NATIONAL INSTITUTE OF ADVANCED STUDIES (NIAS)

Indian Institute of Science Campus, Bengaluru, 560012

Energy and Environment Programme

NIAS-MOES workshop

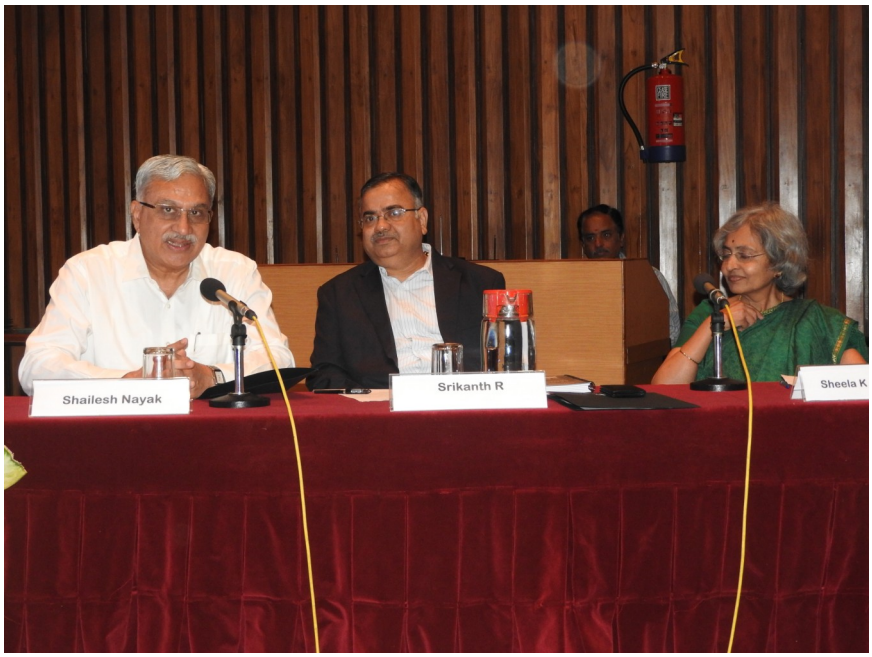
Earth and Human Systems :

Understanding the interaction

Report on the NIAS-MOES workshop held at NIAS on 14 August 2018

In line with one of the key missions of NIAS which is to '*to set up and sponsor research groups on problems relating to the development of the Country and for identifying problems which require immediate study and resolution*,' the Energy & Environment Program (EEP) organized a one-day workshop on August 14, 2018 at the JRD Tata Auditorium in the NIAS campus. This workshop was organized in the backdrop of the five-year Project awarded to NIAS by the Ministry of Earth Sciences (MOES) for, "*Understanding the interaction between components of the Earth and Human Systems at various Spatial and Temporal scales*".

The main aim of this Workshop was to bring together leading experts in the fields of climate and weather modelling, environmental and energy sciences, and the energy sector to share their knowledge and experience with one another and also inspire the young researchers working in EEP. The list of eminent speakers included, Dr. Ramesh, Dr Gopal Iyengar, Dr. Gufran Beig, and Dr. Ramadass from MOES, Profs Nagaraj Narappa and Ashish Verma from Academia, Dr.



Prabhakaran, Mr. R K Mishra, Dr. Tayal, Dr. Vaibhav Chaturvedi, Dr. Ashima Singh, and Mr. Nandikesh Sivalingam from Civil Society, and Mr. Naveen Munjal from Industry.

