



Proceedings of Workshop on Energy and Environment in the Context of Sustainable Development Goals in India

31 March 2015, Magnolia, India Habitat Centre, New Delhi

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Welcome and opening remarks

Prabir Sengupta, Distinguished Fellow, The Energy and Resources Institute (TERI)

Mr Sengupta welcomed the audience to the launch of the twenty-ninth edition of *TEDDY* (*TERI Energy and Environment Data Diary and Yearbook*). Introducing the twenty-ninth edition of the flagship publication, he informed that *TEDDY* was first published in 1986 and has since then been a continuous endeavour by TERI to put forth the latest updated information and statistics on energy and environment sectors. Energy supply is discussed through chapters on coal and lignite, petroleum and natural gas, power and renewable energy sources and technologies. Energy demand is covered through chapters on agriculture, industry, transport and domestic entities. There is also a section on local and global environment examining local environmental issues and climate change. Mr Sengupta stated that the publication would add tremendous value to the ongoing research in the respective sectors been discussed within; and would also be useful to the policy-making community and businesses.



Presentation on TEDDY 2014/15

Ashutosh Senger, Research Associate, TERI

Mr Ashutosh Senger highlighted that *TEDDY* has energy and environment related data from various credible sources. The publication has more than 15,000 readers across the globe and has been cited extensively in international peer-reviewed journals and reports. It includes a Sankey diagram showing commercial energy flow in India. In addition to this, it also provides a review of government policies, programmes and initiatives that have implications for environment and energy sectors of the Indian economy.

Mr Senger brought forth the strong correlation between the human development index and per capita energy consumption, thereby establishing the close inter-linkages of the socio-economic sector with the energy sector. It was discussed that there is a need to diversify energy supply sources by reducing dependence on fossils and increasing capacity of renewable energy sources. Also, it is important to increase energy efficiency and adopt

technological improvements on the demand side. In order to ensure equity, it is essential to increase availability, affordability and access to cleaner forms of energy across all sections of society.

It was emphasized that rapid economic growth is often accompanied by environmental degradation such as air and water pollution; loss of biodiversity and flora–fauna. Climate change poses serious challenges with regard to food and water security; it also results in poor resilience towards extreme weather conditions.

The audience was informed about the structure of the publication. There are four sections, namely energy supply; energy demand; local and global environment; and energy and environment goals. Each chapter within the publication has a green focus highlighting a green initiative or intervention undertaken to further sustainability in the given sector. This publication also features a section with a discussion around sustainable development goals and sustainable energy.

Due acknowledgment was given to UKAID for their support in preparing the section on conceptual issues regarding the goals of energy and environment activities. The activities were supported by the DFID–TERI Partnership for Clean Energy Access and Improved Policies for Sustainable Development. Mr Ashutosh acknowledged Hindustan Petroleum Corporation Ltd., Su-Kam and Avni Energy for providing support in bearing the printing and publishing costs. He informed the audience that the publication was the joint effort of senior advisors, twenty-eight authors and fifteen reviewers, spanning different divisions within TERI, including research, executive support, TERI Press and knowledge management.



Release of TEDDY 2014/15

Leena Srivastava, Acting Director General, TERI

Dr Leena Srivastava talked of how the publication was started way back in 1986. She informed the public that during the initial years of the publication, the research professionals had to go to different government offices to access the data. The present era of digital technology has made data accessibility less tedious, and hence this publication has also evolved in its approach over the years. TERI has always taken the decision to present the data in the publication in raw form, so as to allow researchers and other professionals to use it and mine it according to their objectives and requirements.

She also cited anecdotes from contemporary developments highlighting the importance of studies based on data. Dr Srivastava emphasized that interventions backed by data attribute credibility to the decision-making process. She congratulated TERI colleagues for bringing out the publication successfully and expressed her confidence

in the use value of the publication to policy makers, business organizations, academic institutions and research scholars.



Session 1: Sustainable Development Goals in the Context of India

Chair

Ambassador Chandrashekhar Dasgupta, Distinguished Fellow, TERI

Panelists

Dr Leena Srivastava: Acting Director General, TERI

Ms Shailly Kedia: Fellow, TERI

Mr Prabhat Upadhyay: Linköping University, Sweden



Chandrashekhar Dasgupta, Distinguished Fellow, TERI

Ambassador Dasgupta highlighted the significance of the trinity of goals of the workshop. The first being sustainable development goals in the context of India. The second being sustainable energy and the third being environmental sustainability. The beginning session on sustainable development goals was aimed to set the context for the other two technical sessions since they are subsets of the larger theme of sustainable

development goals. One of the major outcomes of the Rio + 20 Conference was the setting up of sustainable development goals in the post-2015 development agenda. The sessions would aim to deliberate on how sustainable development goals would translate into targets for India. He emphasized that such a discussion is very timely in the global discourse.

Leena Srivastava, Acting Director General, TERI

Dr Srivastava opined that the millennium development goals (MDGs) set the background for the sustainable development goals (SDGs). The session would be an initiative to discuss what will follow the completion of the MDG period in 2015. The Rio Conference in 2012 served as an ideal platform for the Open Working Group to deliberate on these goals. It comprised thirty country representatives and several observer countries. By June 2014, the objectives were consolidated into seventeen goals broken down into one hundred and sixty-nine targets.

She highlighted the need to differentiate between MDGs and SDGs. While the MDGs largely applied to developing countries, the SDGs are expected to be universally applicable. They are also much broader in addressing the social concerns along with the contributions to be made by the developed countries. We are in the era post the financial crisis where there is a need for a global partnership in order to arrive at more universally applicable goals.

With climate change impacts affecting areas across the globe, the need to build resilience is essential. Consumption and production patterns need to be addressed. The levels of ambition articulated in the SDGs are significantly higher than those in the MDGs. Whilst the MDGs spoke of halving poverty, the SDGs speak of ending poverty. In terms of energy, the goals articulate ensuring access to affordable, reliable, sustainable and modern energy for all. This is a mammoth challenge considering the context with three billion people having no access to cooking energy. The goal of gender equality had also created discord since there are several countries that do not want to provide gender equality since it conflicts with their culture and religious practices. There are multiple paradoxes, for example, both luxury and poverty experienced in the cities. Such paradoxes have to be resolved.

