



Capacity building Program for Officials of Bihar State government on

‘Low Carbon Green Growth Pathways’

Venue: At TERI RETREAT, Gual Pahari

24th – 28th June, 2013

Background

TERI is engaged with the state government of Bihar on the issues of climate change. Recently, a five days capacity building program on the theme of ‘Low Carbon Green Growth Pathways’ was organized for the officials of the State government in the week of 24th – 28th June, 2013 at TERI Retreat facilities in Gual Pahari. Spread over a *period of Five days*, and distributed across *Ten Technical Sessions*, the program was designed to deliver training and enhance the understanding of participants on the inter-disciplinary aspects of climate change. The workshop, further, dwelled into possibilities for cross-sectoral activities for the State with immense policy implications.

The capacity building program was customised for the specific needs as per the discussions with some of the senior officials prior to designing the program. The program aimed at achieving the following objectives:

- 1) To bring to light the emerging issues in the State in the context of climate change and sustainable development
- 2) To identify opportunities available for more effective and holistic resource planning in the State and examine the potential of these options in the context of the State

The program was conducted by experts/resource persons from different areas in TERI, through presentations, panel discussions, and group activities. Case-studies and practical field experiences from across different states were also shared with the participants.

The program had participation from the various State departments such as the Department of Transport, Energy, Water Resources, Environment and Forest, Bihar State pollution Control Board and Bihar Industries Association. In all, eleven officials participated in the program.

Summary of proceedings

Day 1, Monday, 24th June, 2013

Introductory Session

The Day 1 started with the introductory session wherein Ms. Suruchi Bhadwal, Associate Director – Earth Sciences and Climate Change Division (TERI) welcomed the participants and briefly introduced them to the program. Thereafter, Dr. R. K. Pachauri, Director General, TERI,

addressed the participants in his keynote address and stressed on the importance of economic growth and development in an inclusive and sustainable manner. Highlighting the challenges of climate change impacts and limited availability of resources he emphasized on the green growth pathways. Participants came up with queries and engaged in a discussion with Dr. Pachauri. This was followed by a group activity led by Dr. Prodipto Ghosh, Director – Earth Sciences and Climate Change Division (TERI). The activity focused on identification of the urgent and critical concerns of the State. Mr. K Ramanathan , Distinguished Fellow-Energy Regulation and Practice, TERI and Dr. Ritu Mathur, Associate Director- Modelling & Economic Analysis division, TERI were also present to further guide the discussion on solutions to the identified concerns through a directional shift in development pathways. The concerns highlighted by the officials included (i) power generation and access to modern energy, (ii) disaster management (esp. floods and droughts), (iii) improved standard of living (reducing pollution (air, water), urban solid waste management, better sanitation, availability of drinking water), (iv) natural resource management (biodiversity), (v) poverty alleviation (population control, jobs creation) and (vi) inter departmental cooperation. The discussion then focused on key resources available to the State. Amongst others availability of human resources, rainfall & water resources including canal network, fertile land & livestock, good solar insulation, and biomass were discussed as key resources for the State. The TERI resource persons initiated the discussion to focus on solutions emphasizing on optimizing the use of available resources and bringing a positive directional change towards minimizing some of the concerns raised. This session resulted in generating lot of new ideas that could be implemented in their States. Some of the ideas included:

- Focusing on mini and micro hydel to harness available water resources. As a first step it was thought that an in-depth resource assessment could be done to identify potential.
- Given that the State has extensive network of canal and good amount of solar insulation, it was thought that the concept of floating solar roof-top could be explored. Further, local panchayat could be involved. Pisciculture or fisheries could be promoted to increase the income levels.
- Biomass power generation could be explored to its full potential given the availability of rice husk and bagasse. New technologies can be explored to eliminate some of the problems. Smart mini grid could be explored to provide access to clean energy.
- In order to enhance flood protection, dredging of river bed and used of silt for strengthening embankments was discussed as a potential option. However, further studies could help.
- In order to harness rain and to avoid droughts, it was discussed to create local storage capacity and revive or reclaim traditional storage/reservoir capacity.
- Social afforestation activities could be enhanced in the state for its positive ecological functions such as soil conservation, water recharge. Use of species of economic importance such as poplar could enhance income levels.
- Detailed studies for better urban planning/habitat planning could be done. It would help built disaster resilience besides better infrastructure including transport.
- It was discussed that early warning system could help in disaster management and capacities should be created even at the local level.
- A study to determine the carrying capacity in each of the urban air-sheds was suggested

- Some other ideas included community toilets with biogas plant and manure management program at gram panchayat level and installations of improved cookstoves for indoor air pollution management.
- Awareness generation, design specification for local population and greater involvement of women were primarily emphasized upon.

