

INSEE

Indian Society for Ecological Economics



**INSEE - CESS International Conference
on**

Climate Change and Disasters: Challenges, Opportunities and Responses

The Tenth INSEE Biennial Conference

Organised jointly with

**Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
&
National Institute of Rural Development and Panchayati Raj, Hyderabad**

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Preface

The INSEE-CESS International Conference on Climate Change and Disasters: Challenges, Opportunities and Responses, The Tenth INSEE Biennial Conference was organised jointly with and hosted by the Centre for Economic and Social Studies (CESS), Hyderabad in partnership with the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ, India) and the National Institute of Rural Development and Panchayati Raj (NIRDPR), Hyderabad during November 6-8, 2019.

This Conference Proceedings is a collection of selected papers from those presented during the conference. It is heartening to note that the conference call for abstracts and papers received a good response. We received about 213 paper abstracts against our call for abstracts. Each abstract received was double reviewed by members of the Scientific Advisory Committee (SAC). Based on the review of abstracts about 139 authors were invited to submit full papers of which 92 authors submitted their full papers. The full papers were again double reviewed by the SAC and finally 66 papers were recommended for oral presentation and eight for poster presentation in the conference. This volume consists of select 29 papers that were presented in the conference.

We take this opportunity to thank all the members of the Scientific Advisory Committee for their time and support in the review process to ensure the quality of papers included in the conference. Our sincere thanks are also due to the co-ordinators of various sub-themes, Prof. Amalendu Jyotishi (Climate Change: Macro Perspectives), Dr. Tapas Kumar Sarangi, Prof. R Balasubhramaian and Prof. Asmita Kabra (Impacts, Mitigation and Adaptation), Dr. Rakesh Kumar Sharma (Incentives, Institutions, Governance and Communities) and Dr. Manjula M (Extreme Weather Events and Disasters), Ms. Brototi Roy (Climate Justice and Equity), Dr. Santadas Ghosh (Building Climate Resilience), Prof. L Venkatachalam (Others) for their contribution in the process of selecting the papers.

We take this opportunity to also thank all those who have whole heartedly supported and contributed to the successful conducting of the conference. We would like to express our special thanks to Prof. E Revathi, Director and the staff of CESS, Mr. Rajeev Ahal and Meekha Hanna Paul from GIZ, India, Dr. W. R. Reddy, Director General, Prof. Jyothis Sathyapalan, faculty and staff of Centre for Wage Employment, NIRDPR for their collaboration and for providing valuable in-kind, financial support for organising the conference. The conference also received valuable support from the TATA TRUSTS, Indian Council of Social Science Research (ICSSR), Government of Telangana, National Bank for Agriculture and Rural Development (NABARD), South Asian Network for Development and Environmental Economics (SANDEE) and Centre for Economics, Environment and Society (CEES), Bangalore. We express our sincere thanks to all of them. A special word of thanks to Malavika Chauhan and Amitanshu Chowdhury for enabling the support from Tata Trust for the conference. Finally, we are thankful to the members of the Executive Committee of INSEE, the Local Organising Committee and the INSEE Office without whose unwavering support, the organization of this conference and the associated events would not have been possible.

The financial assistance received from the Research and Development Fund of National Bank for Agriculture and Rural Development (NABARD) towards the publication of the proceedings of the Conference is gratefully acknowledged.

We place our sincere thanks to the Indian Council of Social Science Research (ICSSR) for their financial support towards partially supporting the publication of the proceedings.

Jeena T Srinivasan

Associate Professor, CESS
Secretary, INSEE &
Conference Organising Secretary

K N Ninan

President, INSEE





The International Society for Ecological Economics



Clóvis Cavalcanti
President
The International
Society For
Ecological Economics
(ISEE)

Message

It is a great honor for me to send this greeting to the 10th biennial conference of INSEE. I am sure that during this meeting you will do your best to promote our field of work, created in the 1980s. INSEE-2019 is a precious opportunity to achieve progress in this process. We need to demonstrate that ecological economics is a path to a saner, truly sustainable world. Without forgetting that INSEE is a fundamental piece of ISEE, being its only regional society in Asia.

When I decided to stop being a conventional economist, and follow the guidance of Nicholas Georgescu-Roegen, I was convinced of his proposal for introducing thermodynamics in the economic approach by changing the understanding of the field of conventional economics. I was fortunate to hear Georgescu in Rio when I was 23 and an admirer of Neoclassical theory. Some years later, I met Herman Daly and then my adherence to the entropic vision of the economic process was completed. Ecological economics is for me the ecological view of the economy, against the economic view of the economy of Neoclassical and Keynesian economics. The economic view of nature, in contrast, is the perspective of the environmental economics. In essence, our discipline is not a branch of economics.

I have always adopted the view of strong sustainability and assumed the steady-state economy model. I also realize that our commitment is to work with the notions of the incommensurability of values, socio-environmental conflicts and injustice, and different languages of valuation. With these references, I cannot be a “light” ecological economist. This is one reason why I have worked for ISEE to be a scientific society committed to promoting the art of life, good living, happiness, social equity, studying how to achieve that much with a minimal ecological footprint. I would like thus to propose that we be more militant. May we have the courage to take on values such as those exposed by the papal encyclical *Laudato Si'*, and like those adopted in the philosophy of GNH (gross national happiness), introduced in the Kingdom of Bhutan from 1972 on. With a view to these commitments, I have sought an involvement with the encyclical *Laudato Si'*, whose ecological-economics credentials seem to be straightforward.

I consider the theme of the 10th INSEE conference – “Climate Change and Disasters: Challenges, Opportunities and Responses” – very appropriate for what I imagine. In this sense, I agree with some of my fellow ecological economists that a deeper and more radical epistemological and ethical rupture is required of ecological economics with the premises of Neoclassical economic rationality. Climate change is a

demonstration of the dangers that the prevailing unsustainable growth model poses for the future of the human species.

I am sure that we agree that humans are the planet's top predator. In this capacity, as David Suzuki has said, "our species remains dependent on clean air, water and soil and biodiversity, making our ability to survive catastrophic planetary disruption questionable." This is a perception we catch also from the Global Footprint Network's calculations leading us to the conclusion that there must be a demarcation of the commitment ecological economists must make to the sustainability of life on the planet. The challenges are clear. Our world has moved into an increasingly frightening picture of unsustainability. The collapse of the Genoa bridge, Italy, in August 2018, indicates this sense of unsustainability. Something can happen suddenly in complex socio-ecological systems, totally beyond our imagination. The commitment of ecological economists is with sustainable bridges, sustainable health, sustainable human well-being, broad equity, and the prudent use of life-support systems. We have to face the reality that what we are doing corresponds to the title of a book by our colleague in ISEE, Brian Czech: "shoveling fuel for a runaway train".

I hope and wish that you can leave Hyderabad assured of our historical responsibilities as ecological economists, rejecting any image that we are a branch of economics. No, our field of work is that of a revolutionary, post-normal, dialectical science, committed to the supreme value of life, with equality, efficiency and sustainability.

In Rio's ISEE conference in June 2012, I said that our affection for humanity should lead us to think about improving the human condition. This is the task I conceive for ecological economics following the diagnosis of Alfred North Whitehead that we are here, first, to live, second, to live well, and, thirdly, to live better. We are not here to own more and more gadgets – some plainly stupid. We do not want to see our world collapsing like that fateful bridge in Genoa. We love life. We want to preserve Nature for our descendants. This takes us to affection as the basis of sustainability and of ISEE. In other words, we do not want to see our world collapsing for we love life, we love nature and we want to preserve nature for our descendants – we love them.

Let's build a field that works towards promoting our ideal of sustainability, justice and efficiency. And let's hope that ours will be a fruitful job involving more activism and more activities that leave smaller ecological footprints as strong features both of INSEE and ISEE. In other words, let us make Ecological Economics a humane enterprise revolving around affection. If you do not lose sense of this commitment, you will be contributing to the steady and consistent development of ecological economics. Have a very good conference.

Clóvis Cavalcanti

Message



K N Ninan
President
Indian Society For
Ecological Economics
(INSEE)

The Tenth Biennial Conference of the Indian Society for Ecological Economics (INSEE) which is co-organised and being held at the Centre for Economic and Social Studies (CESS), Hyderabad during November 6-8, 2019 will mark a milestone when INSEE completes two decades since its registration as a professional society in the year 1999. Over the past two decades INSEE has tried to fulfil its mission and mandate by furthering the cause of sustainable development by providing a forum for dialogue among scholars, practitioners, and policy analysts from various disciplines, particularly economics and ecological sciences on a range of national and international issues such as climate change, natural resources, energy, waste, ecosystem services and valuation. These two decades have witnessed several activities including the successful conduct of nine biennial conferences, several capacity building workshops and training programmes, special lectures, refresher courses for young scholars, publication of books and more recently launch of INSEE's flagship journal Ecology, Economy and Society which has published two volumes so far. Over the years INSEE has collaborated with several governmental and non-governmental agencies, national and international institutions, donor and UN agencies to organise its activities.

It is befitting that the theme of the Tenth INSEE Biennial conference is on 'Climate Change and Disasters: Challenges, Opportunities and Responses' which is of great concern to India, other developing countries and the world. The risks arising from climate change are many, such as unforeseen and extreme weather events like heat waves, typhoons and cyclones, coastal and river flooding and prolonged droughts. These can have adverse economic, social and environmental consequences and affect human well-being and the overall quality of life. The rising demand for food due to rising population and incomes coupled with declining production of staples such as wheat, rice and maize due to the adverse effects of climate change will undermine food security and affect the poor and vulnerable people.

Building resilience to address these climate risks therefore poses a challenge to governments, societies and entities. Mainstreaming 'resilience' into development plans is therefore critical to tackling poverty, inequality, ill health and poor sanitation, as well as realizing the Sustainable Development Goals (SDGs), since poor and marginalized people and poor countries that have low adaptive capacity are most vulnerable to the adverse consequences of climate change. Improving climate and disaster risk management can also lead to larger gains in development and poverty reduction. Building resilience will also be helpful in coping with the uncertainties arising from the complex and dynamic interactions between climate change and other parameters such as health.

What are the likely impacts of climate change on human and natural ecosystems? How will it affect different sectors and sections of the society? What are the alternatives and policy options to address the risks posed by climate change and extreme weather events?

To discuss the challenges, opportunities and responses for addressing the risks posed by climate change and extreme weather events from different perspectives the Tenth Biennial Conference of INSEE will provide a platform for students, researchers, practitioners and policy makers to discuss these issues.

The broad sub-themes covered in the biennial conference includes the macro perspectives on climate change; impacts, mitigation and adaptation; incentives, institutions, governance and communities; extreme weather events and disasters; climate justice and equity; and building climate resilience through nature-based solutions and other alternative approaches. The conference will have keynote addresses by several eminent experts from both India and abroad, plenary and several parallel technical sessions, panel discussions, poster sessions and other activities. The conference will also have curtain raiser events with lectures by INSEE members in other institutions in Hyderabad, as well as pre- and post-conference events. Presentation of the Inaugural Bina Agarwal Prize for Ecological Economics to Professor Joan Martinez-Alier, honouring Professor C H Hanumantha Rao for his Lifetime Achievements, and honouring and conferring the title of INSEE Fellow on Professors M N Murty, Ramprasad Sengupta and Madhu Verma are other noteworthy events during this conference. Another important event is the IPCC Outreach Event/ Dissemination Activity by the Intergovernmental Panel on Climate Change (IPCC) being organised by INSEE where selected IPCC authors will share and discuss the findings of the Special Reports of the IPCC on Global Warming of 1.5°C; Climate Change and Land; Oceans and Cryosphere in a Changing Climate, and the ongoing AR6 assessment cycle. The conference will provide an opportunity for researchers and scholars belonging to different disciplines and policy makers to have a dialogue and share their research from different perspectives, as well as help build networks both within and outside India.

We look forward to the successful conduct of the conference. We would also like to express our immense gratitude to all those who have put in several months of hard labour and work for the organisation of the conference, to the Executive Committee of INSEE, and especially to the Chairman, Director, faculty, administrative and supporting staff of CESS, Hyderabad, to the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), the National Institute for Rural Development Panchayat Raj (NIRDPR), the Government of Telengana, Indian Council of Social Science Research (ICSSR), National Bank for Agriculture and Rural Development (NABARD), TATA TRUST, and the Centre for Economics, Environment and Society (CEES), Bangalore for their valuable support. We would like to profusely thank all the experts and reviewers who reviewed the papers received for the conference which helped ensure the rigour and quality of the papers accepted for the conference. We also extend our sincere thanks to all governmental agencies, national and international institutions, donor and UN agencies for extending their support for the conduct of INSEE's Biennial conferences and other activities and look forward to their continued support.

K N Ninan

Message



E. Revathi
Director, Centre for
Economic and Social
Studies, Hyderabad

The Centre for Economic and Social Studies is co-organising and hosting the Tenth Biennial Conference of the Indian Society for Ecological Economics (INSEE) on "Climate Change and Disasters: Challenges, Opportunities and Responses" during 6-8 November 2019.

We know that threats of climate change loom large over every aspect of our lives with multiple socio, economic and political ramifications. Governments and civil society across the world are putting in earnest efforts to devise ways and methods of adaptation to the extreme events caused by changing weather. It is also equally important to understand the societal response to fine-tune/ customise the adaptation measures. In this context, it is very timely that INSEE has proposed this theme for its Tenth Biennial Conference and the Centre for Economic and Social Studies is glad to co-organise and host the conference. The conference is expected to discuss and debate various issues related to climate change and enhance our understanding of various challenges as well as the opportunities it poses.

We are also glad that CESS is hosting the Biennial Conference of INSEE for the second time and that it coincides with the 20th year of establishment of INSEE which has grown as a vibrant professional body in a short period. It is a matter of happiness to note that the former presidents of the society who were also its founding members will grace this conference. Several professionally well-equipped economists and other social scientists and natural scientists and participants from other civil society organisations are expected to participate in the intense three day Conference.

I warmly welcome all the delegates to our Centre and this conference. I wish you all a pleasant stay in Hyderabad and a productive and successful Conference.