The challenge lies in formulation and implementation. There is a need for an integrated approach towards the goals. Dr Srivastava illustrated the same through the example of the energy goal which helps to meet targets of livelihoods, health and employment among other things and hence must have co-ordination from all the other concerned ministries and departments. TERI has recently set up a Capacity Hub under its Energy for All initiative. She shared that it was heartening to work with three states whose Chief Secretaries led the process whilst ensuring the participation of all the departments. The challenge comes when, based on departmental priorities, the activities become linear in nature and do not arrive at holistic solutions. The current approach to SDGs should not be target driven but rather mission mode oriented.

Prabhat Upadhyay, Linköping University, Sweden

Mr Upadhyay spoke of his experience with NAMA (nationally appropriate mitigation actions) for India, South Africa and Brazil. The Bali Action Plan 2007 is the genesis of the NAMAs. He brought out the linkages between economy and the environment at multiple levels. These concerns are being addressed in several multilateral forums—WTO, UNFCCC to name a few. However, currently there is a challenge of fragmentation of global governance since progress has been slow on these multilateral fora.

He highlighted the case of China that has pushed on growth and taken several out of poverty. This however, has not been favorable for the environment. Due to its size, its actions also have global ramifications. Thus to influence economy and environment, one must understand the local drivers. This is where *TEDDY* can play a crucial role. One of the main drivers in the local context is the availability of data. There is a need for not only quantitative but also qualitative data.

He illustrated the example of South Africa where their national interest will determine their mitigation actions. Poverty, inequality and unemployment are seen as key challenges and hence even the South African Constitution guarantees housing to all under the sustainable settlement facility. They therefore thought of submitting a proposal centered on this objective to the UK NAMA facility. It was, however, rejected since they had not sought approvals from the line ministry that will have to implement the project. This anecdote intended to bring to light the need for a new governance framework that can adopt an integrated approach.

Shailly Kedia, Fellow, TERI

Ms Kedia intervened with a compilation of initial reactions to the SDGs with a focus on energy and environment from experts within TERI. The SDGs that were an outcome of the thirteenth session of the Open Working Group did bring out certain reservations by countries on insufficient representation to cultural diversity among other issues. The reporting framework was adopted from the prototype UN Global Sustainable Development Report which brings out nineteen focus areas and the current progress.

Thematic areas	Energy/ Environment areas	Current status
1. Poverty eradication (MDGs)	Resilience	Completed in the MDGs context, but still 1 billion people in extreme poverty
2. Food security and sustainable agriculture (MDGs and beyond)	Resilience Biodiversity	On-track in the MDGs context
3. Water and sanitation (MDGs)	Water	On-track in the MDGs context
4. Health (MDGs)	Air quality	On-track in the MDGs context
5. Education (MDGs)	Resilience	Off-track
6. Employment (MDGs)	Resilience	Off-track
7. Oceans (Ch. 17 of Agenda 21; JPOI; Aichi Targets 6, 10 and 11; Target 7.B of MDG)	Resilience Water Biodiversity	Off-track
8. Biodiversity (Aichi Targets; MDG Target 7.B)	Biodiversity	Off-track
9. Forest (Aichi Targets on forest; Four shared global objectives on forests, agreed at UNFF Session 6)	Forests	Off-track

Thematic areas	Energy/ Environment areas	Current status
10. Sustainable consumption and production (SCP) (Ch.4 Agenda 21; and JPOI Ch. 3)	Waste management Resource efficiency	Off-track
11. Means of implementation (MDGs, Rio+20; Copenhagen Accord)	Development cooperation	Off-track
12. Sustained and inclusive economic growth (Rio+20)	Resilience	Mixed progress.
13. Needs of countries in special situations, and mid-income countries (Istanbul PoA; Rio+20)	Resilience	Mixed progress among these groups.
14. Human rights, the right to development and global governance (Rio+20)	Resilience	Mixed progress.
15. Equality (MDGs)	Resilience	Off-track
16. Energy (Rio+20 Outcome Document)	Clean energy Energy access	Off-track
17. Sustainable cities, transport (MDGs etc.)	Resilience Resource efficiency	Off-track
18. Climate Change and Disaster Risk Reduction (Copenhagen Accord)	Resilience Climate change response	Off-track
19. Conflict prevention, post-conflict peace- building	Resilience	Different views on how much progress has been made.

Source: United Nations (2014); Column 2 is self-tabulated

One of the poverty indicators is access to natural resources, rather than just basic facilities. In the national context, such an indicator would give a varied picture across different countries.

In the environment context, all the goals are off track. Targets on oceans, forests, biodiversity, sustainable consumption and production are largely off track. Means of implementation which is very crucial is off track. Energy sectors, access to modern energy is off track. Hence, there is a need to discuss these issues by means of the *TEDDY* publication. OWG recognizes all previous SDG conventions, represents all principles set out in Agenda 21, Rio Convention. A lot of the global convention processes are ongoing, like the UNFCCC—debates that emerged were like should climate change be included as a goal within the SDGs.

Air pollution has become a crucial concern in the cities. Reaction has brought out goals related to this, but the concerns have not been adequately addressed. It receives a mention under Proposed Goal 3—attain healthy lives for all. However, it is not addressed under other goals despite the fact that ambient air quality is a major concern in cities of developing and under developed countries. It should link with health and overall environmental quality. MDG process will serve as a useful benchmark to identify successes and gaps towards the means of implementation. Focus needs to be laid on science, technology and innovations.

Energy and setting goals sets off a larger debate on whether the goal can be narrowly construed only as sustainable energy or as it is currently approached as access to affordable, reliable, sustainable and modern energy for all. Energy needs are still dependent on fossil fuels. Currently, possibilities are being explored towards nuclear and hydro energy. Countries like Ethiopia and states like Himachal Pradesh in India are giving a lot of focus to hydro energy in their tryst towards green growth. Ms Kedia acknowledged that the Indian Government in its discussions in Rio+20, had put emphasis on non-traditional security such as food security and energy security.

