

remedial actions[27]. An inter-ministerial group (IMG) was formed in 2011 to approve the projects/schemes eligible for the fund. Any project/scheme for innovative methods to adopt to clean energy technology and research & development shall be eligible for funding under the NCEF. The projects fields eligible are: solar, wind, tidal, geothermal, silicon manufacturing, coal gasification, coal bed methane, shale oil, hydrogen/fuel cells, hybrid vehicles, advanced computing, nuclear technology and NAPCC projects etc.

4.5 Enhanced energy efficiency related policies and programmes

Various energy efficiency related policies and measures are in force to deliver the priority missions related to energy efficiency and renewable energy such as:

- Energy Conservation (EC) Act 2001.
- Making the EC Act operational, by strengthening the institutional capacity of State Designated Agencies (SDAs).
- Perform, Achieve and Trade (PAT): India has embarked on one of the most ambitious and extensive energy saving initiatives in its history, when the much-anticipated Perform, Achieve, Trade (PAT) scheme becomes operational. The PAT scheme is a trading mechanism designed for high energy consuming industries. It aims to incentivize industrial sectors and units to implement energy efficiency measures and to comply with energy consumption targets set by the regulator (Bureau of Energy Efficiency (BEE)). Experts estimate that if PAT is successful, it alone could help India meet half of its emissions intensity targets announced at Copenhagen, i.e. a reduction of 20-25% reduction by 2020, based on a 2005 baseline. The PAT scheme is a market-based mechanism to enhance energy efficiency in the 'Designated Consumers' (large energy-intensive industries and facilities - power, cement, fertilizer, aluminium, iron and steel, railways, pulp and paper and textiles). The resulting savings can be traded as Energy Savings Certificates (ESCerts).
- Market Transformation for Energy Efficiency (MTEE): Making energy-efficient products more affordable and mandatory in some designated sectors (mainly industrial). This target is to be achieved by Demand Side Management (DSM) measures, supported by carbon finance - CDM financing wherever possible. The initiative includes the following activities:
 - a. Programme-based (programmatic) CDM
 - b. Standards and labeling: The National Energy labeling program was launched in May 2006. This scheme attempts to curb demand at the consumption level, by mandating certain norms for appliance manufacturers. The standards provide a minimum energy efficiency standard that is depicted by number of stars on each appliance. The range of star rating is from one to five. A five star marked appliance implies the most energy efficient appliance. This program helps consumers make an informed purchase. At present this program is mandatory for the following appliances: frost free refrigerator, distribution transformer, tube fluorescent lamp and air conditioner.

- c. The Energy Conservation Building Code (ECBC): This code was launched by Ministry of Power (MoP) in 2007 as a voluntary scheme to optimize energy use across commercial buildings.
- d. Public Procurement: The Bureau of Energy Efficiency (BEE) has issued a memorandum for promoting procurement of energy efficient appliances in all ministries/departments and their attached subordinates offices.

Bachat Lamp Yojana (BLY): The BLY scheme promotes usage of energy efficient bulbs to reduce consumption load at the domestic level and promotes replacement of inefficient bulbs with compact fluorescent lamps (CFLs) by leveraging the sale of Certified Emission Reductions (CERs) under the Clean Development Mechanism (CDM) of the Kyoto Protocol. The scheme provides a unique platform for a robust public-private partnership between the Government of India, private sector CFL suppliers and state level electricity distribution companies (DISCOMs). The scheme provides a framework to distribute high quality CFLs at a subsidized price to the residential households in exchange for an incandescent lamp (ICL). BLY has also accrued CERs through the Programme of Activities (PoA). India has the highest number of projects registered with the UNFCCC under BLY PoA.

4.6 Renewable energy related policies and measures

India has abundant potential of variety of renewable energy (RE) sources. However, all the States are not endowed with the same uniform level; some States have a very high RE potential, while other States have very little. The government is putting in place incentives, fiscal measures and preferential arrangements such as feed-in-tariffs to attract investors and enable projects to be commercially viable[24].