E. Revathi

Message



Rajeev Ahal
Director, Natural
Resource Management
Deutsche Gesellschaft für
Internationale
Zusammenarbeit (GIZ)
GmbH, India.

On behalf of GIZ, I would like to firstly congratulate INSEE on organising the 10th biennial conference this year. It is our pleasure to collaborate with INSEE as a principal partner in organising the conference.

As you may be aware, GIZ is the sole implementing agency of Technical Cooperation for the German Government and is currently present in over 120 countries worldwide. The Indo-German cooperation is 61 years young and works with the Governments and other organisations on issues of environment, Natural Resource Management, climate change, sustainable agriculture, energy, social security - to just name a few.

The prime theme for the INSEE conference this year is 'Climate Change and Disasters: Challenges, Opportunities and Responses'. This is a very relevant topic for India today, given that we currently rank sixth in the Global Climate Risk Index published in 2018.

As alerted by the Intergovernmental Panel on Climate Change, water is one of the key resources impacted by climate change. The German Federal Ministry for Economic Cooperation and Development notes that all the existing problems surrounding water, such as too much water causing floods, too little water causing droughts, or water pollution, will all be further exacerbated by climate change. The interlinkages of water to food, energy and other essential systems for sustaining life makes the issue further critical. In this changing climate scenario, climate resilient water security is therefore a prime concern.

Among our ongoing Indo-German projects on water security, the bilateral project 'Water Security and Climate Adaptation in Rural India' is commissioned by the German Federal Ministry for Economic Cooperation and Development, in cooperation with the Indian Ministry of Rural Development and the Ministry of Jal Shakti. The project is being implemented in Tamil Nadu, Rajasthan, Madhya Pradesh, Uttar Pradesh and at the national level from April 2019-March 2022. The project aims to focus on improving climate resilient water resource management, by improving convergent planning and financing

mechanisms, demonstrating innovative water management measures and strengthening cooperation with the private sector.

While this bilateral project is new, we have worked with Governments in various states on improving water conservation and management measures in our past projects. Under the Indo-German project - Environmental Benefits through MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act; April 2013 - March 2019), we have supported the Government of Andhra Pradesh in reviving more than 2000-year-old tank cascade structures in the Champavathi River Basin, contributing to drought mitigation and flood control at the same time. Along with the Government of Chhattisgarh, a 15-kilometre-long drainage line was treated in Rajnandgaon district, contributing to drought proofing, and enhancing irrigation to about 2000 hectares of agricultural land. A remote-sensing based planning approach for MGNREGA demonstrated under the Indo-German project is now being used by 14,000 Gram Panchayats in India for preparing their annual action plans.

In the new project on Water Security and Climate Adaptation in Rural India, we look forward to continue working with the Government partners, knowledge institutions, civil society and the private sector to develop innovative solutions for improving water security and climate adaptation in rural India.

I am happy to note that I will be participating at the INSEE-2019 conference, where I would look forward to share more about our work, and learn much more from the eminent speakers, researchers and other participants. I am sure the conference will be an exciting opportunity to discuss the challenges and opportunities for addressing climate change in India, especially in the context of natural disasters.

I wish the event organisers and all the participants all the very best.

Rajeev Ahal

Message



W R Reddy, IAS
Director General,
National Institute of Rural
Development and
Panchayati Raj, Hyderabad

Climate change is a reality today. People who did least to cause the problem are the most affected, particularly the rural poor and indigenous communities. Research works show that small and marginal farmers around the world will be the most affected category due to land degradation and global warming. A drastic decline in fish catch and aquaculture production is also predicted due to sea-level rise. Climate change can push more people in developing countries below the poverty line. Our natural environment, sources of food, water, and infrastructure needs to be protected against extreme climate risks. Natural resource management becomes critical to improve the adaptive capacity of people living in rural areas. In India, ecosystem specific approaches are built-in rural development programmes and policies. Protection of forests and watersheds are encouraged to reduce the risk of hazards like landslides, soil erosion, etc. Agroforestry is promoted to retain soil moisture and reduced evaporation. In the coast, we have programmes to manage and restore floodplains, mangroves, and marshes. Decentralised approaches with people's participation at the village level, and the convergence between departments, and other agencies are found to be more effective in building climate-resilient societies. Today women self-help groups at grassroots level play a significant role to improve the adaptive capacity of rural poor against climate change-induced risks.

I congratulate the Indian Society for Ecological Economics for selecting the most policy-relevant theme for the Tenth Biennial Conference. I express my sincere thanks to the organisers for inviting the National Institute of Rural Development and Panchayati Raj as a joint organiser of the conference. I wish a fruitful deliberation and success to the conference.

W R Reddy

About the Conference



Jeena T Srinivasan
Organising Secretary
of the Conference

The risks arising from climate change are many, such as unforeseen and extreme weather events like heat waves, typhoons and cyclones, coastal and river flooding, and prolonged droughts. These can have adverse economic, social and environmental consequences and affect human well-being and the overall quality of life. The rising demand for food due to rising population and incomes coupled with declining production of staples such as wheat, rice and maize due to the adverse effects of climate change will undermine food security and affect the poor and vulnerable people.

Building resilience to address these climate risks pose a challenge to governments, societies and entities. Mainstreaming 'resilience' into development plans is therefore critical to tackling poverty, inequality, ill health and poor sanitation, as well as realizing the Sustainable Development Goals (SDGs), since poor and marginalized people and poor countries that have low adaptive capacity are most vulnerable to the adverse consequences of climate change. Improving climate and disaster risk management can also lead to larger gains in development and poverty reduction. Building resilience will also be helpful in coping with uncertainties arising from the complex and dynamic interactions between climate change and other parameters such as health.

What are the likely impacts of climate change on human and natural ecosystems? How will it affect different sectors and sections of the society? What are the alternatives and policy options to address the risks posed by climate change and extreme weather events?

To discuss the challenges, opportunities and responses for addressing the risks posed by Climate Change and extreme weather events from different perspectives, INSEE invited contributions from students, researchers, practitioners and policy makers on the following broad sub-themes:

1. Climate Change: Macro Perspectives
 - 1.1 Vulnerability assessment
 - 1.2 Growth, human well-being and SDGs
2. Impacts, Mitigation and Adaptation
 - 2.1 Agriculture, fisheries, forests, mining
 - 2.2 Biodiversity and ecosystem services

- 2.3 Urban ecosystems
- 2.4 Energy and renewable energy
- 2.5 Water, lakes, rivers, and marine ecosystems
- 2.6 Health, sanitation and nutrition
- 3. Incentives, Institutions, Governance and Communities
 - 3.1 Carbon prices, taxes, trading and finance
 - 3.2 Regulatory measures
 - 3.3 Governance, Communities and Action
- 4. Extreme Weather Events and Disasters
 - 4.1 Droughts, Floods and Cyclones
 - 4.2 Other extreme events
- 5. Climate Justice and Equity
 - 5.1 Gender
 - 5.2 Vulnerable sections and regions
- 6. Building Climate Resilience
 - 6.1 Nature-based solutions
 - 6.2 Other alternative approaches, Technology and Infrastructure

The conference was announced on the 1st of January, 2019 and received about 215 paper abstracts and 15 proposals for panel discussions. We received abstracts from all over the country and abroad. Each Abstract received was reviewed by two members of the Scientific Advisory Committee (SAC) and basing upon their recommendations, about 139 authors were invited to submit their full papers. We received 92 full papers and each paper was reviewed by two members of the Scientific Advisory Committee. The SAC recommended acceptance of 67 papers for oral presentation and 9 for poster presentations. Ten-panel proposals were recommended for presentation at the conference by the SAC.

The three day event was organised into various plenary, panel and technical sessions. Besides the inaugural address and Presidential address, there were five keynote addresses by eminent scholars. There were also ten-panel discussions, twelve technical sessions of contributed papers and a valedictory session. It also had a special IPCC Plenary Session, award ceremonies of the Bina Agarwal Prize for Ecological Economics, the Lifetime Achievements Award and an INSEE Fellows felicitation function. A special session by the Springer Nature on ethical issues in writing was also organised in the conference. Curtain Raiser Events comprising of three public lectures delivered by eminent scholars were held at the Administrative Staff College of India, at the University of Hyderabad and at Osmania University Arts College . A Pre-conference workshop on Behavioural and Environmental Economics (Organised by INSEE) and a Post-conference workshop on Non-market Valuation Techniques (Organised by INSEE in collaboration with SANDEE and CESS) were conducted on 5th November, 2019 and 9th November, 2019 respectively at CESS. About 30-35 scholars participated in these workshops.

Jeena T Srinivasan

Scientific Advisory Committee

Chair	
K N Ninan	Chairperson, Centre for Economics, Environment and Society, Bengaluru President, INSEE (2018-20).
Members	
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R C Bhatta	Indian Council of Agricultural Research Emeritus Scientist (Economics), College of Fisheries, Mangalore.
Kalyan Das	Professor, OKD Institute of Social Change and Development, Guwahati.
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Rohan D'Souza	Associate Professor, Graduate School of Asian and African Area Studies, Kyoto University.
Kuntala Lahiri Dutt	Professor, Resource, Environment and Development (RE&D) Program, The Australian National University, Canberra, Australia and Editor: Ecology, Economy and Society: the INSEE Journal.
Sunny George	Professor, Kerala Institute of Local Administration (KILA), Thrissur, Kerala.
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N Chandrasekhara Rao	Professor, Institute of Economic Growth, Delhi.

Brototi Roy	Doctoral researcher at the Institute of Environmental Science, EC Member, INSEE (2018-2020).
Tapas Kumar Sarangi	Assistant Director, National Institute of Labour Economics Research and Development (NILERD), New Delhi. Treasurer and EC Member, INSEE (2018-20).
Ramprasad Sengupta	Professor Emeritus, Jawaharlal Nehru University (JNU), Mahatma Gandhi National Fellow of ICSSR at the Centre for Studies in Social Sciences Calcutta, Kolkata.
Priya Shyamsundar	Lead Economist, the Nature Conservancy and Founder Director South Asian Network for Development and Environmental Economics.
Jeena T Srinivasan	Associate Professor, Centre for Economic and Social Studies, Hyderabad. Secretary, INSEE and EC Member (2018-20).
Bejoy K Thomas	Fellow, Water, Land and Society programme, Ashoka Trust for Research in Ecology and the Environment (ATREE), Bengaluru.
Anitha V	Associate Professor, Department of Economics, University of Kerala, Kerala.
L. Venkatachalam	Madras Institute of Development Studies, Chennai. EC Member, INSEE (2018-20).
P Balachandran	Department of Management Studies & Centre for Sustainable Technologies, Indian Institute of Science, Bengaluru.
Kamaljit Bawa	Professor of Biology - Conservation Biology, University of Massachusetts, Boston and Editor, Ecology Economy and Society, the INSEE Journal.
Kanchan Chopra	Former Director and Professor, Institute of Economic Growth, Delhi and Founder Member and former President, INSEE (1998-2000 and 2010-12). Editor, Ecology, Economy and Society, the INSEE Journal.
Saudamini Das	NABARD Chair Professor, Institute of Economic Growth, Delhi.
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Anantha Duraiappah	Director, Mahatma Gandhi Institute of Education for Peace and Sustainable Development (MGIEP)/UNESCO.
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Enamul Haque	Professor of Economics, East West University, Dhaka, Bangladesh and Director (Honorary), Asian Center for Development.
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Asmita Kabra	Professor, Ambedkar University Delhi EC Member, INSEE (2018-20).
Pushpam Kumar	Senior Economic Advisor, UNEP, Environment and Research Scientist, The Earth Institute, Columbia University.
Joan Martinez-Alier	Professor of Economics and Economic History and ICTA researcher, Universitat Autònoma de Barcelona, and founder member and former President, ISEE, 2006-07).
Sujit Kumar Mishra	Associate Professor, Council for Social Development, Southern Regional centre, Hyderabad.
Pranab Mukhopadhyay	Professor of Economics, Goa University. Former President, INSEE (2016-18).
Nandan Nawn	Associate Professor, Department of Policy Studies, TERI University, New Delhi.
Manoj Panda	Professor & Director, Institute of Economic Growth Delhi.
Seema Purushothaman	Professor, Azim Premji University and former Vice President, INSEE (2014-16).
V Ratna Reddy	Director, Livelihoods and Natural Resources Management Institute (LNRMI) Lakshminagar, Mehadipatnam, Hyderabad.
Joyashree Roy	Professor of Economics and Coordinator, Global Change Programme, Jadavpur University.
Jyothis Sathyapalan	Professor & Head, Centre for Wage Employment, National Institute of Rural Development, Rajendranagar, Hyderabad,
Amrita Shah	Honorary Fellow, Centre for Development Alternatives, Ahmedabad and former President, INSEE (2012-14).
E Somanathan	Professor of Economics, Indian Statistical Institute, New Delhi and Executive Director, SANDEE.
Nandini Sundar	Professor of Sociology at the Delhi School of Economics, Delhi University.
Madhu Verma	Professor, Indian Institute of Forest Management, Bhopal, India.
Arild Vatn	Professor of Environmental Sciences at the Department of International Environment and Development Studies at the Norwegian University of Life Sciences (NMBU), Norway.

Local Organising Committee

Convener	
Prof. E Revathi	Director and Professor, Centre for Economic and Social Studies, Hyderabad.
Members	
K Anantha	Senior Scientist-Natural Resource Management ICRISAT Development Center Asia Program, Hyderabad.
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S.Galab	Professor, Centre for Economic and Social Studies, Hyderabad.
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Sujit Kumar Mishra	Associate Professor, Council for Social Development, Southern Regional Centre, Hyderabad.
Bibhu Prasad Nayak	Associate Professor, Tata Institute of Social Sciences, Hyderabad.
M S R K.Prasad	Administrative Officer, Centre for Economic and Social Studies, Hyderabad.
M.Gopinath Reddy	Professor, Centre for Economic and Social Studies, Hyderabad.
Jyothis Sathyapalan	Professor & Head, Centre for Wage Employment, National Institute of Rural Development, Rajendranagar, Hyderabad.
Sushil Sen	Academic Programmes Officer, Institute of Economic Growth; INSEE (Office Manager).
C S Shylajan	Professor, IBS Hyderabad, Dontanapalli Shankarpalli Road, Hyderabad, Telangana.
G. Alivelu Sivaprasad	Associate Professor, Centre for Economic and Social Studies, Hyderabad.
Jeena T Srinivasan (Organising Secretary)	Associate Professor, Centre for Economic and Social Studies, Hyderabad. Secretary, INSEE (2018-20).
Lavanya Suresh	Assistant Professor, Department of Humanities and Social Sciences, Birla Institute of Technology & Science-Pilani, Hyderabad Campus. Telangana.
V. Subash Varma	Finance Officer, Centre for Economic and Social Studies, Hyderabad.

