A part of this budget is used for training in climate change and sustainable development issues as well.
4. Government has recently launched “**Skill India**” with the target to provide skill training in various sectors including sustainable development to about 400 million people by 2022.

3. India’s Climate Change Finance Instruments

Maximum share of India's current climate finance comes from budgetary sources, as most of the resources for adaptation and mitigation are built into the ongoing sectoral programmes. The availability of funds for such purposes is largely guided by the overall resources and requirement of different sectors.

At the same time India is not relying solely on budgetary resources and is experimenting with a careful mix of market mechanisms together with fiscal instruments and regulatory interventions to mobilize finance for climate change.

3.1 National Funds

To augment the availability of assured targeted resources, Government of India has set up two dedicated funds at the national level for mobilizing financing for mitigation and adaptation respectively.

- 1) **Cess on Coal:** India imposed a cess on coal in 2010 @ INR 50 (USD 0.8) per tonne of coal. Recently it has been quadrupled to INR 200 (USD 3.2) per tonne of coal. The coal cess translates into a carbon tax equivalent, using the emission factor for coal, of around USD 2 per tonne. This forms the corpus for the **National Clean Environment Fund**, used for financing clean energy, technologies, and projects related to it. The total collection of INR 170.84 billion (USD 2.7 billion) till 2014-15 is being used for 46 clean energy projects worth INR 165.11 billion (USD 2.6 billion).
- 2) India has set up a **National Adaptation Fund** with an initial allocation of INR 3,500 million (USD 55.6 million) to combat the adaptation needs in sectors like agriculture, water, forestry etc. in addition to sectoral spending by the respective ministries.

3.2 Other Fiscal Instruments and Incentives for Low Carbon Growth

Some of the other fiscal measures incentivizing green actions in India are as follows:

- 1) With a series of steps taken recently, India has **cut subsidies and increased taxes on fossil fuels (petrol and diesel)** turning a carbon subsidy regime into one of carbon taxation. Further, in its effort to rationalize and target subsidies, India has launched ‘*Direct Benefit Transfer Scheme*’ for cooking gas, where subsidy will be transferred directly into the bank accounts of the targeted beneficiaries. In fact, over the past one year India has almost cut its petroleum subsidy by about 26%.
- 2) Recent actions have led to an implicit carbon tax (USD 140 for petrol and USD 64 for diesel) in absolute terms. This is substantially above what is now considered a reasonable initial tax on CO₂ emissions of USD 25- USD 35 per tonne. Estimates suggest that these measures will help India achieve a net reduction of 11 million tonnes of CO₂ emissions in less than a year.
- 3) **Tax Free Infrastructure Bonds** of INR 50 billion (USD 794 million) are being introduced for funding of renewable energy projects during the year 2015-16.
- 4) **Finance Commission (FC) Incentive for creation of carbon sink:** Another important initiative has been the 14th FC recommendation on incentives for forestry sector. The

devolution of funds to states from the federal pool would be based on a formula that attaches 7.5 % weight to the area under forest. According to the estimations based on 14th FC data, this initiative has effectively given afforestation a massive boost by conditioning about USD 6.9 billion of transfers to the states based on their forest cover, which is projected to increase up to USD 12 billion by 2019-20. Implicitly, India is going to transfer to states roughly about USD 174 per hectare of forest per year which compares very favorably with other afforested countries.

4. External Cooperation: A Critical Enabler

Over the years, the carbon intensity of the Indian economy has decreased, in large part, due to the adoption of new and innovative technologies which address climate mitigation and climate adaptation. The development, adoption and dissemination of these technologies has been an ongoing process which has led to, *inter-alia*, increased energy efficiency and an increasing share of renewables in the electricity grid. This has been facilitated by several bilateral and multilateral collaborative efforts both in the public and private sector.

At the same time, climate friendly technologies, adapted and deployed in India are also being utilized in other countries, particularly in developing countries, through bilateral cooperation. This development and transfer of technologies, both into the Indian market and from India into other markets, will continue to sustain future decreases in the carbon intensity of the Indian economy and increases in the share of renewables in the electricity-mix.