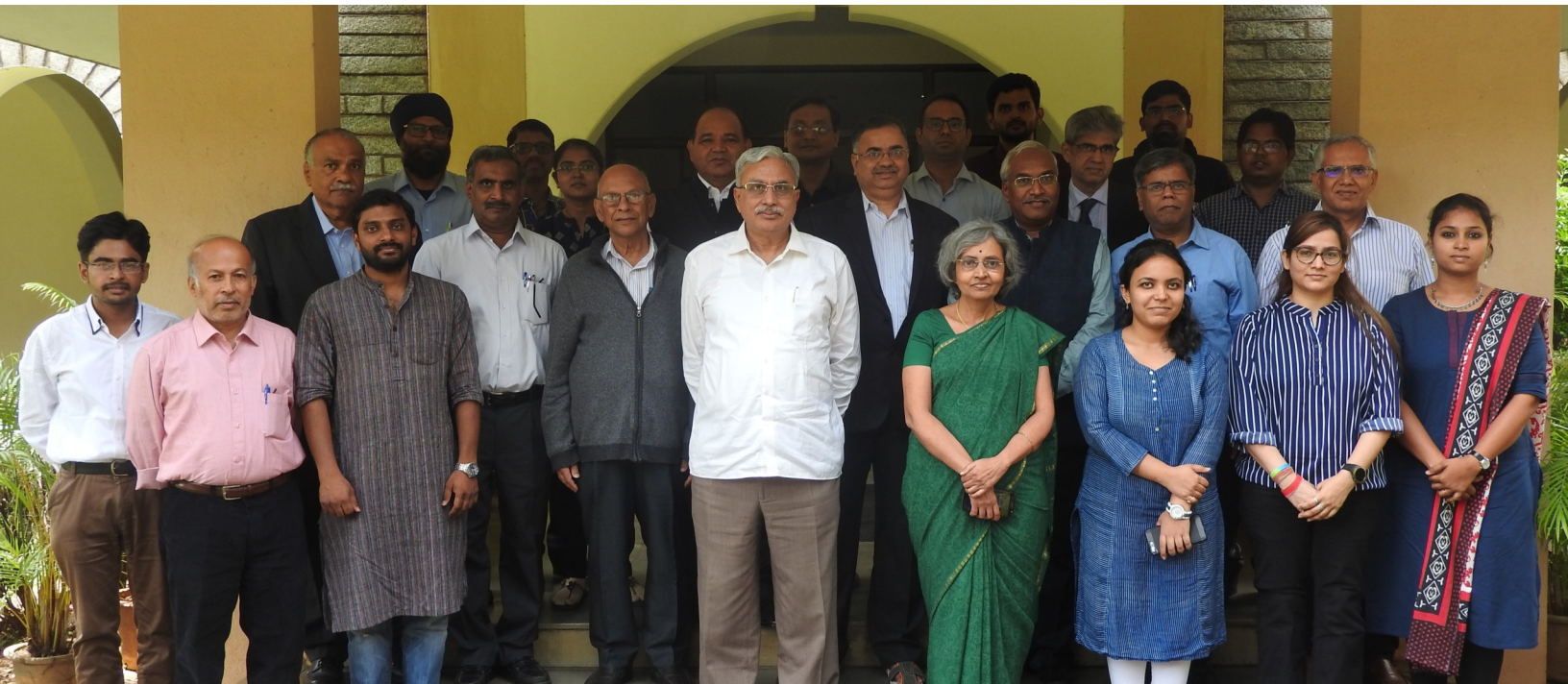
The Workshop was inaugurated by the Director of NIAS, Dr. Shailesh Nayak who had earlier served as the Secretary of MOES. In his inaugural address, Dr. Nayak highlighted the major achievements of MOES in recent years which have contributed to Society in several ways. After this, Prof. R. Srikanth introduced the participants to the main aims and deliverables of the Project.

Socio-economic impact of MOES's programs

Dr. Gopal Iyengar of MOES gave a broad overview of all the major activities MOES has initiated under its mandate (weather forecasts, early warning systems for tsunamis and cyclones, 'now-casting' for extreme weather events). He stated that MOES has developed earth system models which ensure greater accuracy in weather predictions and has also been deeply involved in the IPCC climate change assessment report.. The enormous socio-economic benefits of MOES's work have been assessed and quantified by independent agencies at regular intervals.

Spatial-temporal, seasonal and long-term trends in atmospheric pollutants

Dr. Ramesh, Director General of Indian Meteorological Department (IMD) explained the technological developments that have taken place in IMD during



the ongoing campaign to assess the level of aerosols, gases, and radiation in the atmosphere. He explained the key facets of MOES's ongoing coordinated research program on global and regional climate change.

Impact of air quality on health at the local & regional levels, and mitigation strategies

Dr. Prabhakaran from the Centre for Chronic Disease Control (CCDC), a cardiologist and epidemiologist by training, spoke about the health issues related to the pollution. He emphasized the need for better models to predict the impact of air pollution on health with its knock-on impact on human productivity and productive man-years. He acknowledged the need for longitudinal data linkages, greater awareness of the health impact of air pollution, data collection through low-cost monitoring, and the need for actionable remedial plans. In the short term, he advocated an increase in Government health budgets to ameliorate the impact of air pollution on public health.