The following areas merit attention:

- To make cities and human settlements inclusive, safe and sustainable, there could be a goal so that by 2030, cities achieve the WHO guidelines or nationally prescribed air quality standards.
- Enhance the air quality monitoring network in cities of developing and under developed countries. Encourage reduction of SLCPs (short-lived climate pollutants) in countries to provide immense local health benefits and global gains.
- Enhance and encourage clean biomass based cook-stove technologies in developing and under developed countries to reduce indoor air pollution and related health impacts. Data on health related impacts of air is very scant in India. Data collection for air quality and stronger impact studies are needed.
- Water quantity and quality are important. The goals identify ground and surface water along with oceans. For India, the quality is imperative and an expansion of water quality networks is essential. Water use efficiency is also important and should be quantified.
- Illegal exploitation of forest resources including timber should be addressed to reduce the pressure on forests. Time-bound targets are needed for forest-related goals especially for means of implementation. Climate-related issues can be considered in future forest management.
- For goals around biodiversity, well-defined targets under the Aichi targets, could form the basis. There is interconnectedness between the different goals, which must be looked at and discussed.
- Climate change is a cross-cutting theme among various issues and therefore, synergies need to be built. Goals that could have climate co-benefits must also be looked at. The much needed investments for adaptation are absent. There is a need to reconsider the additional investments which will be required to achieve the SDGs. It is important to also address how future indicators/targets are measured in terms of means of implementation.
- Other cross-cutting issues are of intellectual property rights, financial flows and parallel process of UNFCCC. Mobilizing domestic finance through fiscal measures has been stated as a goal. In India, we have market-oriented policies like EXIM Bank raising \$ 500 million through green bonds. Coal cess has been increased to raise funds for clean energy. Montreal consensus for the means of implementation has been crucial towards getting commitments towards Official Development Assistance (ODA).

Remarks by the Chair

The discussions have captured well the transition from MDGs to SDGs. While the former largely focused on economic parameters, the latter are broader lenses extended to social and environment parameters. This would serve as the beginning of embarking on a complex task.

Gender equality in the social considerations did come up as an issue of debate due to different perceptions shared by different countries. Some highlighted the need for affirmative action like through reservations. India in its claim for guaranteeing something beyond equality to women voted against the resolution in 1993 in China. Women have a crucial role to play in both economic development and environment protection and hence gender equality is not only a social goal. It must be mainstreamed in the debate on sustainable development.

MDGs were largely focused towards developing countries, while SDGs are seen as more universal for all countries to adopt. An approach of differentiation is adopted between targets for developing and developed countries. For example, eradication of poverty will differ in least developed countries (LDCs) and Organisation for Economic Co-operation and Development (OECD) countries. There is a need for specific goals to measure progress.

On another note, there is the issue of differentiation of contributions in terms of finance and technology flows. Certain countries like the Gulf countries have high income but are still not categorized as developed. Such ambiguities bring in the need to do away with such differentiation. On the other side, Mexico, Korea and Singapore are now OECD members despite not being developed countries.

Fragmentation of global governance is a contemporary phenomenon. The root cause of this must be addressed. In the case of international agreements, the rationale differs depending upon the issue being addressed. In disarmament, the Nuclear Non-proliferation Treaty aims to retain status quo in the balance of power—meaning differential treatment of the powerful. In trade and civil aviation, the driving principle is the bid and offer approach, whereby all parties are treated equal like the most favoured nation approach in the WTO process. In environment negotiations, the driving principle must be polluter pay's principle (domestically) and internationally, the common but differentiated responsibility (CBDR) principle. This articulates the root cause of a fragmented international governance since the principle for different agreements varies depending upon the objectives to be met. The current climate change negotiations are trying to move away from the differentiation principle and towards adopting equal treatment for all countries. The increase in competitiveness due to changes in economic powers, have compromised equity concerns.

The centrality of the energy and the water nexus in ensuring food security is crucial to understanding the linkages in the biophysical environment. In the national context, the challenge of energy security is being addressed through scaling up renewable energy—for both solar and wind energy. *TEDDY* has earlier highlighted that India's dependence on coal is not going to reduce in the near future and hence in this context, energy security will mean increasing energy efficiency and bringing down the carbon intensity of coal.

Question and Answers

Q: How can MDGs/ SDGs which are a result of global consensus be translated into actionable national and sub-national targets?

Q: What are the cross boundary implications of the SDG targets? What reporting mechanisms are in place?

Q: Are the global averages stated in the Aichi targets meaningful at the country level?

Dr Srivastava responded by illustrating the example of the sustainable energy for all goal which states three sub-goals—access to modern energy, to double the share of renewable energy in the global energy mix and to double energy efficiency improvements in the period 2010–2030 as compared to the previous forty year period (four-fold increase). Energy is often seen as a backdoor entry into climate change related aspects since there is a strong linkage between the two. The global goals can be seen as aspirations, and the deployed means of implementation through finance and technology would enable each country to reach its specific targets depending upon its context. Pledges can be seen as a bottom driven approach which may not be able to meet the overarching goals. India has come forward in its efforts. In 1997, the policy first articulated energy for all as a goal. Our energy mix currently relies 75–80% on oil imports heading to 90% dependence. India needs to adopt these goals through domestic efforts as well as through international engagements like the MRV (monitoring, reporting and verification) format.

World Bank has committed to launch a monitoring and tracking framework for sustainable energy for all. It will be tracking country-level initiatives for the country to reflect on the global goals and then leave it to the good intentions of the different actors to come up with a pathway to meet these goals. For India and Sub-Saharan

Africa, it is crucial to meet the access goal to achieve the global goal. Onus for implementation lies on global actors.

In terms of cross boundary governance, global oceans can be taken as an example of poor governance. Current discussions are trying to address these concerns.

Mr Prabhat responded that while translating global goals into national targets, you will get pushback from the countries on how to translate them into local action, as elaborated by Dr Srivastava. However, the problem remains in determining who will enforce these targets, and whether there will be specific bodies that will ensure implementation. The sovereign nature of countries does not allow such imposition of targets.

Dr Srivastava intervened stating that MDGs were not globally accepted goals and were rather imposed through a reporting system.

A comment from the audience stated that a holistic approach from a multidisciplinary organization like TERI would be crucial to address these concerns.

Q: Should sustainable development goals, national development goals and grassroot targets be linked?

Q: Implementation takes place at the bottom, while planning takes place on the top. How do we engage sub-national entities in the planning and implementation? (Reference was made of the leather technology mission where all stakeholders were engaged.)

Ms Kedia responded that even renewable energy is material intensive using rare earth materials (silicon). A life cycle approach must be used to assess cumulative material use. Nicholas Georgescu-Roegen, a famous economist had stated that primary energy supply in the form of solar energy may be a lot, but to process it, we may be resource scarce.