Technical Session I – Introduction to Global Warming and Climate Change

The first technical session on Day 1 briefly introduced the participants to concepts behind the physical science of climate change. Mr. Saurabh Bhardwaj, Associate Fellow- Centre of Global Environment Research- referred to the IPCC Fourth Assessment Report which concludes that the global surface temperature has increased 0.74 ± 0.18 °C during the 100 years ending in 2005 primarily due to anthropogenic greenhouse gases (GHG) emissions. He further introduced the theory of global warming; the human induced causes of global warming; its effects on human survival and set theme for building on the scientific basis of climate change. He highlighted that the impacts of climate change are inevitable, irreversible and long-lasting in nature. The primary responses to combat climate change which fall within the category of mitigation and adaptation was also emphasized upon.

In the next presentation, Ms. Suruchi Bhadwal gave an overview of the possible impacts of climate change in various sectors such as agriculture and food security, hydrology and water resources, coastal and low lying areas, on natural ecosystem and biodiversity, and on human health and total well-being. She highlighted the urgency for mitigation and adaptation in order to limit the global temperature from exceeding the threshold limit and emphasized on the need to frame responses to the likely risks of climate change in a timely manner. She also pointed out that effective adaptability however may not be able to address all losses, though it can substantially reduce threats and risks of climate change. She concluded by focusing on the need for scaling up of programs to address the incremental risks of climate change.

The last session on day 1 focused on the identification of vulnerability hotspots in Bihar with the help of a group activity led by Ms. Suruchi Bhadwal and Ms. Sambita Ghosh. The participants were introduced to the concepts of vulnerability and vulnerability assessment methodologies. In that, it was highlighted that most of the climate vulnerability assessments rely heavily on the working definition of IPCC (2007), wherein vulnerability is defined as - *‘the extent to which a natural or social system is susceptible to sustaining damage from climate change’ and is a function of exposure, sensitivity and adaptive capacity’*. The overview presentation was followed by the vulnerability hotspot assessment activity with an aim to identify vulnerable districts. The participants were divided in groups and were asked to select an appropriate exposure indicator in the context of Bihar. Officials noted that with North Bihar in general being highly flood-prone, and South Bihar being highly drought prone they would pick “floods” as the exposure indicator for the activity. Next, five of the districts in Bihar - most exposed to ‘Floods’ were chosen. Officials selected ‘population density’ and ‘lack of infrastructure’ as the indicators of sensitivity; and ‘availability of flood shelters’ and ‘income/wealth in the district’ were chosen as the indicators of adaptive capacity.

The day concluded with discussions revolving around the vulnerability index of Bihar to the impacts of climate change. Officials highlighted the absence of state level climate models and/or vulnerability studies. It was thought that such studies should be conducted along with efforts to enhance community awareness.

Day 2, Tuesday, 25th June, 2013

Technical Session II – Global Response to Climate Change: International Climate Policy and Indian Perspective

Ms. Neha Pahuja gave an overview of the current status of international climate negotiations. The participants were given the history of negotiation on climate change marking the important milestones in the negotiation process such as adoption of the UNFCCC convention and the Kyoto Protocol along with the Bali Action Plan, the Copenhagen Accord, the Cancun agreements and the Durban Platform. Some of the key issues were highlighted such as slow progress on GHG emissions reductions; the widening North-South divide and lack of progress on developing country support and adaptation. Discussion also involved the issues with forestry, reducing deforestation and on the shared global vision. Ms. Pahuja highlighted the issues with regard to the mitigation gap and the ambition conflict between the annex 1 and non-annex 1 countries. A short TERI film on the subject was also screened following which Amb. C Dasgupta gave his special remarks focusing on key stumbling blocks in climate negotiations and on the way forward from the Durban platform on ADP and the key considerations needed to attain the ideal outcome from the global negotiations. This was followed by moderated discussion wherein participants were keen to understand the politics of climate negotiations given it will have such adverse impacts. Mr. Manish Srivastava moderated the discussion.