- Electricity Act (EA) 2003: Requirement for states to set RE targets
- National Electricity Policy (NEP) 2005
- Industrial policy for renewable energy
- Foreign investment policy for renewable energy
- Solar Cities program in India
- Financial incentives for investing in renewable energy technologies
- Feed-in tariffs

4.7 Reducing Emissions from Deforestation and Forest Degradation (REDD+)

India is a party to the United Nations Framework Convention on Climate Change (UNFCCC) and the Government of India attaches great importance to climate change issues. In accordance with the Cancun Agreements, developing countries willing to undertake REDD+ activities are required to formulate and follow a national strategy or action plan, establish a national forest reference emission level or national forest reference level or, a subnational level as an interim measure, a robust and transparent national forest monitoring system for the measurement, reporting and verification (MRV) on the performance of the REDD+ activities, and a system for providing information on how the REDD+ safeguards are being addressed and respected. Since India is willing to implement REDD+ mechanisms, these

stipulations are equally valid for it. India actively participated and took lead in international negotiations leading to REDD+ agreements. India is fully committed to implementing REDD+ activities, and therefore, also to develop a REDD+ strategy to be implemented in accordance with the UNFCCC agreements in its forest sector. [30]. It has presented an ambitious Green India Mission programme under its National Action Plan on Climate Change [31]. India is underlying the following initiatives related to REDD+.

- India has made a submission to UNFCCC on “REDD, Sustainable Management of Forest (SMF) and Afforestation and Reforestation (A&R)” in December 2008
- A Technical Group has been set up to develop methodologies and procedures to assess and monitor contribution of REDD+ actions
- A National REDD+ Coordinating Agency is being established
- A REDD+ cell has been established in the Ministry of Environment and Forests (MoEF) and the Forest Survey of India (FSI) has been entrusted to conduct the task for forest carbon stock accounting. The REDD+ cell would be assisted by Indian Council of Forestry Research and Education (ICFRE), Indian Institute of Remote Sensing (IIRS), Indian Institute of Science (IISc), Wildlife Institute of India (WII) and the state forest departments.
- A Reference document is prepared by Ministry of Environment and Forests to facilitate REDD+ implementation in the country, which clearly indicates Government of India commitment to optimally explore the mitigation potential of forestry sector in the country.

As per India's submission on REDD+ to UNFCCC, India's national strategy aims to enhance and improve the forest and tree cover across the country, while enhancing the value of forest products to the communities dependent on the forests for livelihoods and other services. The Green India mission under the NAPCC and the National Afforestation Program would aid in achieving this goal. India has submitted that this would require an investment of USD 2 billion every year for 10 years. India would also aim to have maximum participation from the communities in the REDD+ programmes and follow the successful model for Joint Forest Management. The pilot projects under REDD+ would be launched upon availability of funding [29]. India is fully committed to implementing REDD+ activities whose primary objective is to minimize the carbon emission and enhance their carbon storage capacities through sustainable management programme [32].

4.8 India GHG program

On 22 July 2013, WRI India, TERI and CII launched the India Greenhouse Gas Program (India GHG Program), a voluntary initiative to standardize measurement and management of GHG emissions in India. The WRI's India GHG Program aims to help companies in India to monitor their progress towards voluntary reduction goals in a consistent and credible manner. The program will provide companies with tools and technical assistance to build inventories, identify reduction opportunities, establish both annual and long-term reduction goals, and track their

progress based on the GHG Protocol, the most widely used emissions accounting and reporting standard in the world.