Ambassador Dasgupta said that hopefully under goal 12, it will be addressed under sustainable consumption and production patterns.

Q: How can social issues be mainstreamed in the context of energy and environment?

Ambassador Dasgupta highlighted that sustainable development in 1992 and earlier in the Brundtland Report focused on two main components—economic and environment. Only in the 1990s, did the general assembly bring in social development. Then, the UN social economic and cultural rights were brought in, as well as the inclusiveness of development with right to food and health.

Q: Fragmentation, differentiation is it rooted in the normative notion of capabilities that are desirable and undesirable. Are SDGs looked at as desirable capabilities that can enable desirable consequences?

Are we in the process of identifying those capabilities? For instance, in economy and environment, capabilities are understood—IPR, private interests, new world order rooted in the knowledge economy.

Q: SDG No 17 speaks of flow of capability rather than building the same. What types of social capabilities are needed?

Q: Cultural capabilities are crucial. What role does this play in energy and environment goals?

Response: Differentiations are to be based more on responsibility, which is a weak form of liability rather than on capabilities. Common but differentiated responsibility (CBDR) and respective capabilities should be the guiding principle.

A representative from the Department of Science and Technology stated that climate change is not prominent in the SDGs; it has only been highlighted through disaster risk reduction and by containing global temperature rise below 2 degrees. Since all goals will be impacted by the climate, it must be given greater importance.

It will be useful to have an understanding of the views of all stakeholders, and have a common platform to take these to guide actions on the field. There is a need to build awareness of the different national missions that are being run. Against each SDG, awareness building programmes for the stakeholders will be a value addition.

Another representative from the Indian Railways highlighted that MOEFCC should percolate down the SDGs to the respective ministries, then make them responsible and liable to the SDG implementation process. There is a need for an institutional mechanism that can create this ownership.



Session 2: Sustainable Energy

Chair

Sh. Anil Kumar Jain, Advisor-Energy, National Institution for Transforming India (NITI Aayog)

Panellists

Dr P.C. Maithani, Director, Ministry of New and Renewable Energy (MNRE)

Dr Atul Kumar, Fellow, The Energy and Resources Institute (TERI)

Ms Lydia Powell, Head – Centre for Resource Management, Observer Research Foundation

Ms Rinki Jain, Associate Fellow, The Energy and Resources Institute (TERI)



Anil Kumar Jain, Advisor-Energy, National Institution for Transforming India (NITI Aayog)

The thought that sustainable development must be integrated in India's development pathways is now well-appreciated and acknowledged at the governance level. It no longer is considered as an option that the richer or developed nations may pursue. In fact, the consideration that it is a costly affair is now a stale opinion. Especially after the natural calamities that has struck various parts of India and the world, it is clear how important it is to develop sustainably. Only development that is consciously sustainable is desirable.

P.C. Maithani, Director, Ministry of New and Renewable Energy (MNRE)

India produces about 5% of the world's total energy and consumes about 4% of the world's total energy consumed. It makes for 17% of the world's population. Of the energy generated in India, 25% is biomass-based (or by traditional sources). More than 80% of India's electricity is fossil-fuel based, 6% comes from renewable sources and the rest comes from large and small hydro power units.

The MNRE has set an ambitious target of increasing the electricity capacity by an additional 130 GW in the next seven years (in 2022) from the existing capacity of 75 GW, which means that roughly 20 GW must be added every year. In the past year, 2014–15, 3 GW has been added, which means that to be able to achieve the 2022 target, about six times the current capacity will have to be added by the next year.

One of the main challenges that adoption of renewable electricity faces is its integration in the grid. A good example to explain this issue is that of Tamil Nadu that makes 35% of India's wind-based electricity. About 30% of renewable-based electricity, last year, had to be taken off in the state due to its lack of acceptance in the grid. Hence, one of our major issues is whether or not our grid is ready for this nature and volume of renewable-based power generation points. The other issue is the availability of these sources. 70% of the wind technology is indigenous and only 30% is imported. In fact, India is in a situation where private players are able to export wind technology while essential components for solar technology still require to be imported as those are not produced in India as yet. Hence, our major challenge is how to create an enabling environment for India to leapfrog from using conventional to renewable-based energy.

According to Census 2011, about 45% (75 million) of rural households in India are still without electricity and 86% of rural households depend on traditional biomass for cooking. The target of goal 7 means that about 75 million households of India are to be provided with a sustainable, modern and affordable source of energy by

2050. This translates to about 75 billion USD (at today's cost) that is required in the next fifteen years to be able to address modern energy access and about 5 billion USD to address modern cooking methods in rural households.

The goal of making a shift from the current system to a sustainable system is enormously challenging. It is our hope that the strong political will of the new government will create a positive enabling environment for making this shift.

Atul Kumar, Fellow, TERI

The tenth five-year plan of India stressed on one of the three pillars of sustainable development, the economic. The eleventh five-year plan stressed on the economic and inclusive growth, and the current plan aims to focus on the three pillars of sustainable development—economic, social and environment. The shift in priority itself is a significant achievement.

There is indeed a huge energy requirement in India but the question we are to focus on is where we wish to position ourselves on the HDI vs. electricity consumption index. There has been no record of any country that has been able to eradicate poverty without increasing electricity consumption by a very high order. The current pattern of energy consumption and expansion looks at an unsustainable and unambitious future; unsustainable as they challenge human health, environment along with rapid economic growth and an increasing dependence on imported fossil fuels; unambitious because there is inadequate utilisation of locally available renewable sources, not performing enough on choosing the most appropriate development pathway and not informing people of the choices available to them.

By 2011/12, most cities in the country had already exceeded the ambient air quality standard. Mortality from PM_{2.5} was 5.73 lakhs which can increase to 10.45 lakhs by 2031/32 with the worsening air quality. In 2011, the PM_{2.5} concentration was dominant in the north belt of the country but this can increase to about the entire country by 2031.

Present situation of the sectors:

Electricity sector: High share of coal in the generation capacity mix, issues related to large-scale integration of renewable energy, poor financial health of the utilities and high T&D losses.