Technical Session III – Domestic Response to Climate Change

The next sessions focused on the National Action Plan on Climate Change (NAPCC) released by the Prime Minister on 30th June 2008. Ms. Pahuja discussed the eight National Missions that outlined the national strategy on climate change which aims to promote developmental objectives while yielding co-benefits for addressing climate change. She highlighted the vision and goals of the eight strategic missions, the approach for their implementation, the progress so far and the challenges faced in the implementation of the NAPCC. While discussing the state action plan on climate change it was noted that the SAPCCs will have to be integrated into the state level planning process so that the resource allocation for the implementation of the identified adaptation/mitigation measures can be made with an objective to achieve the development goals of the state governments. Further, potential mitigation options in various sectors were discussed. This includes Low cost, medium cost and high cost options within the

power, transport, residential and the industry sector. Participants were asked to think if any of the options were applicable in the State context. In next presentation, Mr. Manish Shrivastava discussed the National Mission for Enhanced Energy Efficiency (NMEEE) and the innovative initiatives planned under this mission. The Perform, Achieve and Trade (PAT) scheme and the Renewable Energy Certificates (REC) were discussed as innovative market based mechanisms. Following this, Mr. Sanjay Garg, General Manager, Ministry of Power, Government of India, emphasized the importance of energy efficiency and shared his experiences while designing and implementing the PAT and REC mechanisms with a view to further highlight the role of state governments in such mechanisms

The last session on Day 1 focused on the National Water Mission of the NAPCC. Mr. Anshuman, Associate Director, Water Resource Management Division, TERI discussed the objectives of the National Water Mission and its key goals. Practical examples of conducting water audit were presented in order to introduce participants with the available methodologies. A case study from NTPC was discussed for the same. The discussions revolved around the importance of water auditing by the state ministries for efficient water utilization and recharging in their state.

Day 3, Wednesday, 26th June, 2013

Technical Session IV – Introduction to Mitigation options and co-benefits

Day 3 began by highlighting synergies in developmental actions and its climate co-benefits. The session aimed to sensitize participants to an integrated approach to mainstream climate change in sustainable development policies. Dr. Atul Kumar, TERI sensitized the participants with mitigation opportunities such as energy efficiency improvements and renewable energy. However, he also cautioned the participants on the technological and financial challenges in making a transition to a low carbon economy. He discussed Energy, Economy and Environment in the broad contours of green growth pathways for India and several scenarios were created for future course of emissions and development in the country. He remarked that the macro-inferences from scenarios state that ‘energy efficiency’ is the key in the short and medium term for low carbon development; and renewable energy is necessary and likely to play major role after the year 2021. A strong need to invest in R&D activities was also emphasized.

Dr. Shilpi Kapur in her presentation briefly highlighted that many mitigation options have clear co-benefits for countries like India, and these synergies could turn the challenge of climate change into opportunities for sustainable development. For instance, promotion of clean energy technologies and energy efficiency would mitigate greenhouse gas emissions and at the same time address energy security challenges of the country.

Technical Session V – Renewable Energy Options for Bihar

The next technical session focused on exploring the renewable energy potential for Bihar. To begin with, Dr. Amit Kumar briefed the participants on the roles and opportunities of renewable energy for India as a whole. He gave an overview of India's current energy scenario and the challenges of energy security and energy access. He highlighted that while the demand for energy in the country has been growing significantly, the concern for energy security on the other hand may impact the development and growth of the country. Dr. Kumar very effectively analyzed the options/solutions to energy security by examining the potential role of coal, oil, gas, large hydro and nuclear – which were finally ruled out due to their infeasibility. He concluded that India has abundant renewable energy resource stock like solar, wind, small hydro, and biomass, which hold the potential to contribute towards reduction in dependency on imported fossil fuels and attain energy security for the country. He noted that renewable energy is all the more important for India particularly due to its vast geographic diversity and size; and most importantly for 'the size of its rural economy'. He, thereby, emphasized on the importance of renewable and decentralized sources of energy.