Keynote Speakers



Mr. Rajeev Ahal

Director, Natural Resource Management (NRM), GIZ.

Mr Rajeev Ahal works as Director, Natural Resource Management (NRM) at GIZ India, where he leads the project 'Water Security and Climate Adaptation in Rural India' along with four other projects on issues of NRM production and marketing systems, green financing and climate risk insurance. Mr Ahal has over 30 years of experience in working with international agencies, governments and the private sector in India and African countries on issues of NRM, livelihoods, decentralisation and local governance, social protection among others. He majored in Electrical Engineering for his graduation, and also holds a Diploma in International Programme for Organisational and Systems Development from Gesalt Center for Organisational and Systems Development in Ohio.



Prof. Kirit S. Parikh

Chairman, Integrated Research and Action for Development, IRADe.

He was Member, Planning Commission from 2004 to 2009. He was a Member of the Economic Advisory Council (EAC) of five Prime Ministers of India, Atal Behari Vajpayee, P.V. Narasimha Rao, Chandra Shekhar, V.P.Singh and Rajiv Gandhi.

Founder Director and Vice Chancellor of Indira Gandhi Institute of Development Research (IGIDR) and Professor of Economics since 1967 and has a Doctorate in Civil Engineering and a Master's degree in Economics from Massachusetts Institute of Technology (MIT).

As Member of Planning Commission in charge of Energy and Water, he was the principal architect of India's official Integrated Energy Policy.

He chaired the expert group on 'Low Carbon Strategy for Inclusive Growth' in 2014. The report has had significant impact on India's energy and climate change policy.

He was conferred Padma Bhushan in 2009, shared the Nobel Prize in 2007 given to IPCC authors and was a review editor of IPCC-3 and IPCC-5. Honoured as the Most Distinguished and Illustrious Alumni of the Decade from India by MIT and as Distinguished Alumnus by IIT-Kharagpur.



Prof. N.H. Ravindranath

Professor (Retd.)

Centre for Sustainable Technologies, Indian Institute of Science Bangalore, India.

Areas of Research, Development and Policy Advocacy include: Climate Change, Forests, Bioenergy and Ecosystem Services.

Prof. Ravindranath has focused his research, advocacy and publications on various dimensions of Climate Change - Mitigation Assessment, Greenhouse Gas Emissions Inventory in Land Use Sectors, Impact of Climate Change and Vulnerability Assessment in Forest and Agro-ecosystems, Adaptation and Climate Resilience, Forest Ecology, CDM and REDD+ Projects. He has also worked on Bioenergy, Biofuels and Biomass Production, Environmental / Ecosystem Services, and Citizen Science.

1. He is an author for several IPCC (Intergovernmental Panel on Climate Change) Assessment Reports on Climate Change - WMO and UNEP focusing on mitigation in forest sector.
2. He is an author for IPBES (Intergovernmental Platform on Bio-diversity and Ecosystem Services)-Reports.
3. He is the Scientific Advisory Panel Member for Global Environmental Outlook (GEO 6)
4. He was the Science Technology Advisory Panel (STAP) member of GEF (Global Environmental Facility) for Climate Change Focal Area during 2008 - 2012.
5. He is a UNFCCC expert for GHG (Greenhouse Gas) inventory reports submitted to UN.
6. He has published 8 books (from Oxford and Cambridge Uni. Press, Kluwer, and Springer Publishers) out of which 4 are on Climate Change.
7. He has published over 150 peer reviewed research papers out of which about 60 are on Climate Change.
8. He has brought out special issues on Climate Change in Journals such as Current Science, Mitigation and Adaptation Strategies to Global Change.
9. He has worked for or advised many State governments on "Assessment of Climate Change Projections, Impacts and Vulnerability". He also has worked at national level on MGNREGA and climate change.
10. He is an expert for several World Bank, UN and other bilateral projects related to climate change.



Prof. Thomas Sterner

Professor of Environmental Economics at the University of Gothenburg.

Thomas Sterner is a Professor of Environmental Economics at the University of Gothenburg in Sweden, whose work is focused on the design of policy instruments to deal with resource and environmental problems. He has built up the Unit for Environmental Economics as a leading European centre for environmental economics that gives a unique PhD program in climate economics with students from developing countries. He has been advisor to around 50 PhD students.

Sterner has published more than a dozen books and a hundred articles in refereed journals, mainly on environmental policy instruments with applications to energy, climate, industry, transport economics and resource management in developing countries. He has in particular worked on the importance of fuel taxation for climate and transport policies. He has also worked on the feasibility and income distributional aspects of environmental policies. Another body of his work is focused on intertemporal discounting.

Sterner is the recipient of the Myrdal Prize, Past President for the European Association of Environmental and Resource Economists and Associate Editor of *Environmental and Resource Economics*. He is also a Fellow or researcher at Resources for the Future, The Beijer Institute and Statistics Norway and an EAERE Fellow.

With Gunnar Köhlin, he has founded the Environment for Development Initiative and is a member of the research board of several developing country networks such as CEEPA (Africa) and SANDEE (in South Asia) and the Board of Academic advisors to the Center for Chinese Agricultural Policy, CCAP of the Chinese Academy of Sciences. He sits on numerous boards and is Guest Professor in Cape Town. He is a Member of the Scientific Advisory Panel on Sustainability to the Swedish Government.

During 2012 and 2013 he served as Visiting Chief Economist of the Environmental Defense Fund in New York and he remains affiliated with EDF. For the year 2015-16 he was elected as a guest professor (chaireannuelle) at the Collège de France. Sterner also served in the AR5 of the IPCC where he was Coordinating Lead Author of chapter 15 on policy instruments.



Dr. Vinod Thomas

Former Senior Vice-President, The World Bank.

Vinod Thomas is currently Special Adviser to the President and Dean of Asian Institute of Management and Visiting Professor at National University of Singapore. Previously he was Director General of Independent Evaluation at the Asian Development Bank (2011-2016).

Prior to ADB, Vinod was Director-General and Senior Vice-President of the Independent Evaluation Group at the World Bank Group (2006-2011). He was formerly Country Director for Brazil and Vice-President. He was Vice-President of the World Bank Institute. Having joined the World Bank in 1976, he was Chief Economist for the East Asia and Pacific region, Director for the World Development Report, Chief of Trade Policy and Principal Economist for Colombia, and Economist for Bangladesh.

Vinod has a PhD and MA in Economics from the University of Chicago and a BA from St. Stephen's college, Delhi. He has authored 16 books, articles, and reports on macroeconomic, social and environmental issues. His books include: *The Quality of Growth*, 2000, *Multilateral Banks and the Development Process*, (with Xubei Luo), 2012, *Climate Change and Natural Disasters*, 2017, and (with Namrata Chindarkar) *Economic Evaluation of Sustainable Development*, 2019.

He has taught at Vassar College, New York and the University of Sao Paulo, Brazil, been on several Boards and has addressed numerous fora in all regions. He has been advisor for evaluation at Global Climate Fund and at IFAD, and for Results for Development and the Emerging Market Forum.



Prof. Madhu Verma

Professor, Area of Environment & Developmental Economics and Coordinator - Centre for Ecological Services Management, Indian Institute of Forest Management.

A biological Science graduate and MA, M.Phil & Ph.D. in Economics from Bhopal University, Bhopal. She is a Fulbright Fellow (2012), LEAD Fellow (2007) and World Bank EMCaB program's EEOFCA Grant awardee (2001) for post doc research at the UC (Berkeley) as Visiting Scholar and at UMASS (Amherst) & as Visiting Professor (2001). She works on Economic Valuation & Green Accounting of Ecosystems & Biodiversity, Ecosystem-Economy Modelling, Tiger & Snow Leopard Habitat Valuation, Forest-Fiscal Federalism and Payment for Ecosystem Services. She has 35 years of enriched work experience with many national and international institutes, Ministries like MoEFCC, MoFinance, Forestry Commission & various Finance Commissions of India and United Nations bodies, World Bank and various international funding agencies and academic institute. She has travelled across the globe to more than 30 countries for work and has more than 40 publications in international and national journals, several books & Project Reports to her credit. Many of her research outcomes have greatly influenced the policies and decision making process of the government and have led to introduction of economic instruments in the system. She has contributed to the Millennium Ecosystem Assessment Report, TEEB and to the Global Biodiversity Assessment Report of IPBES.

She has been recognized by United Nations- REDD platform for 'Women Working in Forests', featured in a special issue of India Today in March 2018 on Madhya Pradesh under the category of Trendsetters- Anchors of New Policies for her work on valuation of forest resources to inform policy makers & nominated as a "Human Star" for the "Day out with a Star" forum based at Washington, DC on environmental careers.

Felicitations

Winner of the First Bina Agarwal Prize for Ecological Economics



Prof. Joan Martinez - Alier

Senior Researcher in the Environmental Science and Technology Institute of the Autonomous University of Barcelona (ICTA-UAB).

Joan Martinez-Alier is a senior researcher in the Environmental Science and Technology Institute of the Autonomous University of Barcelona (ICTA-UAB). He is also professor emeritus at FLACSO, Quito. He has edited the journal *Ecología Política* in Barcelona since 1990. His publications are numerous and in English include: *Labourers and Landowners in Southern Spain* (London, 1971), *Haciendas, Plantations and Collective Farms (Cuba and Peru)* (London 1977), *Ecological economics: energy, environment and society* (Oxford, 1987); *Varieties of environmentalism: Essays North and South* (London, 1997), with Ramachandra Guha and *The Environmentalism of the Poor: A Study of Ecological Conflicts and Valuation* (2003). In addition, he edited with Roldan Muradian a *Handbook of Ecological Economics* (2015). He contributed to the book *Degrowth: a vocabulary for a new era* (London, 2014) and co-edited the textbook *Ecological Economics from the Ground Up* (2013), a product of a collaborative research project, CEECEC, 2008-2010, which was followed by the EJOLT project (2011-15), Environmental Justice Organizations, Liabilities and Trade involving 23 academic and activist partners (www.ejolt.org) (www.ejatlas.org). He was President of the International Society for Ecological Economics in 2006 and 2007 and member of the scientific committee of the European Environment Agency between 2000 and 2008. His research focuses on ecological economics, political ecology, agrarian studies, environmental justice and the environmentalism of the poor and the indigenous. In 2016 he was awarded a European Research Council Advanced Grant for the project *EnvJustice (A global environmental justice movement)*, 2016-21.

Lifetime Achievements Award



Prof. C. H. Hanumantha Rao

Past President of INSEE, Former Chairman and Honorary Professor, Centre for Economic and Social Studies, Hyderabad

Professor C.H. Hanumantha Rao holds a PhD from the Delhi School of Economics, University of Delhi (1962). He was Post-Doctoral Fellow, Department of Economics, University of Chicago (1966-67) and Fellow, Institute of Economic Growth, University of Delhi (1961-1992). He has been Hon. Professor, Centre for Economic and Social Studies, Hyderabad since 1992. His areas of interest are: Agricultural Economics, Development Planning and Policy. He has been a member of the Planning Commission, Finance Commission, on the Board of Directors of the RBI; Member, National Advisory Council; and Chancellor, University of Hyderabad. He was awarded 'Padma Bhushan' by the President of India in 2004 in the field of literature and education.

He has published twelve books, seven edited books and over 120 research papers and articles in journals and edited books in India and abroad. He has served as Member of several expert bodies including National Advisory Council, 2004-2008; Technical Advisory Committee for International Agricultural Research, 1996-98; Board of Directors, Reserve Bank of India, 1994-2000; Planning Commission, G.O.I., 1982-86 and Seventh & Eighth Finance Commissions.

He was awarded Rafi Ahmed Kidwai Memorial Prize for 1974-75, by the Indian Council of Agricultural Research, for Outstanding Contribution in the field of Agricultural Economics; Received Financial Express Award for Lifetime Work in Economics, in 1995.

INSEE Fellows



Prof. M.N. Murty

Professor of Economics (Retired), Institute of Economic Growth, University Enclave, Delhi.

He is currently Fellow, South Asian Network for Development Economics and Environment (SANDEE). He was a Ford Foundation Fellow at University of Birmingham and Research Fellow at London School of Economics, UK, Visiting Faculty, at Institute of Developing Economics, Tokyo, Japan and Visiting Professor at National Institute of Public Finance and Policy, and TERI University, Delhi. He was a consultant for World Bank, Asian Development Bank, International Crop Research Institute (ICRISAT) and ESCAP. He specializes in Public Economics and Environmental and Resource Economics. He taught at Delhi University, Institute of Economic Growth, Delhi, Department of Economics, University of Birmingham, U.K, Jawaharlal Nehru University, New Delhi, School of Planning and Architecture, New Delhi, Delhi School of Economics, Delhi, TERI University, Delhi, Indira Gandhi Institute of Development Research, Mumbai, Indian Statistical Institute, Kolkata, Institute for Social and Economic Change, Bangalore, Madras School of Economics, Chennai, and Jadavpur University, Kolkata. He has published 10 books including 6 books in Environment and Resource Economics, four by Oxford University Press, one each by Cambridge University Press and SAGE. He has contributed a large number of research papers to national and international journals of Economics and chapters in a good number of edited books. He has undertaken a number of research projects funded by international organizations like World Bank, IDRC, Canada, ESCAP, European Commission, ICRISAT, Planning Commission, NITI Ayog, CSO, Ministry of Environment and Forests, Ministry of Communications and ICSSR of Government of India.



Prof. Ramprasad Sengupta

Professor Emeritus in Economics at the Jawaharlal Nehru University (JNU), New Delhi.