Transport sector: Decline in share of public transport and railways, extremely rapid growth of motorization, passenger and freight travel, road connectivity, huge dependence on imported crude oil to meet demand

Industry sector: Consumes about 50% of the total commercial energy in India, efficiency intensive medium and small scale industries, obsolete technologies and unskilled labour.

Residential and commercial: Electricity consumption and energy intensity is witnessing a great increase with the current construction boom in India.

Recommendations:

- Recognise the synergistic interdependence between the energy sector development and the other fundamental sectors like health, water and food.
- Recognise the job creation opportunities of decentralised, distributed energy generation, particularly in support of energy access and the small and medium enterprises sector.
- Energy policies are usually much more effective and readily accepted if they are integrated into broader development plans.

Rinki Jain, Associate Fellow, The Energy and Resources Institute (TERI)

The talk began with an introduction to sustainable energy goals and sustainable energy and the proposed goal 7 that states “Ensure access to affordable, reliable, sustainable and modern energy to all” along with its three sub-goals. A matrix mapping the availability of data at the national and global level against the three sub-goals of goal 7 was shared.

Goal 7.1: Ensure access to affordable, reliable, sustainable and modern energy to all

India and China have the highest percentage of population relying on solid fuel amongst the major economies (including Japan, USA and EU), with 63% and 45% respectively.

Goal 7.2: Increase substantially the share of renewable energy in the global energy mix by 2030

Target versus achievement in India in 2013–14 of grid-based and off-grid based renewable energy for all sources—wind, solar, small hydro, waste, biomass, bagasse—show that all the targets have been underachieved. Only 808 MW of wind power was installed against a target of 2500 MW for the period 2013–14. Solar energy had achieved 35% of the target and 395 MW of solar energy was deployed against the target level of 1100 MW. The revised target for solar energy installation as per NSM is 100000 MW by 2022. The capacity as on 31.12.2014 for solar power is 3062.68 MW and Gujarat has the highest installed capacity of 824 MW. For off grid-based renewable energy, the total target comes out to be 145 MW against which only 38.78 MW was deployed, i.e., only 26.74% of the target could be achieved at an all India level in 2013–14. Biomass gasifiers installed for industrial use achieved 52.67% of their target.

Goal 7.3: Double the global rate of improvement in energy efficiency by 2030

As per IEA 2014, the energy intensity of the world barely changed from 2000 to 2012 from 0.25 to 0.24. If the current trend of 4% increase in energy intensity in twelve years (2000–2012) is doubled to 8%, the global energy intensity will be approximately 0.22 in 2030. Energy intensity values have greatly differed between 2000 and 2012 in emerging economies like India and China while it has not changed very drastically for the industrialized economies like United States, European Union and Japan which are already at lower energy intensity levels. If the current trend of 25% increase in twelve years (2000–2012) continues, the energy intensity for India will be approximately 0.285 in 2030 which is still below many advanced economies.

Recommendations:

- Major efforts are required to improve work on the data front—its methodologies, data gaps, national statistical capacities and statistical standards.
- SDGs tracking framework must be every country’s agenda and must be treated as a yardstick to track progress on SDGs.

Lydia Powell, Centre for Resource Management, Observer Research Foundation

The talk began by questioning the truthfulness of the word ‘sustainable’ in its essence and whether or not the governments, businesses and the society at large truly understand it or whether the word ‘sustainable’ is used as a convenient prefix just so that it has a positive connotation. The second part of the pondering question was what exactly is sustainable, for whom, how and on whose cost? The idea behind throwing the questions was to instigate thought and discussion, Ms. Powell said. She also expressed that in her understanding, sustainable is what sustains quality of life and does not do a mere cosmetic job.

History is witness to the fact that human progress through the last few centuries has been made feasible because of the heavy dependence on fossil-fuel based energy for work which in turn reduced the cost of labour. With this inherent nature of growth that we are on, how do we end poverty? Also, the goal that demands end to poverty shall make the other sustainable development goals redundant, as historically, ending poverty has meant increasing consumption.

Once the costs of adopting renewable energy become affordable, there would not be a necessity for making a policy that drives people to adopt it, as it shall pick up on its own. There is a requirement to be realistic about the costs of providing renewable energy. A recent book by David Victor on climate change states that it takes about 700 Euros to eliminate 1 tonne of CO₂. Can we afford this cost and if we do not, how do we remain competitive in the global market and what will then be the future of the 'Make in India' plan of the new government. In the age of manufacturing competitiveness, there are many rare minerals that are required to manufacture mundane appliances like communication gadgets, but how much of these minerals do we have? The session ended by posing an ethical question of whether the sustainable energy discussion will push the richer populace towards sustainable choices while the poorer will have less say or choice in the matter.

Question and answers

Q: Is there any policy on expansion of off-grid solar micro grid standalone PV systems in India?

Dr Maithani: Yes, a policy for solar micro grid exists in India. The vision is to benefit all rural households. There are households, for instance in Bihar, availing micro grids already in conjunction with the main grid. However, there is a cost factor that still needs to be worked out for it to be made viable. Micro grids and the main grid can function in co-existence and micro grids can aid the main grid whenever and wherever feasible.

Q: Why has the existing wind power potential not been harnessed and fed into the grid in Tamil Nadu?

Dr Maithani: Tamil Nadu has the finest wind regime in the country and is one of the earliest states in India to have got wind power plants installed. The state has a total of 12,000 MW installed capacity that comes from conventional sources and wind power, itself has 7,000 MW installed capacity. To ensure that the plant load is integrated in the grid, the Government of India came up with a Green Energy Corridor Project of which Tamil Nadu is also part where the government contributes Rs 700 crores to create these sort of transmission systems. Also, new initiatives like the Renewable Energy Management Center are set up to take care that the previous wastage of energy does not recur.

Q: Is there any analytical study available for the general public that discusses the technicality and economic viability of roof top solar technology?

Dr Maithani: 200 MW capacity systems exist in the country with the biggest single system of 7 MW capacity. Financing for roof top solar technology is one of the major issues and it does not necessarily require subsidy. Upfront costs have to be met. Various studies now show that the payback period is 4–5 years for this technology, as the overall energy consumption hugely comes down. Where the load is good, adoption of this technology does not require subsidy and can be financially viable.

Concluding remarks by the Chair

Sustainability and sustainable energy needs to be better appreciated. Sustainability relates to equity between people, between countries and between inter-generational populations. Equity cuts across the three pillars of

sustainable development. National policies have to dovetail with regional and global policies. The energy policy of any and every country must be linked with the poverty alleviation programme.