The discussion was taken forward by Ms. Parimita Mohanty where she introduced the participants to various distributed energy generation systems and the concept of smart mini grid. She began with the evolution of distributed generation in India and discussed the case studies of smart mini-grids currently implemented in the states of Assam, Uttar Pradesh, Madhya Pradesh and Odisha including key salient features of the project - its finance, marketing, institutional arrangements; the challenges faced during implementation.

Mr. Paltu Acharjee, in his presentation introduced technologies and its application. His presentation focused on case studies of biomass gasifiers in Haryana; Uttaranchal; Grain processing works in Kolkata; Husk Power systems in Bihar; and some other technologies in Odisha. The discussions also revolved around the feasibility of options of grid-connected renewable energy technologies, Biomass gasifier based power system for rural electrification, solar multi-utility units, solar micro-grids, RE based smart mini-grids, Biomass energy for MSMEs. Participants noted that since Bihar has huge potential for generating renewable energy especially from Solar and Biomass resources; such technologies (demonstrated in the presentations) will not only ameliorate the energy situation in the state of Bihar (which is currently below national average), but will also help to contribute to green electricity in the grids.

To further enhance their understanding, an educational tour was organized for the participants to visit the demonstration projects such as smart mini grid at TERI RETREAT facilities.

Technical Session VI – Energy Access, Energy Efficiency and Renewable Energy

The second half of Day 3 was focused on the issue of energy access wherein decentralized energy options for both lightening and cooking needs of rural households were discussed. Mr. Vivek Jha highlighted the huge demand-supply gap in energy provision and that Bihar was no different in this aspect from other parts of the country. He highlighted that almost 55%

additional connections were needed for universal access which will have to come from mini-grids and off-grid solutions. He further shared his experience on TERI's flagship program on 'Lighting a Billion lives'. He discussed the key objective of the program which is to catalyze the use of solar lighting technology by the rural poor. He highlighted the salient features of LaBL which revolves around strengthening the market based value chain for rural energy access and its area of implementation in Africa and few of the states in India such as Jharkhand, Bihar, Uttar Pradesh, and Odisha. He emphasized that the primary approach behind LaBL is attaining sustainability of market for solar technologies and its faster expansion to reach out to all the inaccessible regions of the country - not connected to grid directly. He also noted that despite having implemented in several states, the methodology and approach to be followed varies in each state and hence needs to be pilot tested and examined separately for different regions of implementation. Finally the challenges faced and the means to address those challenges were also deliberated upon.

The second case study was delivered by Mr. Abhishek Kar on business models for up scaling cleaner cook stoves for the users of low efficiency mud stoves. He briefed the participants on TERI's pilot initiatives of distributing more than 1500 stoves across the states of Odisha, Himachal Pradesh, Bihar, Madhya Pradesh, and Uttar Pradesh with a view to highlight the vision, rationale, technologies, market value chain, and challenges in each case. Mr. Kar discussed the business model of the case study in each of the five states and dwelled into the future goal of action on dissemination of improved cookstoves to rural households. During the discussions, participants noted that the program on decentralized energy access has huge potential to mitigate the problem of energy supply to the poor in the remote areas of Bihar.

The next session focused on short lived climate pollutants (SLCP) and their significance in the context of climate change. Mr. Sumit Sharma discussed the concept of SLCP highlighting their role in deteriorating climate by affecting the quality of air. He highlighted that these pollutants like Methane, Ozone, Black carbon, halocarbons etc fall in the category of non-CO₂ climate warmers and adversely impact the climatic balances. He added that there are several control measures to prevent release of pollutants in the air such as eliminating solid fuel cooking, preventing vehicular growth and controlling emissions from vehicle etc. He remarked that controlling SLCPs could lead to 'no regret policy' in preventing climate change and therefore hold huge potential for climate change mitigation.

Day 4, Thursday, 27th June 2013

Technical Session VII –Energy Efficiency in Power Distribution

First half of Day 4 focused on the energy efficiency measures in power distribution. Mr. Saurabh Prasad highlighted the problem of acute shortage of power in Bihar – not only during peak demand, but even for the base demand in the state. He noted that there is need for Demand Side Management (DSM) not only from the perspective of energy security but also for its co-benefits of mitigating GHG emission. The session gave an overview of various concepts important while

developing a DSM plan for the state. He emphasized that the existing regulatory regime mandated implementation of various DSM initiatives.