Prof. Ramprasad Sengupta is a Professor Emeritus in Economics at the Jawaharlal Nehru University (JNU), New Delhi where he was a Professor of Economics for almost four decades and has been a former Dean of its School of Social Sciences. He was Mahatma Gandhi National Fellow of the ICSSR at the Centre for Studies in Social Sciences, Calcutta during 2016 - 2018. He was also a Professor at the Indian Institute of Management Calcutta (1999 -2001) and a Visiting Professor / Scholar in a number of foreign Universities in Europe, North America and Japan. Besides his teaching stints, he was Advisor, Planning Commission, Government of India and a part time Independent Director on the Board of Steel Authority of India for several years.

Prof. Sengupta's area of interest and specialization are Energy, resource and ecological / environmental economics; Quantitative policy modelling of infrastructural sectors. He has written a number of books and large number of scholarly published papers; the latest book authored by him is Ecological Limits and Economic Development : Creating Space, OUP. (2013). His forthcoming book is "Entropy Law, Sustainability and Third Industrial Revolution" to be published by the OUP.



Prof. Madhu Verma

Professor, Area of Environment & Development Economics and Coordinator - Centre for Ecological Services Management, Indian Institute of Forest Management.

Prof. Madhu Verma was a Fulbright Fellow (2012), LEAD Fellow (2007) and World Bank EMCaB program's EEOFCC Grant awardee (2001) for post doc research at the UC (Berkeley) as Visiting Scholar and at UMASS (Amherst) & as Visiting Professor

(2001). She works on Economic Valuation & Green Accounting of Ecosystems & Biodiversity, Ecosystem-Economy Modelling, Tiger & Snow Leopard Habitat Valuation, Forest- Fiscal Federalism and Payment for Ecosystem Services. She has worked with many National and International Institutes and Ministries like MoEFCC, MoFinance, Forestry Commission & Various Finance Commissions of India and UN bodies and World Bank. She has more than 40 publications in International, National Journals and has several books & project reports to her credit. Her work has greatly influenced the policies and decision-making process of the government and have led to introduction of economic instruments in the system. She has contributed to Millennium Ecosystem Assessment Report, TEEB and to the Global Biodiversity Assessment Report of IPBES.

IPCC Outreach Event



Intergovernmental Panel on Climate Change (IPCC) Outreach Event on IPCC's Role, Activities and Findings hosted by the Indian Society for Ecological Economics (INSEE) at the Tenth Biennial Conference of INSEE held at the Centre for Economic and Social Studies (CESS), Hyderabad on November 07th 2019

IPCC

The Intergovernmental Panel on Climate Change (IPCC) is the UN body for assessing the science related to climate change. The IPCC does not conduct its own research. It identifies where there is agreement in the scientific community and where there are differences of opinion and where further research is needed. It is a partnership between scientists and policymakers, and it is this that makes its work a credible source of information for policymakers. IPCC assessments are produced according to procedures that ensure integrity, in line with the IPCC's overarching principles of objectivity, openness and transparency. IPCC reports are policy relevant, but not policy prescriptive.

IPCC assessments provide governments, at all levels, with scientific information that they can use to develop climate policies. IPCC assessments are a key input into the international negotiations to tackle climate change. IPCC reports are drafted and reviewed in several stages, thus guaranteeing objectivity and transparency. In 2013-2014 IPCC published the Fifth Assessment Report. In 2015 and 2016, the IPCC decided to produce a Sixth Assessment Report (AR6), three Special Reports, a Methodology Report and AR6 by 2022 as follows:

- Special Report on Global Warming of 1.5°C (SR1.5) in 2018.
- Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) in 2019.
- Special Report on Climate Change and Land (SRCCL) in 2019.
- Refined 2006 IPCC Guidelines for National Greenhouse Gas Inventories will be delivered in 2019.
- AR6 Synthesis Report to be finalized in the first half of 2022.

Objective:

INSEE with the participation of the IPCC authors is organizing a Panel discussion followed by Q & A session on “Understanding Climate Change Science and Adaptation and Mitigation Options” based on the Special Reports of IPCC and AR6 assessment cycle. The objective of the event is to generate scientific understanding among various stakeholders about climate change to encourage climate actions at local levels. More specifically, it seeks (i) **To raise awareness** especially among policy makers, about the outcomes of the Special Reports of the IPCC and understanding the AR6 assessment cycle and process, and social scientists of INSEE to demonstrate how climate change impacts are closely linked to human dimensions. The event will highlight the current level of multidisciplinary scientific understanding of the climate science, potential solutions to the challenges of climate change focussing on adaption and mitigation; (ii) **To promote knowledge sharing**, especially among policy makers and the scientific community from the region about the IPCC process, priorities and scope of participation in IPCC AR6 process and assessments in future; (iii) **To encourage participation of the local social science research community** in climate research and encourage regional contributions to future assessments and climate change studies; (iv) **To foster better understanding among the news media, youth and the private sector** about climate science, the IPCC’s role and innovative solutions for climate change; (v) **To present key findings of climate change studies and enable climate actions among** policy-makers, development practitioners, students, civil society and business sector representatives.

About the Event:

INSEE will host the event with the participation of IPCC on November 7th, 2019 at the Tenth Biennial Conference of INSEE being held at CESS, Hyderabad. Two more special events for public and policy makers are proposed to be held in Hyderabad on November 8th, 2019 in collaboration with local government and organizations. There will be sessions devoted to discussing the findings of the Special Reports of the IPCC as well as the production of the ongoing Sixth Assessment Report (AR6) and how these are being operationalized in South Asia and the potential solutions. The INSEE programme will help forge synergies with IPCC assessment. The event will have sessions for interaction with the authors and NGOs, policy makers and the local scientific community including students. In addition, INSEE will have poster sessions demonstrating various local actions.

IPCC Plenary Session on November 07th, 2019

Chair/Moderator

Professor Thomas Sterner

Professor of Environmental Economics, University of Gothenburg, Sweden and Contributing Lead Author of the Fifth Assessment Report of the IPCC (2014); and Past President of the European Association of Environmental and Resource Economists.



Speakers (IPCC Authors):

Speaker	Affiliation	Topic
Krishna Achuta Rao	Associate Professor, Centre for Atmospheric Sciences, Indian Institute of Technology, Delhi.	Climate Science and Models
Joyashree Roy	Bangabandhu Chair Professor, Asian Institute of Technology, Thailand.	Main Messages from Special Report on Global Warming of 1.5°C in Sustainable Development Context.
Anjal Prakash	Associate Professor and Associate Dean, Business Development, TERI-SAS, Hyderabad.	Special Report on Ocean and Cryosphere in a Changing Climate.
Joyashree Roy	Bangabandhu Chair Professor, Asian Institute of Technology, Thailand.	IPCC Process and Scope for Participation in AR6.
Jagadish Krishnaswamy	Senior Fellow, Ashoka Trust for Ecology and the Environment (ATREE), Bangalore.	Special Report on Climate Change and Desertification, Degradation, Sustainable Land Management, Food Security, and Greenhouse Gas Fluxes in Terrestrial Ecosystems.



Dr. Jagdish Krishnaswamy

Dr Jagdish Krishnaswamy has a B.Tech in Civil Engineering from Indian Institute of Technology, Mumbai, India and a MS in Statistics and Decision Sciences and a Ph.D in Environmental Studies, Duke University, North Carolina, USA. His research and teaching interests include ecohydrology, landscape ecology, conservation planning, ecosystem services and applications of bayesian approaches in understanding complex changes in the environment over space and time. He has coordinated the establishment of instrumented catchments in the Western Ghats and in the Himalayas to study the impacts of land-cover and climate variability on hydrological processes. Jagdish has recently become involved in defining and assessing ecological flow requirements of rivers in the Western Ghats and the Ganga basins with a special focus on endangered species such as the gharial and river dolphin. His work on climate science and climate change includes vegetation response to climate and land-cover change in India, Central America and Africa. Over the years, his work has contributed to various policy and actions such as the declaration of the Western Ghats as a UNESCO World Heritage Site, the investment of the Critical Ecosystem Partnership Fund in the Western Ghats and a special report on Himalayan Springs to the Niti Ayog. He has designed capacity building and field hydrology training courses for aquatic ecologists and grass roots NGOs. He is a Coordinating Lead Author of the Special IPCC Report on climate change, desertification, degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems.



Dr. Anjal Prakash

Dr. Anjal Prakash is Associate Professor and Associate Dean - Business Development at TERI-SAS Hyderabad Campus. Before joining TERI- SAS, Dr. Prakash worked as the Programme Coordinator of Himalayan Adaptation, Water and Resilience (HI-AWARE) Research on Glacier and Snowpack Dependent River Basins at International Center for Integrated Mountain Development (ICIMOD) based in Kathmandu, Nepal. Dr. Prakash has been selected as coordinating Lead Author for the IPCC Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) and also been selected as a Lead author in the chapter on cities, settlements and key infrastructure in the IPCC's 6th Assessment Report.



Dr. Krishna Achuta Rao

Dr. Krishna Achuta Rao is currently Associate Professor, Centre for Atmospheric Sciences at Indian Institute of Technology, Delhi (IIT-Delhi). Prior to join IIT-Delhi Dr. Achuta Rao was working as a Research Scientist at Program for Climate Model Diagnosis and Intercomparison (PCMDI), Lawrence Livermore National Laboratory, Livermore CA, U.S.A. He is one of the Lead Authors in the Sixth Assessment Report of Working Group 1 (Chapter-3) of the Intergovernmental Panel on Climate Change (IPCC). His research interests span ocean heat uptake, variability of the coupled ocean-atmosphere system from ENSO to decadal and longer time-scales, climate model verification and diagnosis, regional impacts and detection & attribution of climate change.



Prof. Joyashree Roy

Prof. Joyashree Roy is currently the Bangabandhu Chair Professor at Asian Institute of Technology, Bangkok in Thailand and Professor of Economics, Jadavpur University, Kolkata (on lien). Prof. Roy is also one of the Coordinating Lead Authors of the Sixth Assessment Report of Intergovernmental Panel on Climate Change (IPCC). She is founder advisor of the Global Change Programme at Jadavpur University, which focuses on climate change research and beyond. She is interested in multidisciplinary approaches to understand development challenges. Her research interests are: Economics of Climate Change, Modeling energy demand, Water quality demand modeling, Sustainable development indicator development, Developmental and environmental issues relevant for informal sectors and Coastal ecosystem service evaluation. She has worked extensively with developing country data.

Other IPCC Outreach Events

Date	Time	Venue	Chair / Moderator
7 th November, 2019	14.30 - 16.00	Environment Protection Training and Research Institute, Gachibowli, Hyderabad.	Sri B.Kalyan Chakravarthy , IAS Director General.
	10.00 - 11.30	ICRISAT, Patancheru, Hyderabad.	Anthony Whitbread, Research Program Director, Innovation System for the Drylands, ICRISAT.
8 th November, 2019	15.00 - 17.00	Centre for World Solidarity, Tarnaka, Secunderabad.	Ms. Suryakumari Director, Centre for Peoples' Forestry, Secunderabad.

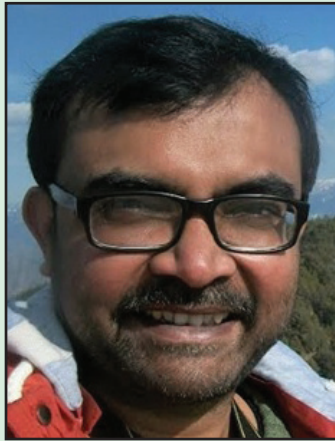
Speakers at the Curtain Raiser Events



Shreekant Gupta

Shreekant Gupta is Professor at the Delhi School of Economics, University of Delhi. He has held visiting appointments at National University of Singapore, Nazarbayev University and Jawaharlal Nehru University. Prior to joining University of Delhi, he was Fellow, National Institute of Public Finance and Policy where he headed the Environmental Policy Cell. He has also worked as an environmental economist at the World Bank at Washington DC and as an economist in the Indian government (Indian Economic Service cadre). His policy experience includes Directorship of National Institute of Urban Affairs. He has served on various national and international committees on environment, notably the Economic Options Committee of the Montreal Protocol and 3rd, 5th and 6th Assessment Reports of IPCC.

Professor Gupta has a Ph.D. in Economics from the University of Maryland and was Fulbright Fellow at Massachusetts Institute of Technology and Shastri Fellow at Queens University. He is an Associate Editor of the *Indian Economic Review* and serves on the editorial board of *Agricultural and Resource Economics Review*.



Nandan Nawn

Nandan Nawn, is an economist by disciplinary training with a doctoral degree from Jawaharlal Nehru University. He is presently at Department of Policy Studies, TERI School of Advanced Studies, New Delhi. He teaches a course on Methods of Research in Economics besides multiple courses in the interface of Environment, Development, and Economics in the MSc Economics (with a specialization in Environment and Research Economics) programme. His present research interests are in Ecological Economics, Environment and Development and Environmental-Economic Accounting. Before joining TERI SAS in 2014, he has taught in the West Bengal National University of Juridical Sciences, Kolkata since 2001. His works have been published in various journals including *Journal of Agrarian Change*, *Economic and Political Weekly* and *Journal of Human Development and Capabilities*. He has recently co-edited *Ecology, Economy and Society: Essays in Honour of Kanchan Chopra* (2018; Springer), *Global Change, Ecosystems and Sustainability* (2017; Sage) and *Economic Challenges for the Contemporary World: Essays in Honour of Prabhat Patnaik* (2016; Sage). He was the Head of Department of Policy Studies of TERI SAS (2017-18) and Secretary of the Indian Society for Ecological Economics (INSEE; 2016-18). He has been a recipient of doctoral fellowships from University Grants Commission, Indian Council of Social Science Research and Fulbright-Nehru International Education Administrator Seminars scholarship, besides being an Associate at the Indian Institute of Advanced Study, Shimla. He is presently the Managing Editor of *Ecology, Economy and Society—the INSEE Journal*, a guest co-editor of the “Review of Environment and Development” in *Economic and Political Weekly*, Coordinator of Internal Quality Assurance Cell (IQAC), TERI SAS and coordinator of Bioeconomy component of the pilot precursor project to National Mission on Biodiversity and Human Well-Being (2020-25), funded by Office of the Principal Scientific Adviser, Government



Pranab Mukhopadhyay

Pranab Mukhopadhyay is Professor of Economics at Goa University. He is a Fellow of the South Asian Network for Development & Environmental Economics (SANDEE), Kathmandu and was former President of the Indian Society for Ecological Economics, INSEE (2016-18). He graduated from Presidency College, Calcutta and did his masters and doctoral work at Jawaharlal Nehru University, New Delhi. He has co-edited *Promise, Trust and Evolution: Managing the Commons of South Asia*, (OUP, UK, 2008), *Global Change, Ecosystems, Sustainability*, (Sage Publications, New Delhi, 2017) and *Nature, Economy and Society* (Springer, New Delhi, 2016). He co-authored the book *Common Property Water Resources: Dependence and Institutions in India's Villages* (TERI Press, New Delhi, 2008). His articles have been published in *Climatic Change*, *Current Science*, *Ecology and Society*, *Environment and Development Economics*, *Economic and Political Weekly*, *Geojournal*, and *Journal of Quantitative Economics*.