Session 3: Sustainable Energy

Chair

Prodipto Ghosh, Distinguished Fellow, TERI

Panelists

Dr Suneel Pandey, Associate Director, TERI

Dr Madhu Verma, Professor, Indian Institute of Forest Management (IIFM), Bhopal

Sumit Sharma, Fellow, TERI

Soumitri Das, Forestry Specialist, USAID



Prodipto Ghosh, Distinguished Fellow, TERI Dr Ghosh asserted the need for potential indicators of sustainable development to be formulated for both developed and developing countries. He opined that the country has serious sustainability issues with interface of technology, public policy, individual behaviour and economics.

Suneel Pandey, Associate Director, Green Growth and Resource Efficiency Division, TERI

Dr Pandey of TERI made a presentation on the occasion. He argued that the issue of waste management is becoming more complex, especially solid waste which includes construction and demolition debris, plastic and hospital waste and e-waste. He opined that increasing solar PV installations in India will also lead to increase in exhaustive PV waste.

He advocated waste problems to be seen as a more wide-ranging problem affecting all the components of the environment because when solid waste is disposed on land, it is not only the land it affects but also the air, surface water, ground water and soil. Waste management practices also contribute to global warming because of GHG emission from the waste.

Even though the per capita waste generation in India is less than that of a developed nation, considering India's population, it does pose a serious concern. While highlighting the challenges in waste management, he emphasized on the huge land requirement needed for waste disposal which is projected to be 66,000 ha for the next twenty years.

Based on the review of SDGs in context of the waste sector, Dr Pandey highlighted that there are ten focus areas covering the issues with suggested twenty-four targets and indicators to measure the progress. He discussed that the waste sector needs to be looked at from the life cycle perspective to minimise waste and contain its exposure. Stakeholder (local authorities, NGOs and community-based organisations, service users, private informal and formal sectors and donor agencies) engagement in waste management should be practiced to map out their concerns and benefits while planning aspects related to waste management. Successful partnership in the field of waste management and a case for investing in the waste sector were showcased.

Madhu Verma, Professor, Environment and Developmental Economics, Centre for Ecological Services Management, Indian Institute of Forest Management, Bhopal

Dr Verma highlighted the importance of valuation-based studies in informed decision-making to ensure sustainability, with its linkages to biophysical and qualitative parameters. She introduced the participants to the Centre for Ecological Services Management at Indian Institute of Forest Management (IIFM) and some of their recent work.

While referring to the study 'Economic Valuation of Tiger Reserves in India: A VALUE+ approach: A Case of Policy and Institutional Success', she stressed the need for a policy institution, as it would provide tiger reserves highest conservation status, thus acknowledging their contribution to the economic system. She apprised that tiger and tiger reserves are vital for the ecosystem. The study used the VALUE+ approach where the '+' denotes the service attributed to conservation of tiger reserves but that cannot be physically accounted because methodologies, knowledge, indicators and data are limited. Study revealed that conservation of tiger reserves contribute flow benefits in the range of INR 8–18 billion per year, stock benefits in the range of INR 22 to INR 650 billion. There is a need to appreciate the numerous benefits which are not accounted because of their intangible nature. While talking of tiger reserve management, she explained a case of conservation finance that diversion of tiger reserve will incur a huge cost of about INR 500 billion for an average tiger reserve of size 1200 sq. km. Protection of tiger habitats leads to flow of ecosystem services. Benefit-sharing mechanisms, connectivity, exchange of gene flow and data collection are critical to tiger conservation.

Dr Verma mentioned another study on 'Regional Research to Inform the High Level Panel on Global Assessment of Resources for Implementing the Strategic Plan for Biodiversity 2011–2020: Report for South Asia Region (CBD): Policy, Institutions and Market Strengthening'. Within this, she discussed financial issues associated with conservation activities. She argued that there should be some incentive for local people for the

sacrifice they make to conserve biodiversity. Lack of quantitative information exists on investment needs, resource requirements and cost effectiveness to meet Aichi targets. The study highlights substantial gap between available and required resources for achieving the Aichi Targets.

Dr Verma talked about the study on 'High Conservation Value Forests: An Instrument for Effective Forest Fiscal Federalism in India (14th Finance Commission of India): Incentive Based Mechanisms', wherein she highlighted that the states have inadequate motivation to keep and maintain the areas under forests. The study further made a case for forest conservation by recommending increase in allocation of budget. The Fourteenth Finance Commission included forest area as a metric and assigned it a weight of 7.5 per cent of the total tax allocation to states.

While elaborating on the study on 'Revision of Rates of NPV Applicable for Different Class/Category of Forests (MoEFCC): CLEV', she spoke about the importance of scrub in forest ecosystem. The study suggested sharing of CAMPA monies with stakeholders. Possession value of land should be considered while valuing forest land. Dr Verma made reference to the study on 'Guidelines of Cost-Benefit Analysis for Forest Diversion (MoEFCC): Institutional Strengthening'; and she emphasized that there is a need to consider the benefits which are lost and costs that are imposed on account of developmental activities.

While concluding, she recounted the need for informed decision-making using available data, understanding the requirements and gaps and bridging these gaps such that there is larger body of knowledge to facilitate correct decision-making.

Sumit Sharma, Fellow, Centre for Environmental Studies, TERI

Mr Sumit made a presentation linking SDGs with air pollution. Air pollution does not find a mention under any of the goals; but there are six goals which are linked directly or indirectly with air pollution. India's population has grown 3.5 times with 48 times growth in power consumption per capita and 463 times growth in number of vehicles in the last sixty years. Increase in the number and sprawl of cities, increasing consumerism and increase in the number of vehicles coupled with a shift towards inefficient road transport has posed serious challenges in terms of sustainability.

Mr Sumit highlighted the negative impacts of pollutant formation. More than 80% cities violate the standards of RSPM (respirable suspended particulate matter) and the number of cities violating the standards of NO_x has started to grow. One reason for this can be attributed to the growth in number of vehicles. He highlighted that high level of NO_x leads to more ozone at the breathing level. With the help of satellite images, he showed the presence of aerosols in the Indo-Gangetic plains. Air pollution can have impacts on agriculture, climate, buildings and aesthetics. It is the fifth largest killer in India, and there are severe health impacts associated with it. Particles less than 10 micron and finer particles can pass through the windpipe and lungs. Some of the smallest particles, called respirable particulates may tend to be deposited in the alveoli.