He highlighted several factors that impact the demand for energy in the state such as Income, GDP, climatic factors, government policies, unexpected incidences etc. and laid out methods of reducing the energy costs using the DSM methodology which involved ‘integrated resource planning’.

He further emphasized on the co- benefits derived from DSM strategy such as environmental and social improvement via reduced GHG emissions; enhanced reliability and ameliorated issues in electricity networks; usefulness in delaying/avoiding network expansion; improved market access; and usefulness in attaining the state energy security.

In the next presentation, Mr. Gurudeo Sinha highlighted the existing and emerging policy and regulatory support for DSM. The discussion also focused on some key regulatory interventions and Cost –benefit of DSM. Firstly, he mentioned that utilities will not implement DSM programs without an assurance of cost recovery, the availability of sales-revenue decoupling mechanisms and financial incentives for shareholders; secondly, DSM can serve as a public policy tool to increase energy efficiency in restructured power markets if it is supported by a public goods charge on the distribution of electricity to cover costs of program implementation; and lastly, that In the context of designing DSM programs, market pull strategies can play a key role. It is important to create a self-sustaining process involving all members of the value chain, including the equipment manufacturer, wholesaler, retailer, installation and maintenance contractors and the end use customer.

Mr. Saurabh then discussed two of the case-studies one from Andhra Pradesh and from Tamil Nadu with a view to further enhance participants’ understanding on DSM and related issues. The participants realized and discussed cross-disciplinary nature of the energy issues with key sectors such as Agriculture and Industry which are critically important for Bihar.

Technical Session VIII – Sustainable Agriculture

Technical session VIII focused on sustainable agriculture and discussed how this sector is likely to be impacted upon by climate change. The presentations focused on the ways and means by which sustainable agriculture can be put into practice in Bihar. The latest concepts and technologies available for resilient agricultural practices were illustrated with the help of case studies.

Ms. Samibita Ghosh briefed the audience on the relevance and importance of agriculture for developing countries like India and need for checking climate projections for its impacts in the agricultural sector. She talked about the direct and indirect impacts that climate change has on agricultural systems like crops, livestock, fishery, horticulture and livelihoods. The need for an integrated modeling approach to quantify impacts for sustainable agricultural practices was emphasized upon.

This was followed by the case study on sustainable agricultural practices for stressed hilly agriculture. Dr. Nidhi Chanana talked about the successful technologies such as Tissue Culture, Resource use efficient technologies, Vermi-composting, Bio-pesticides, Biofertilizers, and discussed some secondary agricultural techniques. The other case study was delivered by Dr. Shanuja Beri on the role of Mycorrhiza in soil fertility, the technology for replenishing fertility of the soil via laboratory experiments. She discussed the multi-locational field trials in variety of soil crops and regional systems. She also discussed the implementation methodology and life-cycle of mycorrhiza process in case of Wheat, Soya bean, Banana and some other crops. In addition, she highlighted the relevance and strength of mycorrhiza in wasteland reclamation for the states.

The participants discussed with the experts on the overall strategy under the BAPCC to transform agriculture and its allied sectors into climate resilient and vibrant production system, while developing their full potential and ensuring sustained food and nutritional security in the State.

The Bihar state officials showed keen interest in implementing pilot study on mycorrhiza for developing soil fertility and food security in Bihar.

Day 5, Friday, 28th June, 2013

Technical Session IX – Global carbon markets: opportunities offered by carbon trading

Sessions on day 5 particularly dealt with the existing and emerging global carbon markets and the opportunities offered by carbon trading. Ms. Priyanka Batra discussed the initiatives on REDD plus activities in India implemented by TERI in various states.