IV INDIA'S INDC

Keeping in view its development agenda, particularly the eradication of poverty coupled with its commitment to following the low carbon path to progress and being sanguine about the unencumbered availability of clean technologies and financial resource from around the world, *India hereby communicates its Intended Nationally Determined Contribution (INDC) in response to COP decisions 1/CP.19 and 1/CP.20 for the period 2021 to 2030:*

1. To put forward and further propagate a healthy and **sustainable way of living** based on traditions and **values of conservation and moderation**.
2. To adopt a **climate friendly and a cleaner path** than the one followed hitherto by others at corresponding level of economic development.
3. To **reduce the emissions intensity of its GDP by 33 to 35 percent by 2030 from 2005 level**.
4. To achieve about **40 percent cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030** with the help of transfer of technology and low cost international finance including from Green Climate Fund (GCF).
5. To **create an additional carbon sink of 2.5 to 3 billion tonnes of CO₂ equivalent** through additional forest and tree cover by **2030**.
6. To **better adapt** to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management.
7. To mobilize **domestic and new & additional funds** from developed countries to implement the above mitigation and adaptation actions in view of the resource required and the resource gap.
8. To **build capacities**, create domestic framework and international architecture for quick diffusion of cutting edge climate technology in India and for joint collaborative R&D for such future technologies.

To achieve the above contributions, India is determined to continue with its on-going interventions, enhance the existing policies as detailed in previous sections and launch new initiatives in the following priority areas:

- 1) Introducing new, more efficient and cleaner technologies in thermal power generation.
- 2) Promoting renewable energy generation and increasing the share of alternative fuels in overall fuel mix.
- 3) Reducing emissions from transportation sector.
- 4) Promoting energy efficiency in the economy, notably in industry, transportation, buildings and appliances.
- 5) Reducing emissions from waste.
- 6) Developing climate resilient infrastructure.
- 7) Full implementation of Green India Mission and other programmes of afforestation.
- 8) Planning and implementation of actions to enhance climate resilience and reduce vulnerability to climate change.

India has also revisited the National Missions under the NAPCC in the light of new scientific information and technological advances and identified new missions or programs on wind energy, health, waste to energy, and coastal areas. It is also redesigning the National Water Mission and National Mission on Sustainable Agriculture.

It is clarified that India's INDC do not bind it to any sector specific mitigation obligation or action, including in agriculture sector. India's goal is to reduce overall emission intensity and improve energy efficiency of its economy over time and at the same time protecting the vulnerable sectors of economy and segments of our society.

The successful implementation of INDC is contingent upon an ambitious global agreement including additional means of implementation to be provided by developed country parties, technology transfer and capacity building following Article 3.1 and 4.7 of the Convention.

5. MEANS OF IMPLEMENTATION

5.1 CLIMATE CHANGE FINANCE REQUIREMENT

Finance is a critical enabler of climate change action. However, an overall assessment and quantification of finance requirements for adaptation and mitigation for a country with so much diversity and demand is a difficult task given the rapid pace of changing technologies and innovation. Estimates by various studies vary in projecting precise requirements but converge on the enormity of funds that would be needed.

Preliminary estimates indicate that India would need around USD 206 billion (at 2014-15 prices) between 2015 and 2030 for implementing **adaptation actions** in agriculture, forestry, fisheries infrastructure, water resources and ecosystems. Apart from this there will **be additional investments needed** for strengthening resilience and disaster management. An Asian Development Bank Study on assessing the costs of climate change adaptation in South Asia indicates that approximate adaptation cost for India in **energy sector alone** would roughly be about USD 7.7 billion in 2030s. The report also projects the economic damage and losses in India from climate change to be around 1.8% of its GDP annually by 2050. **Mitigation requirements are even more enormous.** Estimates by NITI Aayog (National Institution for Transforming India) indicate that the mitigation activities for moderate low carbon development would cost around USD 834 billion till 2030 at 2011 prices.

India's climate actions have so far been largely financed from domestic resources. A substantial scaling up of the climate action plans would require greater resources. A detailed and full scale assessment of international climate finance needs will be finalized at a later stage and would depend on the gap between actual cost of implementation of India's plans and what can be made available from domestic sources. While this would evolve over time, a preliminary estimate suggests that at least USD 2.5 trillion (at 2014-15 prices) will be required for meeting India's climate change actions between now and 2030.

5.2 REQUIREMENT FOR TECHNOLOGY TRANSFER & SUPPORT

In the rapidly and ever evolving realm of technology development, it is difficult to project future requirement of technologies. Transfer and grounding of technologies and their knowhow would be key to enhancing adaptation and mitigation measures in developing countries. It also calls for meaningful and adequate financing for the required cutting edge

technologies. It is in this context that India has advocated global collaboration in Research & Development (R&D), particularly in clean technologies and enabling their transfer, free of Intellectual Property Rights (IPR) costs, to developing countries. IPR costs can also be borne from the GCF through a separate window.

It is also to be appreciated that every country has different requirements of technology and different capabilities of handling technologies depending on trained and skilled manpower, supporting infrastructure, intellectual environment etc. Knowledge creation, eco-system design for innovation and development, and technology deployment would be a continuous requirement in this process.