Mr. Nandikesh Sivalingam from Greenpeace gave a focused presentation on emissions from coal-fired thermal power generation plants in the context of the Environment Protection (Amendment) Rules, 2015 (EPAR) which were to be implemented nationwide from December 2017 onwards. He stated that a Greenpeace study has found that there will be a 40% reduction in Particulate Matter (PM) and 48% reduction in oxides of sulphur and nitrogen if the EPAR are implemented effectively across the country.

Microclimate of select cities to assess the relative contribution of different emission sources

Dr. Gufran Beig, the initiator of the program on System of Air quality and weather Forecasting And Research (SAFAR) at the Indian Institute of Tropical Meteorology (IITM) at Pune presented a detailed overview of the SAFAR program which currently covers four cities in India, viz., Delhi, Mumbai, Pune, and Ahmedabad. He explained how, local emissions, local weather, and distant transport contribute to local air pollution, and presented interesting data from the four cities covered by the SAFAR program.

India's Polymetallic Nodules (PMN) Program

India needs to augment its resources of cobalt and nickel since they are key raw materials to produce Li-Ion batteries that are likely to be necessary for greater penetration of Renewable Energy (RE) in India. India has zero or limited proven reserves of these

elements compared to its growing need for these metals in the future for RE as well as for Electric Mobility. Dr. Ramadass from the National Institute of Ocean Technology (NIOT) presented an overview of the long-range Polymetallic Nodules program for which India has obtained the permission from the International Seabed Authority for exploratory mining in its allotted area covering 75,000 square meters in the Central Indian Ocean.

Transition strategies towards a more sustainable energy and transportation mix

Mr. RK Mishra (Carnegie India) spoke about the smart city mission and elaborated how the urban environment is affected by mobility. He explained the need for increasing the engineering capability in India's cities and the need to strive for 60-70% of city commuting to be through public transport since cities are the growth engine of the Indian economy today.

Prof. Ashish Verma of IISc and Dr. Pratima of C-STEP together presented the results of their research in transportation modelling for Bangalore. They concluded that, increasing the use of public transport, providing infrastructure for walking and cycling to work, and levying additional taxes on private vehicles form the most sustainable transportation mix bundle for Bangalore.

Mr. Naveen Munjal detailed the ongoing transition to a more sustainable energy mix for India. He explained how coal will continue to supply the base load for electricity in India for the next 15-20 years due to the intermittency of solar and wind power. He also explained the need to reinforce the Green Energy Corridors to facilitate grid integration of RE, while gas-based and hydropower plants are required to cater to the peak load.

Water-Energy-Agriculture Nexus

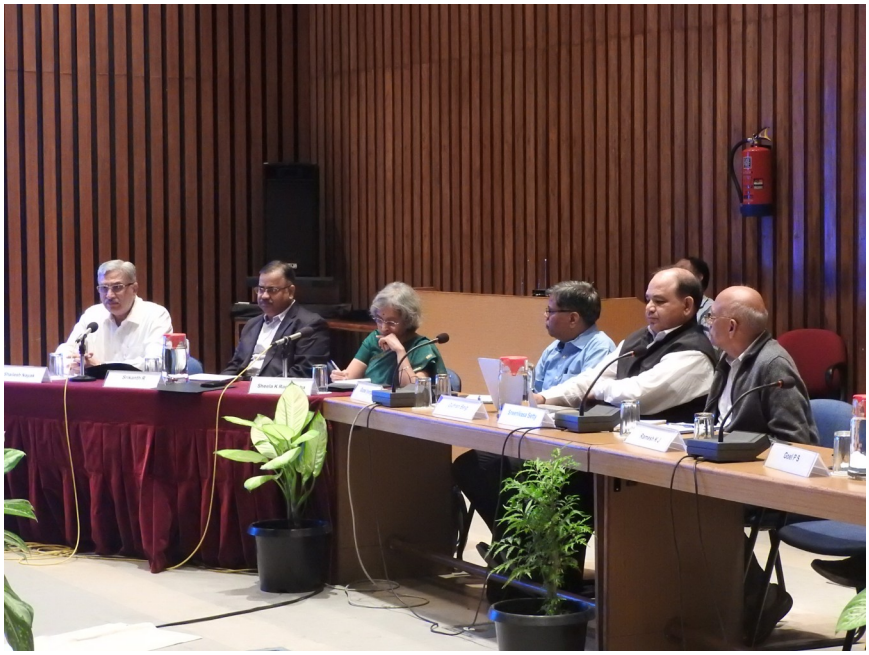
Dr. Vaibhav Chaturvedi from the Council on Energy, Environment, and Water, (CEEW) explained how electricity subsidies for farmers are also distorting energy markets and water use behaviour in agriculture. However, water scarcity has not been considered in the energy and climate change scenarios for India though water may turn out to be a constraint for India's energy and climate policies.