While deliberating on impacts on climate change, he highlighted that short-lived climate pollutants (SLCP) primarily black carbon, methane, ozone and HFCs, impact the human society by either the pollutant route or by warming the planet. While talking on Delhi's air pollution, he opined the increase in number of vehicles and growth of satellite towns around Delhi as the causes of air pollution. Catalytic converters, adoption of CNG and shift from 2-stroke to 4-stroke bikes have helped reduce concentration of carbon monoxide. However, there is an absence of standards for NO_x for industries and interventions to promote cleaner fuel for cooking in rural households. He concluded with recommendations to check for air pollution in sectors namely, transportation, power and industries and domestic.

Soumitri Das, Forestry Specialist, USAID

Mr Soumitri deliberated around the inter-linkages between SDGs and forestry. He emphasized the importance of information in establishing a case for forest conservation. Goal 15 of SDGs encompasses almost every dimension of forest conservation directly; however, there are other goals in SDGs which also indirectly emphasise forest conservation.

Talking about sustainability, he commented that it is difficult to define it considering the several elements that form a part of it. He informed about the work and operations of USAID in forestry and related sectors. He discussed the changing context of forest conservation and argued that forests are not just about trees and animals; but also about fellow human beings who reside in and around the forests.

Mentioning the USAID initiative on 'Partnership for Land Use Science (FOREST-Plus)' that aims at accelerating India's transition to low carbon economy by taking REDD+ action, Mr. Das elaborated on the connect between forestry and climate change in today's context. He concluded by providing snippets about activities that would help define sustainability and that emphasized the importance of people in forest conservation.

Question and Answers

Q: Are there any planned studies being undertaken on crop residue, especially covering the social issues of the farmers?

Ms Kedia apprised about the TERI project which deals with the issue of paddy straw management in Punjab and specially looks at the issue of illicit burning of crop residue. She informed that initiatives undertaken by the government are insufficient and there is a need for long-term solutions to curb crop residue burning.

Mr Sumit added that another TERI study has estimated emission load from open burning across the country. The study looks at how emission mixes up with meteorology and how air quality concentrations are formed. Results of the study are completed and will be available in public domain soon.

Q: Have there been any valuation studies done for the Gir Lion Reserve?

Q: What is the contribution of diesel to air pollution and what are its impacts?

Dr Verma answered the question about the lion reserve and informed that valuation was made for the national park and not for the species. Dr Ghosh remarked that animal reserves are of great importance in conservation of species.

Taking on the question about diesel and its impact on air pollution, Mr Sumit shared that most of the vehicular pollution for particulate matter (PM) and NO_x comes from diesel vehicles, 60% vehicular emission on roads comes from those running on diesel. Diesel is also a known carcinogen by the World Health Organization (WHO).

Q: What kind of non-monetary matrix could be useful for policy-makers?

Dr Ghosh responded by emphasizing the need for public policy to go beyond monetary valuation values. Dr Verma added that sometimes biophysical linkages explain the value, but cannot be captured through monetary valuation methods. She emphasized the need for policy-makers and citizenry at large to appreciate that every species has a right to live and something that might not be of value to one can be valuable to other.

Q: What is the risk involved while reporting wide valuation range?

Dr Verma responded by saying value ranges are indicative and communicated with the intention to sensitize about their conservation value rather than to set market price and since the ecosystem is complex enough to be understood completely, precautionary principle is followed while establishing valuation ranges. On this, Dr Ghosh added that policy-making should contain these wide ranges even if they are uncertain and not wait for them to be certain, as they help in decision-making.



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Agenda of Book Launch and Workshop

Energy and Environment in the Context of Sustainable Development Goals in India

31st March 2015, Magnolia, India Habitat Centre, Lodhi Road, New Delhi 110003

09:30 – 10:00	Registration
10:00 – 10:05	Introductions and setting the stage
10:05 – 10:10	Welcome and opening remarks by Prabir Sengupta, Distinguished Fellow, TERI
10:10 – 10:15	Presentation on TEDDY 2014/15 by Ashutosh Senger
10:15 – 10:20	TEDDY 2014/15 release by Leena Srivastava, Acting Director General, TERI
10:15 – 11:45	<p>Session 1: Sustainable Development Goals in context of India Chair: Chandrashekhar Dasgupta, Distinguished Fellow, TERI</p> <p>Panelists Leena Srivastava, Acting Director General, TERI Prabhat Upadhyaya, PhD candidate, Linköping University, Sweden Shaillly Kedia, Fellow, TERI</p> <p><i>Q&A (15 minutes)</i></p>
11:45-12:00	Tea break
12:00– 1:30	<p>Session 2: Sustainable Energy Chair: Anil Jain, Advisor-Energy, National Institution for Transforming India (NITI) Aayog</p> <p>Panelists P.C. Maithani, Director, Ministry of New and Renewable Energy Atul Kumar, Fellow, TERI Lydia Powell, Head, Centre for Resources Management, Observer Research Foundation Rinki Jain, Associate Fellow, TERI</p> <p><i>Q&A (15 minutes)</i></p>
1:30– 2:30	Lunch
2:30 – 4:00	<p>Session 3: Environmental Sustainability</p> <p>Chair: Prodipto Ghosh, Distinguished Fellow, TERI</p> <p>Panelists Suneel Pandey, Associate Director, TERI Madhu Verma, Professor, IIFM Sumit Sharma, Fellow, TERI Soumitri Das, Forestry Specialist, USAID</p> <p><i>Q&A (15 minutes)</i></p>
4:00 – 4:05	Vote of thanks by Aparna Vashisht, Research Associate, TERI
4:05 – 4:30	Tea/ coffee