In its pursuit of low carbon growth, India would be focusing on technologies that need to be moved from lab to field and those that require targeted global research along with those that are still in the realm of imagination. One of the important areas of global collaborative research should be clean coal and fossil fuel, energy management and storage systems for renewable energy. Given the current stage of dependence of many economies on coal, such an effort is an urgent necessity. A preliminary and illustrative list of some of the technologies (which will evolve over time) is at **Annexure A**.

5.3 CAPACITY BUILDING NEEDS

India's efforts will require proper training and upgrading of skills across sectors. While no firm assessments have been made, it is evident that substantial resources will be required to implement capacity building programmes both nationally and across the states to address climate change challenges. It is expected that the international mechanism will support such initiatives including formation of Thematic Knowledge Networks, further expand activities under Global Technology Watch Group, establishing more intensive state centric knowledge and awareness creating activities and training of professionals in different aspects of renewable energy and supporting research and development institutions for pre-competitive research.

Though a firm projection is difficult, rough estimates indicate that around 2.5% of Government's salary budget would be required for capacity building initiatives, while some part of it would need to be financed internationally.

V. CONSIDERATION ON FAIRNESS AND AMBITION

India's INDC is based on the 1992 convention. In terms of the provision on Article 3.1 and 4.7, this submission by India represents the utmost ambitious action in the current state of development. Both in terms of cumulative global emissions (only 3%) and per capita emission (1.56 tCO₂e in 2010), India's contribution to the problem of climate change is limited but its actions are fair and ambitious.

The recent decisions of the Government represent a quantum jump in our aspirations in climate change actions starting with the manifold scaling up of our renewable energy targets to the programme on Smart Cities, cleaning of rivers and Swachh Bharat Mission (Clean India Mission). The initiatives have demonstrated unparalleled vision and strong political initiatives of the Government. It is expected that developed countries will re-examine their pre 2020 actions in the light of substantial action taken by developing countries like India to ensure that the ambition gap is substantially bridged.

Through this INDC, India has shown its commitment to combat climate change and these actions are indeed important contributions to the global effort. However, our efforts to avoid emissions during our development process are also tied to the availability and level of international financing and technology transfer since India still faces complex developmental challenges. The critical issue for developing nations is the gap between their equitable share of the global carbon space and the actual share of carbon space that will be accessible to them. The transfer of appropriate technologies and provision of adequate finance will have to be a determined contribution of the developed countries, which will further enable the developing countries to accomplish and even enhance their efforts. It is expected that developed countries would recognize that without means of implementation and adequate resources, the global vision is but a vacant dream. Addressing the United Nations Summit for the adoption of Post-2015 Development Agenda in September 2015, the Prime Minister of India, Shri Narendra Modi said; "We should forge a global public partnership to harness technology, innovation and finance to put affordable clean and renewable energy within the reach of all. Equally, we must look for changes in our lifestyles that would make us less dependent on energy and more sustainable in our consumption. It is equally critical to launch a global education programme that prepares our next generation to protect and conserve

Nature. I hope that the Developed World will fulfil its financing commitments for development and climate change, without in any way putting both under the same head”.

India’s INDC is fair and ambitious considering the fact that India is attempting to work towards low carbon emission pathway while endeavoring to meet all the developmental challenges the country faces today. Through this submission, India intends to reduce the emissions intensity of its GDP by 33 to 35 % by 2030 from 2005 level. This commitment is further echoed in India’s actions in climate change adaptation with setting up its own ‘National Adaptation Fund’.

The current policy framework also includes a favorable environment for a rapid increase in renewable energy, move towards low carbon sustainable development pathway and adapting to the impacts of climate change. It represents the highest possible efforts as evident from the multiple initiatives of the Government of India.

Accordingly, India’s development plans will continue to lay a balanced emphasis on economic development and environment.

India reserves the right to make additional submissions on Intended Nationally Determined Contribution (INDC) as and when required.

Recent Initiatives of the Government of India

Under the leadership and vision of Hon'ble Prime Minister Shri Narendra Modi, Government of India has taken a number of measures to promote sustainable development and address the threat of climate change at national and sub-national level.

The first step was revisiting the National Missions under the National Action Plan on Climate Change (NAPCC). Government is proposing to set up new missions on Wind Energy, Health, Waste to Energy, Coastal Areas and redesigning the National Water Mission & National Mission on Sustainable Agriculture. Other initiatives include:

MITIGATION STRATEGIES

- Green Generation for Clean & Energy Secure India: **more than 5 times increase** in Renewable Capacity from 35 GW (upto March 2015) to **175 GW by 2022**.
- **National Solar Mission** scaled up five-fold from 20 GW to **100 GW by 2022**. Kochi Airport is the World's first airport to fully run on solar power.
- **Solar powered toll plazas** envisaged for all toll collection booths across the country.
- **National Smart Grid Mission** launched for efficient transmission & distribution network.
- **Green Energy Corridor projects** being rolled out to ensure evacuation from renewable energy plants.
- Nationwide Campaign for **Energy Conservation** launched with the target to save **10% of current energy consumption** by the year 2018-19.
- Launched **Smart Cities Mission** to develop new generation cities by building a clean and sustainable environment.
- **National Heritage City Development and Augmentation Yojana** (HRIDAY) launched to bring together urban planning, economic growth and heritage conservation in an inclusive manner.
- **Atal Mission for Rejuvenation and Urban Transformation** (AMRUT) is a new urban renewal mission for 500 cities across India.
- Launched one-of-its kind 'Swachh Bharat Mission' (**Clean India Mission**) to make country clean and litter free by 2019.

- **Zero Effect, Zero Defect (ZED)** with **Make in India** campaign to enhance energy& resource efficiency, pollution control, use of renewable energy, waste management etc.
- Formulated **Green Highways (Plantation & Maintenance) Policy** to develop 140,000 km long “tree-line” along both sides of national highways.
- Faster Adoption and Manufacturing of **Hybrid & Electric Vehicles** (FAME India) to promote faster adoption and manufacturing of hybrid and electric vehicles.
- Country's first **passenger vehicle fuel-efficiency standards** finalized.
- Policies to increase production of **energy efficient 3 phase locomotives** and switchover to 100% of these locos from 2016-17 onwards.
- Policy directive issued to use **5% bio-diesel in** traction fuel in diesel locomotives.
- **National Air Quality Index** launched with One Number, One Color and One Description to give the status of air pollution in a particular city.

ADAPTATION STRATEGIES

- Launched **Soil Health Card Scheme**. Additionally, 100 mobile soil-testing laboratories setup across the country.
- **Paramparagat Krishi Vikas Yojana** launched to promote **organic farming** practices.
- The **Pradhan Mantri Krishi Sinchayee Yojana** launched to promote **efficient irrigation** practices.
- **Neeranchal** is a new programme to give additional impetus to **watershed development** in the country.
- Launched **National Mission for Clean Ganga** (Namami Gange) which seeks to rejuvenate the river.
- **National Bureau of Water Use Efficiency** (NBWUE) proposed for promotion, regulation and control efficient use of water.
- **‘Give It Up’ Campaign** launched to encourage citizens to give up subsidy on cooking gas to meet the needs of the truly needy citizens, thereby promote shift away from inefficient use of biomass in rural areas.

CLIMATE FINANCE POLICIES

- Setting up of INR 3,500 million (**USD 55.6 million**) **National Adaptation Fund**.
- **Reduction in subsidies** on **fossil fuels** including diesel, kerosene and domestic LPG.
- **Coal cess quadrupled** from INR 50 to **INR 200 per tonne** to help finance clean energy projects and Ganga rejuvenation.
- Introduction of **Tax Free Infrastructure Bonds** for funding of renewable energy projects.

Illustrative list of some of the Technologies (Mitigation perspective)

Clean Coal Technologies (CCT)

- Pulverized Combustion Ultra Super Critical (PC USC)
- Pressurised Circulating Fluidised Bed Combustion, Super Critical, Combine Cycle (PCFBC SC CC)
- Integrated Gasifier Combined Cycle (IGCC)
- Solid Oxide Fuel Cell (SOFC), Integrated Gasifier Fuel Cell (IGFC)
- Underground Coal gasification (UCG)

Nuclear Power

- Pressurized water reactor, Integral pressurized water reactor, Advanced Heavy Water Reactor (AHWR)
- Fast breeder reactor (FBR)
- Accelerated-driven systems in advanced nuclear fuel cycles

Renewable Energy

- Yeast /enzyme based conversion to high quality hydrocarbon fuels
- Conversion of pre-treated biomass to fuels and chemicals
- Gasification technologies like fluidised bed, plasma induced etc. for power generation
- Wind Energy technologies:
 - Development of smaller and efficient turbines
 - Wind turbines for low wind regime
 - Designs of offshore wind power plants
- Solar PV technologies:
 - Based on p-type silicon wafers and n-type silicon wafers
 - Hetero junction with Thin Interfacial (HIT) Module, Back Contact Back Junction (BCBJ) Modules
 - Crystalline silicon photovoltaic cells of > 24 % cell efficiency
 - High efficiency Concentrating PV (CPV)
 - Non-silicon based solar PV technologies
- Composite cylinders for on-board hydrogen storage
- Advanced biomass gasification technologies
- Low temperature Polymer Electrolyte Membrane Fuel Cell (PEMFC) for stationary power generation and for vehicular applications
- Energy storage technologies for bulk storage and Renewable Energy integration, frequency regulation, utility Transmission & Distribution applications and for community scale projects.