In his talk, Prof. Nagaraj Narappa explained how the current policies of subsidized or free electricity to farmers are promoting over-extraction of groundwater while adversely affecting the health of the Government Distribution Companies (DISCOMs) who are not in a position to invest in the electricity distribution system, ultimately leading to poor quality of power particularly in the rural areas of India.

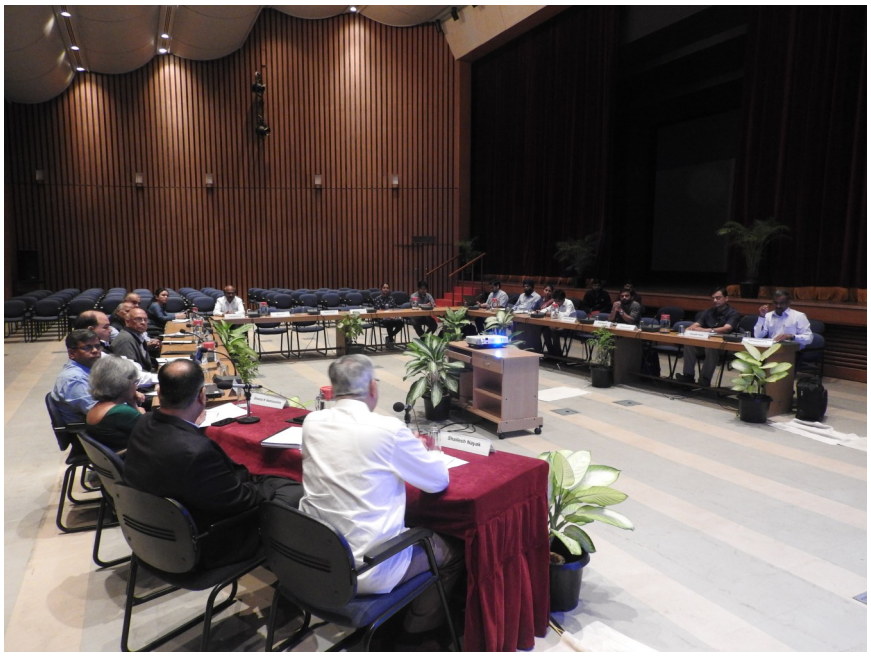
Water Efficiency in Power Generation

Dr. Shresht Tayal of TERI indicated that about 18% of water consumed in the country is used for power generation, mostly in CPPs. Unfortunately, 41% of India's coal-fired power generation capacity is located in highly water-stressed areas. Dr. Tayal concluded by explaining the need to examine the feasibility of water neutrality in power generation.

Mr. AV Krishnan (ex BHEL) detailed the various technologies which can be implemented to reduce specific water consumption in CPPs since the current specific water consumption standard has been reduced to 3.5 m^3/MWh for older plants and to 3.0 m^3/MWh with zero wastewater discharge in case of CPPs installed after 1st January 2017.



All the distinguished speakers shared their findings relevant to the Project and answered all the queries posed by the audience during and after their respective talks. The Workshop then ended with a Vote of Thanks by Dr. Sheela Ramasesha who played a key role in organizing the Workshop.



About EEP

The ongoing research projects in the Energy and Environment Program (EEP) at NIAS revolve around the Sustainable Development Goals with particular focus on: energy and environment, minerals, water, steel and other basic materials, and governance issues related to coal, electricity, and mining.

These projects have enabled EEP to attract a significant number of PhD students and researchers. In addition, members of EEP are also engaged with the Government of India on various policy issues.

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