To begin with, she talked about the National Mission for “Green India” – its aims at addressing the issue of climate change, the total mitigation potential in forests and its impact on emission intensity of the country. She discussed the evolution of REDD+ mechanism in the international climate regime. The key concepts in REDD+ mechanism was highlighted in discussions pertaining to the rationale for site selection; the methodology for REDD Plus employed; primary techniques of carbon assessment; the method of socio-economic assessment; and the like. She also briefed the participants about the REDD+ pilot case studies undertaken in India by TERI which are currently implemented in six states of Uttarakhand, Uttar Pradesh, Nagaland, Madhya Pradesh, Odisha, and West Bengal. The results and inferences obtained from the studies were also discussed.

The next presentation focused on the Kyoto and non- Kyoto mechanisms - CDM and BOCM (bilateral offset crediting mechanism). Ms. Nimisha Pandey particularly focused on the Clean Development Mechanism (CDM). She discussed the history and origin of CDM; and the

concepts of baseline, additionality and its eligibility requirements; the project cycles in terms of costs and time involved; type of projects eligible for CDM. . In the presentation, Ms. Pandey also highlighted the current status of carbon markets and the future opportunities that may arise out of the international regime. In addition to CDM, she briefly discussed some other mechanisms such as the non- Kyoto mechanism - BOCM, and some basics of the voluntary markets. The officials of Bihar state government were very keen on recognizing the opportunities and benefits available for mitigation in industries and forestry sector from these mechanisms.

Technical Session X – Sustainable Habitat

The technical session on sustainable habitat focused on issues related to sustainable urban development, transportation systems, and habitats to address the opportunities and challenges under the sustainable habitat mission for Bihar.

Ms. Priyanka Kochhar introduced the participants to the Green Buildings Rating system in India (GRIHA) developed by TERI for measuring and rating a building's environmental performance in the context of India's varied climate and building practices. She highlighted the key parameters of assessment within GRIHA such as energy consumption, waste generation, renewable energy adoption, over entire life cycle of buildings etc. She also noted some prime benefits of adopting sustainable green buildings of which cost effectiveness over life cycle was the key highlight. In addition, Ms. Kochhar illustrated the salient features of few of the green rated building under GRIHA taking the case of CESE building IIT, Suzlon, Police training campuses etc.

In the next presentation, Dr. Divya Sharma delved into the best practices for building resilience in Cities. She further discussed the case of urban transformation in the city of Gorakhpur with the help of short film developed by TERI.

Participants engaged in discussion around Bihar's sustainable habitat mission in the context of the two presentations. They raised queries regarding GRIHA and where possible, deliberated upon the process that can followed for building resilience in Bihar.

The program concluded with the Closing remarks from Ms. Neha Pahuja, TERI and Mr. S. K. Karn, Advisor, MoEF (Bihar). This was followed by a round of feedbacks from the participants.

Annex I Participants list

Title of the Event: Five Days Program on Low Carbon High Growth Pathways

Date: 24-28th June 2013, Gual Pahari

S.No	Salutation	First Name	Last Name	Organization name	Designation	Industry Type	Organization Type
1	Mr	Ramendra Nath	Jha	Energy Dept., BTPS	E.E.E. (fuel), BTPS, Baramni	Energy	Central/Union Governments
2	Mr	Sarveshwar	Katiya	Energy Dept, BTPS	EEE (Transmission)	Energy	Central/Union Governments
3	Mr	Pankaj	Rajesh	Energy Dept, BTPS	AEE (MD Cell)	Energy	Central/Union Governments
4	Mr	Rishi	Prasad	Energy Dept, BTPS	Chief Engineer (HR)	Energy	Central/Union Governments
5		Bhairav nath	Jha	Water Resources Department, Bihar	EE	Water	Central/Union Governments
6	Mr	B.K	Gupta	Water Resources Department, Bihar	AE	Water	Central/Union Governments
7	Mr	Arbind Kumar	Tiwari	Department of Transport, Bihar	Joint Secretary	Transport	Central/Union Governments
8	Mr	S.K	Karn	Environment & Forest Department, Govt of Bihar	Advisor	Environment	Central/Union Governments
9	Mr	S	Kumar	Environment & Forest Department, Govt of Bihar	Divisional Forest Officer	Environment	Central/Union Governments
10	Mr.	B. K	Singh	Bihar State Road Transport Corporation	B.A.S, A.C.A	Transport	Central/Union Governments
11	Dr	B	Prasad	Bihar Industries Association (BIA)	Chairman	Industry	Central/Union Governments