Curtain Raiser Events

5th November, 2019

Sl.No	Speaker	Topic	Venue
1	Shreekant Gupta	Climate Change: Challenges and Policy Response for India	EDP Administrative Staff College of India, College Park Campus, Road No 3: Banjara Hills Time : 15.00
2	Nandan Nawn	Environment and Economic Development in India: seeing like an ecological economist	Gautam Mathur Seminar Hall Department of Economics Arts College Osmania University Time : 11.00
3	Pranab Mukhopadhyay	Environmental Challenges and Public Policy in India	CR - 2 School of Economics University of Hyderabad Time : 11.30

INSEE – CESS International Conference							
Climate Change and Disasters: Challenges, Opportunities and Responses							
The Tenth INSEE Biennial conference							
DAY 1: 6 th November 2019, Wednesday							
08.30 - 09.15	Registration Auditorium Main Hall						
09.15 - 11.30	Inaugural Session						
11.35 - 12.00	Tea/Coffee Break Car Parking Area						
Panel Session PS 1 (Parallel)							
12.00 - 13.30	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">PS 1.1: How IWRM in India can be more Climate Resilient? (Auditorium Seminar Hall)</td> <td style="width: 33%;">PS 1.2: Climate & Disaster Resilient Urban Development (Seminar Hall I, First Floor, Main Building)</td> <td style="width: 33%;">PS 1.3: Adapting to Climate Change in South Asian Cities (<i>SANDEE-ACD Panel</i>) (Seminar Hall II, Second Floor, Main Building)</td> </tr> </table>	PS 1.1: How IWRM in India can be more Climate Resilient? (Auditorium Seminar Hall)	PS 1.2: Climate & Disaster Resilient Urban Development (Seminar Hall I, First Floor, Main Building)	PS 1.3: Adapting to Climate Change in South Asian Cities (<i>SANDEE-ACD Panel</i>) (Seminar Hall II, Second Floor, Main Building)			
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13.30 - 14.30	Lunch Car Parking Area						
Plenary Session 1 : Climate Resilient Growth in India: Strategies and Measures (Auditorium Main Hall)							
14.30 - 16.00	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Keynote Address: Low Carbon Strategy for Inclusive Growth</td> <td style="width: 50%;">Keynote Address: Water Security and Climate Change Adaptation: Experiences and Way Forward</td> </tr> </table>	Keynote Address: Low Carbon Strategy for Inclusive Growth	Keynote Address: Water Security and Climate Change Adaptation: Experiences and Way Forward				
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16.00 - 16.30	Tea/Coffee Break Car Parking Area						
Technical Session (TS) 1 (Parallel)							
16.30 - 18.00	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">TS 1.1: Growth, Human Wellbeing and SDGs (Auditorium Seminar Hall)</td> <td style="width: 33%;">TS 1.2: Vulnerability, Impact and Adaptation to Climate Change (Seminar Hall I, First Floor, Main Building)</td> <td style="width: 33%;">TS 1.3: Vulnerability to Floods (Seminar Hall II, Second Floor, Main Building)</td> </tr> <tr> <td colspan="3" style="text-align: center;">TS 1.4: Environmental and Climate Justice (Classroom, Ground Floor, Main Building)</td> </tr> </table>	TS 1.1: Growth, Human Wellbeing and SDGs (Auditorium Seminar Hall)	TS 1.2: Vulnerability, Impact and Adaptation to Climate Change (Seminar Hall I, First Floor, Main Building)	TS 1.3: Vulnerability to Floods (Seminar Hall II, Second Floor, Main Building)	TS 1.4: Environmental and Climate Justice (Classroom, Ground Floor, Main Building)		
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TS 1.4: Environmental and Climate Justice (Classroom, Ground Floor, Main Building)							
18.15 - 18.45	Session by Springer Auditorium Main Hall						
18.45 - 19.45	INSEE General Body Meeting (For INSEE Members Only) Auditorium Seminar Hall						
19.30 - 20.30	Cultural Programme Auditorium Main Hall						
20.30 - 21.30	Dinner Car Parking Area						

DAY 2: 7 th November 2019, Thursday		
09.15 - 10.15	Plenary Session 2 Bina Agarwal Prize - Award Ceremony First Recipient: Prof.Joan Martinez Alier	Auditorium Main Hall
10.15 - 10.30	Tea/Coffee Break	Car Parking Area
10.30 - 12.00	Plenary Session 3 The Work and Findings of the Intergovernmental Panel on Climate Change	Auditorium Main Hall
12.00 - 13.00	Plenary Session 4 Felicitations (Auditorium Main Hall)	
13.00 - 14.00	Conferring the Lifetime Achievement Award on Prof.C.H.Hanumantha Rao	Conferring the Honour and Title of INSEE Fellows on Prof.M.N.Murty, Prof.RamprasadSengupta and Prof.MadhuVerma
13.00 - 14.00	Lunch	Car Parking Area
14.00 - 16.00	Technical Session (TS) 2 (Parallel)	
14.00 - 16.00	TS 2.1: Climate Vulnerability: Agriculture and Food Security (Auditorium Seminar Hall)	TS 2.2: Adaptation of Agriculture to Climate Change (Seminar Hall I, First Floor, Main Building)
14.00 - 16.00	TS 2.3: Climate Resilient Measures in Rural India (Seminar Hall II, Second Floor, Main Building)	TS 2.4: Institutions and Sustainability (Classroom, Ground Floor, Main Building)
16.00 - 16.30	Tea/Coffee Break	
16.30 - 18.00	Panel Session (PS) 2 (Parallel)	
16.30 - 18.00	PS 2.1: Local Action Plan on Climate Change: Methodology and Action (Auditorium Seminar Hall)	PS 2.2: Martin Weitzman's Contributions to Environmental Economics (Seminar Hall I, First Floor, Main Building)
16.30 - 18.00	PS 2.3: MGNREGS Contribution to Climate Change Mitigation and Adaptation (Seminar Hall II, Second Floor, Main Building)	
19.30 - 20.30	Dinner	Car Parking Area

Day 3: 8 th November 2019, Friday			
Plenary Session 5			
Climate: Economics and Institutions (Auditorium Main Hall)			
9.30 - 11.00	Keynote Address: Institutional Reforms for Managing the Environment in India	Keynote Address: Dealing With the Climate in an Efficient, Fair and Feasible Manner: What Can We Learn from Economics?	Keynote Address: Climate Change, Forests and Biodiversity: Impact, Vulnerability and Adaptation – Challenges and Opportunities
11.10 - 11.30	Tea/Coffee Break Car Parking Area		
Panel Session (PS) 3 (Parallel)			
11.30 - 13.00	PS 3.1: Climate Change and Indian Agriculture: Methodological Issues (Auditorium Seminar Hall)	PS 3.2: Climate Change, Adaptation and Mitigation – A Focus on Rainfed Agriculture (Seminar Hall I, First Floor, Main Building)	PS 3.3: Building Climate Resilience: Lessons from ‘Commoning’ the Commons (Seminar Hall II, Second Floor, Main Building)
13.00 - 14.00	Lunch Car Parking Area		
Technical Session (TS) 3 (Parallel)			
14.00 - 16.00	TS 3.1: Ecosystem Services, Resource Dependency and Disaster Recovery (Auditorium Seminar Hall)	TS 3.2: Climate Mitigation: Industry and Infrastructure (Seminar Hall I, First Floor, Main Building)	TS 3.3: Conservation, Economic Value and Climate Change Impact (Seminar Hall II, Second Floor, Main Building)
16.00 - 16.30	Tea/Coffee Break Car Parking Area		
16.30 - 17.30	Valedictory Session Auditorium Seminar Hall		

Pre-Conference Workshop
On
Behavioural and Experimental Economics for Environmental Policy

Date: 5th November 2019

Venue: Auditorium Seminar Hall, CESS, Hyderabad.

A one-day pre-conference workshop on Behavioural and Experimental Economics for Environmental Policy was scheduled at the Centre for Economic and Social Studies (CESS), Hyderabad, the venue for the Tenth INSEE Biennial Conference.

This workshop proposed to provide a theoretical background of behavioural and experimental economics, their applications in various fields with emphasis on environmental and natural resource economics. Case studies involving field experiments conducted among farmers in Bhavani river basin and among households of Coimbatore city were demonstrated. Hands on practice session focused on participants gaining insights into design and implementation of laboratory and field experiments as well as natural experiments. The schedule was as follows:

Time	Topic / activity	Resource person(s)
08.30 - 09.00	Registration	
09.00 - 10.15	Behavioural Economics - An introduction to principles and methods	L.Venkatachalam RBI Chair Professor, Madras Institute of Development Studies, Chennai.
10.15-10.30	Discussions	
10.30-10.45	Coffee break	
10.45-12.00	Experimental Economics - Theoretical and methodological overview	R.Balasubramanian Professor of Agricultural Economics, Tamil Nadu Agricultural University.
12.00 - 12.15	Discussions	
12.15 - 1.15	Experimental Economics - An illustrative example from field experiment	L.Venkatachalam
13.15 - 14.15	Lunch Break	
14.15 - 15.30	Experimental Economics - Experiences from the field	R.Balasubramanian
15.30-15.45	Tea Break	
15.45-17.00	Experimental Economics and Environmental Policy	R.Balasubramanian & M. Manjula, MSSRF.
17.00 - 17.30	Discussions and feedback	M.Manjula and workshop participants

There were about 30 participants in this Pre-Conference Workshop.

Post-Conference Workshop
On
Non-market Valuation of Environmental Goods and Services
Date: 9th November 2019
Venue: Auditorium Seminar Hall, CESS, Hyderabad.

Indian Society for Ecological Economics (INSEE) in collaboration with the South Asian Network for Development and Environmental Economics (SANDEE) and Centre for Economic and Social Studies (CESS), Hyderabad, has scheduled a one-day Post-Conference Workshop on Non-Market Valuation of Environmental Goods and Services on November 9th, 2019 at the Centre for Economic and Social Studies (CESS), Hyderabad, the venue for its Tenth Biennial Conference. The one-day workshop covered fundamentals of non-market valuation of environmental goods and services, in terms of theory and empirics. The schedule was as follows:

Time	Topic / activity		Resource person(s)
09:45 - 10:00	Introductions		
10:00 - 11:30	Session I:	Review of the theories of the environmental valuation	Prof. Enamul Haque, East West University, Dhaka.
11:30 - 12:00	Coffee/Tea Break		
12:00 - 13:30	Session II	Applications of environmental valuation in South Asia	Prof. Pranab Mukhopadhyay, Goa University, Goa.
13:30 - 15:00	Lunch break		
15:00 - 16:30	Session III	Writing a good research proposal for valuation of environmental goods and services	Dr. Mani Nepal, Program Coordinator SANDEE & Lead Economist.
16:30 - 17:00	Closing session		

There were about 35 participants in this Post-Conference Workshop.

Program Overview

PROGRAMME

DAY 1: 6th November 2019, Wednesday

(Venue: Auditorium)

08.30-09.30: Registration

09.15-11.30: Inaugural Session

Chair : C.H. Hanumantha Rao

(Past President of INSEE, Former Chairman and Honorary Professor, Centre for Economic and Social Studies, Hyderabad)

09.15-09.25	Introduction	Lavanya Suresh Member, Local Organising Committee
09.25-09.35	Welcome	E Revathi Director, Centre for Economic and Social Studies, Hyderabad
09.35-9.40	Inauguration	Lighting of the Lamp
09.40-10.10	Inaugural Address: <i>Imperatives for Confronting Climate Change and Natural Disasters</i>	Vinod Thomas Former Senior Vice President, The World Bank; Special Adviser to the President, Dean of Asian Institute of Management, Manila; Visiting Professor, National University of Singapore and Former Director General of International Evaluation, Asian Development Bank.
10.10-10.40	Address by the Guests of Honour	V Praveen Rao Vice Chancellor, Prof. Jayashankar Telangana State Agriculture University, Hyderabad Rajeev Ahal Director, Natural Resource Management, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), India W. R. Reddy, IAS Director General, National Institute of Rural Development and Panchayati Raj, Hyderabad Bhagirath Gop Tata Trust, Mumbai
10.40-11.10	Presidential Address	K N Ninan President, Indian Society for Ecological Economics, New Delhi
11.10-11.15	About the Conference	Jeena T Srinivasan Organizing Secretary of the conference
11.15-11.25	Remarks by Chair	
11.25-11.30	Vote of Thanks	Lavanya Suresh
11.30-11.35	Group photo	Lawn in front of the auditorium
11.35-12.00	<i>Tea/Coffee Break</i>	<i>Car Parking Area</i>

12.00-13.30 (Parallel):Panel Session (PS) 1

PS 1.1: How IWRM in India can be more Climate Resilient?