4.9 National communication (UNFCCC reporting)

The United Nations Framework Convention on Climate Change (UNFCCC) has laid down a mandatory reporting exercise to all countries party to the Convention. In accordance with the principle of 'common but differentiated responsibilities' enshrined in the Convention, each non-Annex I country Party have to submit its initial communication to the Convention. As per the Convention's requirement, India submitted the first initial national communication (NATCOM-1: reporting GHG inventory for the year 1994) in the year 2004 and the second national communication (NATCOM-2: reporting GHG inventory for the year 2000) was submitted in 2012. The national communication covers issues like the national circumstances in terms of the national GDP, geography, population, literacy, economic state energy demand, GHG inventory information, vulnerability assessment and adaptation, research and systematic observation, education and capacity building and programs on sustainable development. It highlights the gaps and shortcomings which create a barrier for financial and technical capacity to address the impacts of climate change.

4.10 Carbon Finance

India is a party to the United Nations Framework Convention for Climate Change (UNFCCC) and so Clean Development Mechanism (CDM) projects can be implemented in India and the resulting Certified Emissions Reductions (CERs) can be traded globally. The availability of these tradable CERs increases the attractiveness and viability of projects for investors [24]. India's participation in the carbon markets has contributed to the recognition that it is a useful tool in attracting climate friendly investments. India was an early player in the market, and it used the hosting of the Eighth Conference of Parties to the UNFCCC in Delhi in October 2002 to sensitize the business community about the opportunity provided by carbon finance and the modalities of the emerging CDM [33]. The CDM's primary goal of supporting development whilst creating cost-effective greenhouse gas emissions reduction is achieved through the buying and selling of CER credits [24]. As a developing country, India does not have any emission reduction target, but it is able to sell CERs pursuant to the CDM, to large emitters covered by the EU ETS, countries that have emission reduction targets under the Kyoto Protocol, or any other entity that wishes to purchase such CERs for compliance purposes. It can also supply ERs and VERs for the growing voluntary markets [33].

By May 2013, the NCDMA had approved about 2,800 projects of which 40% are registered with UNFCCC, 25% are at the stage of validation with UNFCCC accredited Designated Operational Entities, 10% have completed validation and are now with UNFCCC for final approval / registration and 25% have either been withdrawn by the project proponents, the validation has been terminated by DOE or have been rejected by the CDM regulators at UNFCCC. The registered CDM projects and NCDMA

approved projects from India represent an investment of over INR 1.6 trillion and INR 5.5 trillion respectively[29].

5. Conclusion

For India, the only way to deal with the sharp conflict between rapid economic growth and high CO₂ emission is to develop a low carbon economy, including technological innovation, developing low-carbon energy technology, transforming economic growth patterns and social consuming model. Designing an appropriate mix of policy instruments, and implementation of low carbon strategies, is a task that is highly multi-sectoral and inter-disciplinary in nature. Collaboration and open stakeholder involvement from a range of fields including government, industry, academic and civil society is essential in carving out the details of the path ahead in order to ensure that the best policies are implemented to promote environmental sustainability, spur innovative businesses and meet the poverty reduction and basic access needs of India's large underserved population. However, the path to low carbon economy in India has its own set of challenges. India should recognize the importance of technological innovations in implementing low carbon growth strategies and harness research and development in that direction. A focused approach of policy and reducing bottlenecks in emerging business scenario can go a long way in enabling a Low Carbon Economy.

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Author Profile

Vandana Sharma is a Research Scholar at Institute of Environmental Studies, Kurukshetra University, Kurukshetra, India. She received the M.Sc. degree in Environmental Sciences from the same department. She is currently working as Assistant Professor in College of Vocational Studies, University of Delhi, New Delhi. She has earlier worked with National and International Organizations like GIZ, Ministry of Environment and Forests etc.

Prof. Smita Chaudhry is Director, Institute of Environmental Studies, Kurukshetra University, Kurukshetra, India. She received her Ph.D. degree in 1991 (Ecology, Kumaun University, Nainital) and M.Sc. in 1984 (Botany, Kumaun University, Nainital). Her specializations are in Plant Ecology, Ecological Restoration and Environmental Biotechnology. She has 25 years of research & teaching experience.