List of Participants at the Book Launch and Workshop

Energy and Environment in the Context of Sustainable Development Goals in India

31st March 2015, Magnolia, India Habitat Centre, Lodhi Road, New Delhi 110003

Name of Participant	Organization affiliation
Mr Joseph T Varghese	Independent
Dr Raghavendra Prakash Dubedi	P. G. College, Pithoragarh
Ms Bulusu Prasanna	360 Analytics & Advisory Pvt. Ltd.
Mr Jagdish C. Bhatt	Bhatt Energy Research
Ms Anja Shivhare	GIZ
Mr Prasun Pandey	Shakti Sustainable Energy Foundation
Mr Upendra Nath Singh	Central Pollution Control Board
Mr Witness Ngwenya	Embassy of the Republic of Zimbabwe
Mr Solomon Ticharwa Musaka	Embassy of the Republic of Zimbabwe
Ms Olga Chepelianskaia	ERG TERRA Expertise
Mr Leiv Landro	Royal Norwegian Embassy
Amb. Eivind Homme	Royal Norwegian Embassy
Dr M. R. Anand	Ministry of Information Technology
Dr Brijendra Pateriya	Punjab Remote Sensing Centre
Ms Preeti Malhotra	Alstom India Limited
Ms Prarthana Borah	Centre for Environment Education
Mr Aditya Agarwal	Paterson Consulting Group Pvt. Ltd.
Mr Gian N Kathpalia	Alternative Futures
Mr Manish Bhadu	Independent
Ms Subhavna Juneja	Centre for Environment Education
Ms Shweta Arora	Paharpur Business Centre
Mr Damandeep Singh	CDP India
Mr B. K. Agrawal	Indian Railways Organisation for Alternate Fuels
Mr Subrata Nath	Indian Railways Organisation for Alternate Fuels
Mr S. D. Garg	Council of Scientific & Industrial Research
Mr Anirban Ganguly	Department of International Development
Dr Ramesh Kumar Jalan	UNDP
Ms Jasmer Dhingra	IDH
Mr Pradeep Yadav	Independent
Ms Gursimran Kaur	Centre for Environment Education
Ms Aastha Pitalia	Office of Supriya Sule, MP
Mr Kumar Vikrant	Office of Shri Dharmendra Yadav, M.P.
Ms Prathiba Raju	Infrastructure Today
Mr Rishiraj Vashisht	Skymet
Ms Lalita Balakrishnan	AIWC
Mr Akshay Goyal	Skymet Weather Services Pvt. Ltd.
Mr Mohit Sharma	AVV Technologies
Ms Ritu Thakur	ICLEI - South Asia Secretariat

Workshop on Energy and Environment in the Context of Sustainable Development Goals in India

Mr Nazeer Khan	Jamia Millia Islamia
Mr J. Tamilselvan	Galaxy Group (Strategy, Consultancy)
Mr Dinesh Kapur	Indian Institute of Urban Affairs
Mr S. Kamboj	PCI (Press)
Mr Ajit Kumar	Radiance Media
Mr Ashish Gupta	Observer Research Foundation
Dr Nisha Mendiratta	Ministry of Science & Technology
Mr Prabhat Upadhyaya	Linkoping University
Mr Anil Jain	Niti Ayog
Mr P C Maithani	Ministry of New and Renewable Energy
Ms Lydia Powell	Observer Research Foundation
Mr Soumitri Das	USAID
Dr Madhu Verma	Indian Institute of Forest Management
Dr Leena Srivastava	The Energy and Resources Institute
Dr Prodipto Ghosh	The Energy and Resources Institute
Dr Ritu Mathur	The Energy and Resources Institute
Mr Chandrashekhar Dasgupta	The Energy and Resources Institute
Mr Prabir Sengupta	The Energy and Resources Institute
Dr. Suneel Pandey	The Energy and Resources Institute
Dr Atul Kumar	The Energy and Resources Institute
Mr Sumit Sharma	The Energy and Resources Institute
Ms Shailly Kedia	The Energy and Resources Institute
Mr Manish Anand	The Energy and Resources Institute
Mr Ashish George	The Energy and Resources Institute
Dr Arindam Datta	The Energy and Resources Institute
Mr R Suresh	The Energy and Resources Institute
Mr Kanwal Nayan Singh	The Energy and Resources Institute
Mr Jai Kishan Malik	The Energy and Resources Institute
Mr Saswata Chaudhury	The Energy and Resources Institute
Ms Ilika Mohan	The Energy and Resources Institute
Mr Saptarishi Das	The Energy and Resources Institute
Mr Swarup Mallik	The Energy and Resources Institute
Mr Jitendra Tiwari	The Energy and Resources Institute
Mr Omkar S Patange	The Energy and Resources Institute
Ms Aparna Vashisht	The Energy and Resources Institute
Ms Rumbidzai Faith Masawi	The Energy and Resources Institute
Ms Rinki Jain	The Energy and Resources Institute
Ms Ninika Dhawan	The Energy and Resources Institute
Mr M K Bineesan	The Energy and Resources Institute
Ms Aastha Sharma	The Energy and Resources Institute
Mr Ashutosh Senger	The Energy and Resources Institute
Dr Prakashkiran Pawar	The Energy and Resources Institute
Mr Ananda G Vadivelu	The Energy and Resources Institute
Ms Karnika Palwa	The Energy and Resources Institute
Mr Cameron Campbell	The Energy and Resources Institute

About TEDDY

TERI Energy and Environment Data Diary and Yearbook (TEDDY) is an annual publication brought out by The Energy and Resources Institute (TERI) since 1986. It is the only comprehensive energy and environment yearbook in India which provides updated information on the energy supply sectors (coal and lignite, petroleum and natural gas, power, and renewable energy sources), energy demand sectors (agriculture, industry, transport, residential, and commercial sectors), and environment (local and global). It also provides a review of the government policies that have implications on energy and environment in India.

Each edition of *TEDDY* contains India's commercial energy balances for the last four years that provide comprehensive information on energy flows within different sectors of the economy and how they have been changing over time. These energy balances and conversion factors are a valuable reference for researchers, scholars, and organizations working on energy and related sectors. After the introductory chapters, *TEDDY* has been divided into sections on energy supply, energy demand, and local and global environment. The twenty-ninth edition of the publication, *TEDDY* 2014/15, comes with several interesting features. The Green Focus at the end of each chapter highlights sustainable initiatives and successful practices. The publication also features a section with a discussion around sustainable development goals and tracking framework for sustainable energy goals at global, national, and sub-national levels.

Graphs, maps, and tables have been used in all chapters to explain facts, which make the book an interesting read. In addition, detailed tables at the end of each chapter represent statistical data on energy and environment. The publication is accompanied by a complimentary CD containing full text. The publication is cited in international peer-reviewed journals and policy documents.