(Venue: Auditorium Seminar Hall)

Chair/Moderator: Rajeev Ahal

(Director, Natural Resource Management, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), India)

12.00-13.30

Speakers:

Jagdish Purohit

Programme Director, Society for Promotion of Wasteland and Development, New Delhi

Jyothis Sathyapalan

Professor, NIRDPR

(TBA)

Official from Environmental Protection Training and Research Institute (EPTRI)

PS 1.2: Climate & Disaster Resilient Urban Development

(Venue: Seminar Hall I, 1st Floor, Main Building)

Chair/Moderator: Jyoti K Parikh

(Executive Director, Integrated Research and Action for Development (IRADe), Delhi)

Rohit Magotra

(Deputy Director, Integrated Research and Action for Development (IRADe), Delhi)

12.00-13.30

Speakers:

V Srinivasa Chary

Director, Centre for Energy, Environment, Urban Governance and Infrastructure Development, Administrative Staff College of India, Hyderabad

Lipika Nanda

Vice President, Multi-sectoral Planning in Public Health, PHFI

Rajkiran Bilolikar

Associate Professor, Centre for Energy, Environment, Urban Governance and Infrastructure Development, Administrative Staff College of India, Hyderabad

PS 1.3: Adapting to Climate Change in South Asian Cities (SANDEE-ACD Panel)

(Venue: Seminar Hall II, 2nd Floor, Main Building)

Chair/Moderator: E. Somanathan

(Professor, Economics and Planning Unit, Indian Statistical Institute, New Delhi)

12.00-13.30

Speakers:

Mani Nepal

Program Coordinator SANDEE & Lead Economist,
International Center for Integrated Mountain
Development, Nepal

A K Enamul Haque

Professor, East-West University and Executive Director,
Asian Centre for Development, Bangladesh

Muntaha Rakib

Associate Professor, Shahjalal University of Science
and Technology, Sylhet, Bangladesh

Ismat Ara Pervin

Institute of Water Modelling, Bangladesh

13.30-14.30

Lunch

Car Parking Area

14.30- 16.00: Plenary Session I

Climate Resilient Growth in India: Strategies and Measures

(Venue: Auditorium Main Hall)

Chair: Shreekant Gupta

(Professor, Delhi School of Economics and Vice President, Indian Society for Ecological
Economics)

14.30-14.40

Introduction

Shreekant Gupta

14.40-15.10

Keynote address:
*Low Carbon Strategy for
Inclusive Growth*

Kirit Parikh

Chairman, Integrated Research and Action for
Development, (IRaDe), New Delhi.

15.10-15.40

Keynote address:
*Water Security and
Climate Change Adaptations:
Experiences and Way Forward*

Rajeev Ahal

Director, Natural Resource Management, Deutsche
Gesellschaft für Internationale Zusammenarbeit (GIZ),
India

15.40-15.50

Discussion

15.50-16.00

Remarks by Chair

Shreekant Gupta

16.00-16.30

Tea/Coffee Break

Car Parking Area

16.30-18.00 (Parallel): Technical Session (TS) 1

TS 1.1: Growth, Human Well Being and SDGs

(Auditorium Seminar Hall)

Chair: M N Murty

(Former Professor, Institute of Economic Growth, Delhi)

Co-chair: Amalendu Jyotishi

(Professor, Amrita Viswa Vidhyapeetham, Bengaluru)

16.30-16.45	<i>Ability-Biased Technical change, Economic Growth and the Environment</i>	Saheli Das and Meeta Keswani Mehra
16.45-17.00	<i>Issue of Conditional Green Convergence: A Study of Selected OECD Countries</i>	Abhishek Dutta and Maniklal Adhikary
17.00-17.15	<i>Depreciation of Capital due to Natural Disasters and Adjusted Net Domestic Product</i>	Amarendra Das , Dasarathi Padhan and Chinmayee Sahoo
17.15-17.30	<i>Gender Equality, Food Security and the Sustainable Development Goals</i>	Bina Agarwal
17.30-17.45	<i>Fiscal Transfers, Natural Calamities and Partisan Politics - Evidence from India</i>	Anubhab Pattanayak and K.S. Kavi Kumar
17.45-17.55	Discussion	
17.55-18.00	Remarks by Chair/Co-chair	

16.30-18.00 (Parallel): Technical Session (TS) 1

TS 1.2: Vulnerability, Impact and Adaptation to Climate Change

(Venue: Seminar Hall I, 1st Floor, Main Building)

Chair: Malavika Chauhan / Amitanshu Choudhary

(Tata Trust, Mumbai)

Co-chair: Rakesh Kumar Sharma

(Associate Professor, Himachal Institute of Public Administration, Shimla)

16.30-16.45	<i>Climate Change in the Agriculture Sector Across Different Agro-Ecosystems: A Micro Level Analysis from Four Southern States of India</i>	Sushanta Mahapatra , G Sridevi and Amalendu Jyotishi
16.45-17.00	<i>Impact of 2018 Flood on Riverine Micro Ecosystems: A Case Study in Manali River at Thrissur, Kerala</i>	P. Athulya , T.V. Sajeew and S. Rajathy
17.00-17.15	<i>Socio-Economic-Environmental Impacts of Climate Change Aspirational District (Haryana)</i>	Susmita Mitra , Pradeep K. Mehta and Sudipta Kumar Mishra

17.15-17.30	<i>Valuing the Carbon Sequestration Regulation Service by Hokersar Wetland of Kashmir Himalaya</i>	Irfan Rashid , Ishfaq Ahmad Sheergojri, Ishfaq ul Rehman and Irfan Rashid
17.30-17.45	<i>Impact of Environmental Shocks on Livelihood Diversification in Rural India: Evidence from Large Scale Survey Data</i>	Chhavi Tiwari and Sankalpa Bhattacharjee
17.45-17.55	General discussion	
17.55-18.00	Remarks by Chair/Co-chair	
16.30-18.00 (Parallel): Technical Session (TS) 1		
TS 1.3: Vulnerability to Floods		
(Venue: Seminar Hall II, 2 nd Floor, Main Building)		
Chair: Amita Shah		
(Past President of INSEE and Former Professor and Director, Gujarat Institute for Development Research, Ahmedabad)		
Co-chair: Prajna Paramita Mishra		
(Assistant Professor, University of Hyderabad)		
16.30-16.45	<i>Flood Vulnerability of Marginal Caste Communities in the Kosi Region North Bihar</i>	Ranjeet Kumar Sahani , Siddhartha Krishnan and Shrinivas Badiger
16.45-17.00	<i>Assessing the Determinants of Social Vulnerability to Floods in Bihar, India</i>	Rupak Kumar Jha and Haripriya Gundimeda
17.00-17.15	<i>India's Preparedness to Address Urban Flood Through Institutional Mechanism in Comparison to Asian Countries</i>	Satarupa Rakshit and Zareena Begum Irfan
17.15-17.30	<i>A Review of the Kerala Flood - Assessing Losses, Damages and Recovery Pattern</i>	Harshan T. P
17.30-17.55	Discussion	
17.55-18.00	Remarks by Chair/Co-chair	

16.30-18.00 (Parallel): Technical Session (TS) 1

TS 1.4: Environmental and Climate Justice

(Venue: Classroom, Ground Floor, Main Building)

Chair: Jayanta Bandyopadhyay

(Past President of INSEE and Former Professor, Indian Institute of Management, Kolkotta)

Co-chair: Brototi Roy

(Ph.D Student, Institute of Environmental Science and Technology, Autonomous University of Barcelona, Spain)

16.30-16.45	<i>Relocation from Protected Areas as Violent Process in the Recent History of Biodiversity Conservation in India</i>	Eleonora Fanari
16.45-17.00	<i>Change in Climate, Cropping Pattern and Food Sovereignty in Eastern Himalayan Hills</i>	Deena Gurung
17.00-17.15	<i>Alternative Ways of Understanding Ecological Conservation Practices to Enable Environmental Justice for All</i>	Lavanya Suresh and Anwesha Mohanty
17.15-17.30	<i>Climate Justice: Is a Robust Legal Framework Need of the Hour?</i>	Rakesh Chandra
17.30-17.45	<i>Measuring the Socio-economic Vulnerability of the Coastal Ecosystem: A Case Study of Indian Sundarbans</i>	Sneha Biswas
17.45-17.55	Discussion	
17.55-18.00	Remarks by Chair/Co-chair	

18.15-18.45: Session by Springer
(Auditorium Main Hall)

18.15-18.45	Publishing Ethically: Best and Not-so-Good Practices	Nupur Singh, Springer Nature
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18.45-19.45 INSEE General Body Meeting
(Auditorium Seminar Hall) (For INSEE Members Only)

19.30-20.30	<i>Cultural Programme</i>	<i>Auditorium Main Hall</i>
20.30 -21.30	<i>Dinner</i>	<i>Car Parking Area</i>

DAY 2: 7th November 2019, Thursday

09.15-10.15: Plenary Session 2

Bina Agarwal Prize - Award Ceremony

(Venue: Auditorium Main Hall)

Chair: K N Ninan

(President, Indian Society for Ecological Economics)

09.15-09.20	Welcome	K N Ninan
09.20-09.30	About the Prize	Bina Agarwal Donor of the Prize
09.30-09.35	Reading of the Citation	K N Ninan
09.35-09.45	Presentation of the Award and Citation	Bina Agarwal
09.45-10.10	Response by the awardee	Joan Martinez Alier Institute of Environmental Science and Technology, Autonomous University of Barcelona, Spain
10.10-10.15	Vote of thanks	Jeena T Srinivasan , Secretary, Indian Society for Ecological Economics
<i>10.15-10.30</i>	<i>Tea/Coffee Break</i>	<i>Car Parking Area</i>

10.30-12.00: Plenary Session 3

The Work and Findings of the Intergovernmental Panel on Climate Change

(Venue: Auditorium Main Hall)

Chair: Thomas Sterner

(Professor of Environmental Economics, University of Gothenburg, Sweden)

10.30 -11.30	<i>Climate Science and Models</i>	Krishna Achuta Rao Associate Professor, Centre for Atmospheric Sciences at Indian Institute of Technology, Delhi
	<i>Main Messages from Special Report on 1.5° C in Sustainable Development Context</i>	Joyashree Roy Bangabandhu Chair Professor at AIT, Thailand and Professor (on lien), Department of Economics, Jadavpur University

Special Report on the Ocean and Cryosphere in a Changing Climate

Anjal Prakash

Associate Professor and Associate Dean
- Business Development at TERI-SAS
Hyderabad Campus

Special report on Climate Change and Desertification, Degradation, Sustainable Land Management, Food Security and Greenhouse Gas Fluxes in Terrestrial Ecosystems

Jagdish Krishnaswamy

Ashoka Trust for Ecology and the Environment (ATREE), Bengaluru

IPCC process and Scope for Participation in AR6

Joyashree Roy

Bangabandhu Chair Professor at AIT, Thailand and Professor (on lien), Department of Economics, Jadavpur University

11.30-12.00 Discussion

12.00 - 13.00 Plenary Session 4

Felicitations

(Venue: Auditorium Main Hall)

Chair: K N Ninan

(President, Indian Society for Ecological Economics)

Conferring the Lifetime Achievements Award on:

C H Hanumantha Rao

Past President of INSEE and Resident of Hyderabad

Conferring the Honour and Title of INSEE Fellows on:

M N Murty

Professor (Retired) and Senior Consultant, Institute of Economic Growth, Delhi

Ramprasad Sengupta

Professor Emeritus of Economics, Centre for Economic Studies and Planning, & Former Dean of School of Social Sciences, Jawaharlal Nehru University, New Delhi

Madhu Verma

Professor, Indian Institute of Forest Management, Bhopal

13.00-14.00 Lunch

Car Parking Area

14.00-16.00 (Parallel): Technical Session (TS) 2

TS 2.1: Climate Vulnerability: Agriculture and Food Security

(Venue: Auditorium Seminar Hall)

Chair: Gopal Kadekodi

(Past President of INSEE and Honorary Professor, Centre for Multi-disciplinary Research,
Dharward)

Co-chair: Krishan Tyagi

(Natural Resource Management Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
GmbH, India.)

14.00-14.15	<i>District Scale Vulnerability Index to Climate Variability for Vidarbha Region, Maharashtra, India</i>	Deepika Swami and Devanathan Parthasarathy
14.15-14.30	<i>Climate Change and Paddy Cultivation: The Relevance of GI Tagged Pokkali Rice from Kerala</i>	Soumya Vinayan and N Lalitha
14.30-14.45	<i>Climate Change, Food Security and Poverty of Vulnerable Groups: A Case of Two Villages</i>	G Sridevi and Amalendu Jyotishi
14.45-15.00	<i>Loss and Damage from Floods in India: Influence of Human Development, Income and Inequality</i>	Chandra Sekhar Bahinipati and Unmesh Patnaik
15.00-15.15	<i>Studying the Climate Change Risk for Finger Millet Crop: Empirical Evidence from Karnataka</i>	Pradyot Ranjan Jena and Rajesh Kalli
15.15-15.30	<i>Stress Adaptation and Farmer Preferences: A Bidding Experiment on Stress Tolerant Rice Varieties (STRVs) in Eastern India</i>	Lisa Mariam Varkey , Vikram Patil and Prakashan Chellattan Veetil
15.30-15.50	Discussion	
15.50-16.00	Remarks by Chair/Co-chair	
16.00-16.30	<i>Tea/Coffee Break</i>	<i>Car Parking Area</i>

14.00-16.00 (Parallel): Technical Session (TS) 2

TS 2.2: Adaptation of Agriculture to Climate Change

(Venue: Seminar Hall I, 1st Floor, Main Building)

Chair: Bina Agarwal

(Professor, Manchester University, U.K and Former Director, Institute of Economic Growth)

Co-chair: R Balasubramanian

(Professor, Tamil Nadu Agricultural University, Coimbatore)

14.00-14.15	<i>Scaling - up of Climate Resilient Agricultural Practices through Sustainable Livelihood and Adaptation to Climate Change (SLACC)</i>	V. Suresh Babu, K. Krishna Reddy, Ravindra S. Gavali, Basavaraj Patil, A. Bhagawat
14.15-14.30	<i>Impact of short duration climate smart variety on cropping pattern of indigenous agricultural systems</i>	Prabhakaran T. Raghu, Prakashan C. Veetil and Mayank Sharma
14.30-14.45	<i>Crop Insurance for Adaptation to Climate Change in Odisha: Some Micro-Evidence from Bolangir District</i>	Mamata Swain and Basanti Renu Hembram
14.45-15.00	<i>Multi-criteria analysis and ex-ante assessment to prioritise and scale up climate smart agriculture in semi-arid tropics, India</i>	Shalander Kumar, K Dakshina Murthy, Elias Khan Patan, Murali K Gumma, Arun Khatri-Chhetri and Anthony Whitbread.
15.00-15.30	Discussion	
15.30-16.00	Remarks by Chair/Co-chair	
16.00-16.30	Tea/Coffee Break	Car Parking Area

14.00-16.00 (Parallel): Technical Session (TS) 2

TS 2.3: Climate Resilient Measures in Rural India

(Venue: Seminar Hall II, 2nd Floor, Main Building)

Chair: M Gopinath Reddy

(Former Professor and Consultant, Centre for Economic and Social Studies, Hyderabad)

Co-chair: Meekha Hannah Paul

(Natural Resource Management, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), India)

14.00-14.15	<i>Building A Climate Resilient Rural India: Nature-based-Solutions for Water Ecosystems in MGNREGA Programs.</i>	Neeraj Mishra, Jyothis Satyapalan and Anagha Mariya Jose
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14.15-14.30	<i>Addressing Climate Resilience approaches through MGNREGS Assets in Telangana State</i>	P. Anuradha , K. Jayasree, V. Suresh Babu and V. Srinivasa Rao
14.30-14.45	<i>Assets Creation under MGNREGS and its Contribution to Adaptive Capacity of the Rural Communities in Drought Prone Districts of Rajasthan and Karnataka</i>	Anagha Mariya Josea and Anuradha Palla
14.45-15.00	<i>Adoption of Soil Conservation Measures: Evidence from Rain-Fed Watershed Areas of Telangana</i>	Dayakar Peddi
15.00-15.15	<i>Re-looking into Micro Irrigation Models in India to Adapt to Climate Change</i>	Krishna Reddy Kakumanu , Shrikant V Mukate, V Suresh Babu and Ravindra S Gavali
15.30-15.50	Discussion	
15.50-16.00	Remarks by Chair/Co-chair	
16.00-16.30	<i>Tea/Coffee Break</i>	<i>Car Parking Area</i>

14.00-16-00 (Parallel): Technical Session (TS) 2

TS 2.4: Institutions and Sustainability

(Venue: Classroom, Ground Floor, Main Building)

Chair: Madhu Verma

(Professor, Indian Institute of Forest Management, Bhopal)

Co-chair: L Venkatachalam

(Professor, Madras Institute of Development Studies, Chennai)

14.00-14.15	<i>How Do Water Institutions Perform? The Case of Canal Water User Association in South India</i>	Durga A.R. , K. Chandran and D. Suresh Kumar
14.15-14.30	<i>Interventions for Sustainable Fishing in Sundarbans: A Scoping Analysis</i>	Saptarsi Chakraborty
14.30-14.45	<i>Framing Management Plan for the Conservation of Sacred Groves of Kachch, Gujarat, Based on Stakeholders' Analysis</i>	Amit Pandey and Kavita Sardana
14.45-15.00	<i>Adaption of Grid Connected Solar Rooftop Systems in the State of Jammu and Kashmir: A Stakeholder Analysis</i>	Aaina Dutta and Sukanya Das

15.00-15.15 *Clean Energy at the Cost of Food? Effects of Hydro-electric Projects on Local Agriculture in Sikkim* **Bickey Sharma**

15.15-15.45 Discussion

15.45-16.00 Remarks by Chair/Co-chair

16.00-16.30 *Tea/Coffee Break* **Car Parking Area**

16.30-18.00: Panel Session (PS) 2

PS 2.1: Local Action Plan on Climate Change: Methodology and Action

(Venue: Auditorium Seminar Hall)

Chair/Moderator: Joy Elamon

(Director, Kerala Institute of Local Administration, Thrissur)

16.30-18.00

Speakers:

Sunny George

Professor, Kerala Institute of Local Administration, Kerala

J B Rajan

Associate Professor, Kerala Institute of Local Administration, Kerala

K S Shibu

President, Perumbalam Grama Panchayat, Kerala

K. Sobha

Secretary, Perumbalam Grama Panchayat, Kerala

Sasidharan Nair

Resource Person, Perumbalam Grama Panchayat, Kerala

PS 2.2: Martin Weitzman's Contributions to Environmental Economics

(Venue: Seminar Hall 1, 1st Floor, Main Building)

Chair/Moderator: Thomas Sterner

(Professor of Environmental Economics, University of Gothenburg, Sweden)

16.30-18.00

Speakers:

Shreekant Gupta

Professor, Delhi School of Economics, Delhi

M N Murty
Professor (Retired), Institute of Economic
Growth, Delhi

Ramprasad Sengupta
Professor Emeritus of Economics, Centre
for Economic Studies and Planning, &
Former Dean of School of Social Sciences,
Jawaharlal Nehru University, New Delhi

PS 2.3: MGNREGS Contribution to Climate Change Mitigation and Adaptation
(Venue: Seminar Hall II, 2nd Floor, Main Building)

Chair/Moderator: Jyothis Sathyapalan
(Professor, CWE, National Institute of Rural Development and Panchayati Raj, Hyderabad)

16.30-18.00

Speakers:

N H Ravindranath
Former Professor, Indian Institute of
Science, Bengaluru

A Digambar
Associate Professor, National Institute
of Rural Development and Panchayati
Raj, Hyderabad

Neeraj Mishra
Associate Professor, National Institute
of Rural Development and Panchayati
Raj, Hyderabad

P Anuradha
Assistant Professor, National Institute
of Rural Development and Panchayati
Raj, Hyderabad

19.30-20.30 *Dinner*

Car Parking Area

DAY 3: 8th November 2019, Friday

9.30-11.00: Plenary Session 5

Climate: Economics and Institutions

(Auditorium Main Hall,)

Chair: Kanchan Chopra

(Past President, Indian Society for Ecological Economics and Former Professor and Director,
Institute of Economic Growth, Delhi)

Speakers:

09.30-09.35	Introduction	Kanchan Chopra
09.35-10.00	<i>Keynote address:</i> <i>'Economic Valuation - of Tiger Reserves in India: A Value + Approach'</i>	Prof. Madhu Verma Professor, Area of Environment & Development Economics and Coordinator - Centre for Ecological Services Management, Indian Institute of Forest Management.
10.00-10.25	<i>Keynote address:</i> <i>Dealing With the Climate in an Efficient, Fair and Feasible Manner: What Can We Learn from Economics?</i>	Thomas Sterner Professor, University of Gothenburg, Sweden
10.25-10.50	<i>Keynote address:</i> Climate Change, Forests and Biodiversity: Impact, Vulnerability and Adaptation - Challenges and Opportunities	N H Ravindranath Former Professor, Indian Institute of Science, Bengaluru
10.50-11.10	Discussion and remarks by Chair	
11.10-11.30	<i>Tea/Coffee Break</i>	<i>Car Parking Area</i>

11.30-13.00 (Parallel): Panel Session (PS) 3

PS 3.1: Climate Change and Indian Agriculture: Methodological Issues

(Venue: Auditorium Seminar Hall)

Chair/Moderator: Anubhab Pattanayak

(Assistant Professor, Madras School of Economics, Chennai)

11.30-13.00	<i>Speakers :</i> Sonal Barve Research Intern, RBI, Mumbai Dayakar Peddi Assistant Professor Centre for Economic and Social Studies K S Kavi Kumar Professor, Madras School of Economics
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PS 3.2: Climate Change, Adaptation and Mitigation - A Focus on Rainfed Agriculture

(Venue: Seminar Hall I, 1st Floor, Main Building)

Chair/Moderator: E Revathi

(Director, Centre for Economic and Social Studies)

11.30-13.00

B Venkateswarlu

Former Vice-Chancellor, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra and Former Director, Central Research Institute for Dryland Agriculture (CRIDA), Hyderabad, Telangana

Ravindra Chary

Director, CRIDA, Hyderabad

Nambi Appadurai

Director (Climate Resilience Practice), World Resources Institute, Bengaluru, Karnataka

S Naresh Kumar

Professor and Principal Scientist, Centre for Environment Science and Climate Resilient Agriculture, PUSA, New Delhi

PS 3.3: Building Climate Resilience: Lessons from 'Commoning' the Commons

(Venue: Seminar Hall II, 2nd Floor, Main Building)

Chair/Moderator: Rucha Ghate

(Foundation for Ecological Security, Anand)

11.30-13.00

Speakers:

Pratiti Priyadarshini

Foundation for Ecological Security, Anand

Himani Sharma

Foundation for Ecological Security, Anand

Shiwanaya Rawat

Foundation for Ecological Security, Anand

Liya Thomas

Foundation for Ecological Security, Anand

PS 3.4: Climate Change Vulnerability Assessment in the Indian Himalayan Region

(Venue: Classroom, Ground Floor, Main Building)

Chair/Moderator: Anamika Barua

(Associate Professor, Department of Humanities and Social Sciences, Indian Institute of Technology Guwahati)

11.30-13.00

Speakers:

Shyamasree Dasgupta

Assistant Professor, School of Humanities and Social Sciences, Indian Institute of Technology Mandi, Himachal Pradesh

N H Ravindranath

Former Professor, Indian Institute of Science, Bengaluru

T Brajakumar Singh

Directorate of Environment and Climate Change, Government of Manipur

13.00-14.00 *Lunch*

Car Parking Area

14.00-16.00 (Parallel): Technical Session 3

TS 3.1: Ecosystem Services, Resource Dependency and Disaster Recovery
(Venue: Auditorium Seminar Hall)

Chair: P S Easa

(Former Director, Kerala Institute of Forest Research, Thrissur)

Co-chair: Santadas Ghosh

(Associate Professor, Department of Economics & Politics, Visva-Bharati, Santiniketan)

14.00-14.15 *Post-disaster Recovery in Coastal Fishing Communities*

Trupti Mishra and Krishna Malakar

14.15-14.30 *An Economic Analysis of the Impacts of Anthropogenic Climate Change on Agriculture: A Case Study on Hyderabad Karnataka and Coastal Areas*

Jagadeesh and P. S Sasdhar

14.30-14.45 *Cultural Ecosystem Services and Forest Dependency- Assessment of Recreational Demand for Parambikulam Tiger Reserve, Kerala, India*

Divya Soman and V. Anitha

14.45-15.00	<i>Reducing Ecological Stress through Subsidized Rice: Findings from Sundarbans Delta</i>	Sreejit Roy
15.00-15.15	<i>Prediction Modelling for Land Use Land Cover (LULC) in the Urmodi River Watershed, Maharashtra</i>	Wasim A. Bagwan and Ravindra S. Gavali
15.15-15.45	Discussion	
15.45-16.00	Remarks by Chair/Co-chair	

14.00-16.00 (Parallel): Technical Session 3

TS 3.2: Climate Mitigation: Industry and Infrastructure

(Venue: Seminar Hall 1, 1st Floor, Main Building)

Chair: Pranab Mukhopadhyay

(Past President of INSEE and Professor, University of Goa, Goa)

Co-chair: Tapas Kumar Sarangi

(Assistant Director, National Institute of Labour Economics Research and Development, Delhi)

14.00-14.15	<i>Potential Mitigation Strategies for Road Transport Sector of India</i>	Namita Singh , Trupti Mishra and Rangan Banerjee
14.15-14.30	<i>Green Growth and the Right to Energy in India</i>	Rohit Azad and Shouvik Chakraborty
14.30-14.45	<i>Adoption of Renewable Energy: Challenges in the Household Sector</i>	Smita Bhaskar
14.45-15.00	<i>Carbon Mitigation and Fuel Efficiency Improvement Strategy for North Indian Brick Industry</i>	Priyanka Jajal , Trupti Mishra, Chandra Venkataraman and Alok Jhaldiyal
15.00-15.15	<i>Environmental Disclosure Regulation and Decarbonization of Indian Industries: Evidence from FirmLevel Data</i>	Mousami Prasad
15.15-15.35	<i>Estimating Shadow Price of Water Pollutants: A Case of Kanpur Leather Industry in India</i>	Aparajita Singh and Haripriya Gundimedda
15.35-15.55	Discussion	
15.55-16.00	Remarks by Chair/Co-chair	

14.00-16.00 (Parallel): Technical Session 3

TS 3.3: Conservation, Economic Value and Climate Change Impact

(Venue: Seminar Hall II, 2nd Floor, Main Building)

Chair: K S Kavi Kumar

(Professor, Madras School of Economics, Chennai)

Co-chair: Manjula Menon

(MS Swaminathan Research Foundation, Chennai)

14.00-14.15	<i>Conserving Mangroves in Sundarbans through Clean Cooking Fuel: Field Evidences</i>	Tapas Kumar Sutradhar
14.15-14.30	<i>Estimating the Economic Benefits of Universal Health Coverage for Climate-Induced Diseases in Southwest Coastal Region of Bangladesh</i>	Md. Hafiz Iqbal and Md. Elias Hossain
14.30-14.45	<i>Does Economic Development and Disaster Adaptation Measures Reduce the Impact of Natural Disasters? A District Level Analysis from the State of Odisha, India</i>	Prakash Kumar Sahoo , Yashobanta Parida, Prarthna Agarwal Goel and Tapaswini Nayak
14.45-15.00	<i>Marginal Value of Sub-Watershed Treatment on Profit and labour Demand in Darjeeling District, India</i>	Chandan Singha
15.00-15.15	<i>A Time Series Study of Monsoon Rainfall Behaviour in Odisha - 1871 to 2016: An inquest into Climate Change</i>	Abhilas Kumar Pradhan
15.15-15.35	<i>Fertilizer Use and Rainfall Shocks in Indian Agriculture</i>	Kaushik Bora
15.35-15.55	Discussion	
15.35-15.55	Remarks by Chair/Co-chair	

<p>14.00-16.00 (Parallel): Technical Session 3 TS 3.4: Sustainability: Infrastructure, Health and Water (Venue: Class Room, Ground Floor, Main Building) Chair: C Ramachandraiah (Professor, Centre for Economic and Social Studies, Hyderabad) Co-chair: K H Anantha (Scientist, International Crop Research Institute for Semi-arid Tropics, Hyderabad)</p>	
14.00-14.15	<p><i>Is Electric Street Car a Sustainable Public Transport System in India? A Demand Side Analysis</i></p> <p style="text-align: right;">Oindrila Dey and Debalina Chakravarty</p>
14.15-14.30	<p><i>Sanitation Deficiency Induced Health Costs Soma in the Slums of Lucknow, Uttar Pradesh</i></p> <p style="text-align: right;">Sanatan Nayak and Samanta</p>
14.45-15.00	<p><i>Circular Sanitation Economy in India: Evidence from Amberpet Sewage Treatment Plant, Hyderabad</i></p> <p style="text-align: right;">Sourav Mohanty and Prajna Paramita Mishra</p>
15.00-15.15	<p><i>The Economic and Environment Benefits of System of Rice Intensification: The Case of Telangana State</i></p> <p style="text-align: right;">Ramdas Dagam</p>
15.15-15.30	<p><i>Integrating Economic and GIS Modelling to Evaluate Watershed Interventions Under Changing Climate</i></p> <p style="text-align: right;">Josily Samuel, CA Rama Rao, BMK Raju, Pushpanjali Nagarjuna Kumar and G Ravindra Chary</p>
15.30-15.45	<p><i>Discussion</i></p>
15.45-16.00	<p><i>Remarks by Chair/Co-chair</i></p>
16.00-16.30	<p><i>Tea/Coffee Break</i></p> <p style="text-align: right;">Car Parking Area</p>
<p>16.30 - 17.30: Valedictory Session (Venue: Auditorium Seminar Hall) Chair: E Revathi, Director, CESS</p>	
16.30-16.35	<p><i>Welcome</i></p>
16.35-16.45	<p><i>Overview of the Conference Deliberations</i></p> <p style="text-align: right;">Shreekant Gupta, Vice President, INSEE</p>
16.45-17.00	<p><i>Valedictory Address</i></p> <p style="text-align: right;">Gopal Kadekodi, Past President of INSEE and Honorary Professor, Centre for Multidisciplinary Research, Dharwad</p>
17.00-17.15	<p><i>Remarks by Chief Guest</i></p> <p style="text-align: right;">C Parthasarathi, IAS, Principal Secretary, Department of Agriculture, Government of Telangana</p>
17.15-17.30	<p><i>Vote of thanks</i></p> <p style="text-align: right;">Jeena T Srinivasan, Organising Secretary</p>

Conference Report



Jeena T Srinivasan
Organising Secretary
of the Conference

The Intergovernmental Panel on Climate Change (IPCC) and several scientific studies have pointed out that an increase in the greenhouse gases in the atmosphere is likely to increase both the average and extreme temperatures over most land surfaces resulting in an increased risk of weather-related natural disasters like floods, cyclones, storms and typhoons, heat waves etc in various parts of the world. According to the United Nations, about 200 million population mostly belonging to developing countries and marginalised communities are estimated to be vulnerable to weather related disasters. Like many other countries, climate change is of great concern to India as well. It was in this context that the Indian Society for Ecological Economics (INSEE) selected this as the central theme for its Tenth Biennial Conference.

Titled as *INSEE-CESS International Conference on Climate Change and Disasters: Challenges, Opportunities and Responses*, the Tenth INSEE Biennial Conference, was organised jointly with and hosted by the Centre for Economic and Social Studies (CESS), Hyderabad in partnership with the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ, India) and the National Institute of Rural Development and Panchayati Raj (NIRDPR), Hyderabad during November 6-8, 2019. Some of the critical questions addressed in this conference were: What are the likely impacts of climate change on human and natural systems? How will it affect different sectors and sections of society? What are the alternative policy options to address the risks posed by climate change and extreme weather events?

The conference which received considerable media coverage saw participation of over 200 delegates from all over India and a few from abroad. Apart from the inaugural and presidential addresses, the conference had about five plenary sessions, five keynote addresses, ten panel discussions, twelve technical sessions and a valedictory session. A special session on 'Publishing Ethically: Best and Not so Good Practices' was also organised by Springer Nature.

In his inaugural address on 'Climate Change and Disasters from an Asian and Indian Perspective,' Vinod Thomas (Former Senior Vice President, World Bank) noted that India, South and South East Asia were not only most vulnerable to climate crisis but were also ill-prepared. While it is an existential crisis for some, in most countries economy is not integrated with climate change in their growth projections with the result that policies target growth at the expense of well-being of the humanity and the planet. With increased occurrence, countries must be prepared to tackle disasters within a short period and develop and adopt measures to reduce the risks and exposure and to build resilience to global warming. In his Presidential address, K N Ninan (President, INSEE) made an illuminating presentation on the growth and development of ecological economics in India and on climate change and disasters from an Indian Perspective. His address reflected on how the field of environmental and ecological economics in India has evolved over the years and highlighted some of the significant contributions made by INSEE members to the area.

The inaugural session which was chaired by C H Hanumantha Rao (former President, INSEE) had also addresses by E Revathi, (CESS), Rajeev Ahal (GIZ), W R Reddy (NIRDPR) and Bhagirath Gop (Tata Trusts) representing collaborating institutions. They reflected on the climate change issues specific to cities like Hyderabad, possible solutions and information needs of adapting to a rapidly changing weather system, peoples' participation, decentralised approaches and about civil society engagements in mitigation and adaptation.

The conference had five illuminating keynote addresses on varied topics by eminent scholars. The speech by Rajeev Ahal was on 'Water Security and Climate Change Adaptations: Experiences and Way Forward'. He noted that with increasing water demand and scarcity harming national and agricultural incomes, water security, climate resilience and efficiency of water use in agriculture and industry could be improved with cooperation between private and public sectors for integrated climate-adapted management of water. Kirit Parikh (Integrated Research and Action for Development (IRADe), New Delhi) gave an address on 'Low Carbon Strategy for Inclusive Growth'. He pointed out that low carbon strategy for inclusive growth must focus on alternative renewable energies and linking of inclusive growth requirements with factors like housing, drinking water, sanitation, education, health electricity, cooking gas, infant mortality rate (IMR) and fertility. Further in the international negotiations on climate change, India must insist on a fair share of the atmospheric space on equal per capita basis.

Thomas Sterner (University of Gothenburg, Sweden) delivered his address on 'Dealing with Climate in an Efficient, Fair and Feasible Manner: What Can We Learn from Economics?' He highlighted three aspects of Climate Policy- Efficiency, Fairness/ Feasibility and Speed in which the policies need to be fastened and efficient policy instruments to control the worsening of the environment and ecology should be of prime focus. N H Ravindranath (Indian Institute of Science, Bengaluru), in his address on 'Climate Change, Forests and Biodiversity: Impact, Vulnerability and Adaptation challenges and opportunities' pointed out that many ecosystems are more vulnerable than humans. He observed that there is increased tree mortality, increases in the intensity of ecosystem disturbances, shifts in geographic ranges, seasonal activities, and migration patterns, experienced changes in abundances and species interactions and impacts from recent climate-related extremes such as heat waves, droughts, floods, cyclones and wildfires on ecosystems. In another keynote address by Madhu Verma (Indian Institute of Forest Management, Bhopal) on 'Economic Valuation of Tiger Reserves in India a Value + Approach' economic value of ecosystem services from 16 selected tiger reserves using the application of spatial mapping package InVEST was presented. While Tigers provide a range of ecosystem services, its contribution to the national economy is largely ignored. Economic valuation can aid in communicating the value of natural capital and justify enhanced investments for conservation.

The conference had ten thought-provoking and engaging panel discussions with eminent scholars, policymakers and others as panellists. The panel by GIZ on 'How IWRM in India can be more Climate-resilient?' observed that the complex interlinkages of water

with other critical systems such as food, energy and the economy provide an urgent imperative for the adoption of Climate-Resilient Water Management (CRWM) at various scales with the help of data and forecasting. Another panel by IRADe on 'India's Climate Disaster Vulnerability and the need for Systemic Responses' discussed the importance of hazard vulnerability maps and the importance of planning for disaster resilient cities, affordability of preventive measures and the willingness of employers to invest in it to protect the workers from extreme weather events. The focus of a third panel by SANDEE-ACD was on 'Cities and Climate Change' and how cities in countries like Nepal and Bangladesh were coping with the hydro-meteorological events and floods, its impact on those cities and the role of hard and soft interventions including Solid Waste Management in mitigating the problems.

The fourth panel on 'Local Action Plan for Climate Change- Methodology and Action' by the Kerala Institute of Local Administration, Thrissur highlighted the importance of Local Self Governance and Climate Change Action Plans initiated by the Panchayats and the critical challenges faced in mitigating climate change. The fifth panel by INSEE on Martin Weitzman's Contributions to Environmental Economics' threw light on his seminal works on climate catastrophes, the famous 'Dismal Theorem', 'prices versus quantities' and the significance of green accounting. The contribution of Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) to Climate Mitigation and Adaptation was the theme of a sixth panel by the NIRDPR. It presented estimates of carbon sequestration under MGNREGS during 2017-18 and described how and what kinds of works under it are directly or indirectly contributing to building resilience to climate change.

'Climate Change and Indian Agriculture' focussing on methodological issues was the theme of a seventh panel organised by Madras School of Economics, Chennai where they presented a methodological review of the statistical approaches to quantitatively assess the climate change impacts on agriculture. The eighth panel organised by CESS focused on 'Climate Change Adaptation and Mitigation in Rainfed Agriculture' in Telangana State. It noted that crops which consume more water and energy occupy over ninety per cent of the total cropped area and short term needs of food and long term resource conservation must be balanced. The impact of climate change on allied sectors like fisheries, dairy and poultry were also discussed.

The ninth panel was on 'Building Climate Resilience: Lessons from 'Commoning' the Commons' organised by the Foundation for Ecological Security, Anand. It highlighted the restoration of common land and emphasised that the crisis facing the farming system is in fact the crisis in social and ecological systems and that commons are not only a safety net but also the foundation for farming systems. Another exciting panel on 'Climate Change Vulnerability Assessment in the Indian Himalayan Region' was organised by Indian Institute of Technology, Mandi. It deliberated on the climate change issues faced by Himalayan states which have high frequency of floods, rainfalls and landslides in the hill areas and noted that women and children are most vulnerable and that there exists a huge gap between research and policy.

One of the major highlights of the conference besides the above was an Outreach event organised by the IPCC in partnership with INSEE where the IPCC authors presented the Special Reports of the IPCC and the ongoing AR6 process. Krishna Achuta Rao made a presentation on the physical and scientific basis of the climate systems and climate change and about climate models and projections whereas Joyashree Roy's presentation focussed on the impact of global warming on crop yields, water stress and other problems and about the importance of mitigation activities on Sustainable Development Goals. Jagdish Krishnaswamy presented on land management and interaction of atmosphere with land resources and about land usage as a problem and solution for climate change. The special report on the ocean and cryosphere was presented by Anjal Prakash where he discussed the changes in the polar region due to 1.5°C rise in the global surface temperature that led to increase in sea levels and causing coastal extremes and effecting livelihoods and marine life and causing food insecurity.

Fifty-six contributed papers by participants were presented in twelve technical sessions (parallel) organised according to the sub-themes of the conference such as growth, human well-being and SDGs, vulnerability to floods and other natural disasters, climate vulnerability, agriculture and food security, climate mitigation and resilience, infrastructure, environmental and climate justice, and sustainability and institutions etc. There were presentations on gender equality, food security and the sustainable development goals as well as those discussing fiscal transfers, natural calamities and partisan politics discussing issues of the political economy of disaster management etc. A number of papers discussed the effects of floods in 2018 on riverine micro-ecosystems, made assessments of damages due to flood, risks at community level and recovery pattern, effectiveness of early warning systems, role of state and civil society, etc. While some of the papers focussed on environmental and climate justice both in the Indian and global contexts others focused on the adaptation of agriculture to climate change. Some papers discussed the MGNREGS from a broader perspective of climate and social engineering of the population, creation of assets and its contribution to building adaptive capacity of the rural communities. Yet another set of papers focused on sustainability and institutions concerning sustainable fishing and conservation of sacred groves. Adoption of renewable energy as a solution for a sustainable, environmental-friendly, long-term, cost-effective source of power and environmental regulation vs use of market-based instruments was the primary focus of few other papers.

In his Valedictory address, Gopal Kadekodi (Former President, INSEE) spoke about how the conference discussed the changes that are needed in climate strategy and the way forward. He pointed out that the ecosystem services as viewed by the economists and ecologists would have more impact and said that the dynamic interlinkages between ecosystem services and their stakeholders need a matrix approach.

The year 2019 also marked the completion of Twenty years of INSEE as a registered society and the conference is also credited to have several first-time events. INSEE honoured and conferred the Lifetime Achievements Award to C H Hanumantha Rao for his outstanding contributions to agricultural economics, environmental economics

and development studies. The First Bina Agarwal Prize for Ecological Economics was awarded to Joan Martinez-Alier (University of Barcelona, Spain) for his outstanding contributions to ecological economics, especially on environmentalism of the poor and environmental justice. INSEE also honoured and conferred the title of INSEE Fellow on M N Murty, Ramprasad Sengupta and Madhu Verma who are Life Members of INSEE for their outstanding contributions to ecological economics.

The organisers also held Curtain raiser events at the Administrative Staff College of India, Arts College, Osmania University and the University of Hyderabad with lectures by INSEE members. A Pre-Conference workshop on Behavioural and Environmental Economics and a Post-Conference Workshop on 'Non Market Valuation of Environmental Goods and Services' was organised in association with SANDEE and CESS. These workshops were attended by 35-40 participants and young scholars. A video message from Clovis Cavalcanti, President, International Society for Ecological Economics was also played at the conference.

Overall, the conference provided an invaluable opportunity for the participants to listen to eminent scholars as well as to share their research and concerns on the environmental and existential threat posed by climate change both in India and globally and how to respond systematically and scientifically. It also provided ample opportunities for the delegates to forge better academic and social interactions and network building not just inside the seminar halls but outside these halls with efficient time management and coffee breaks. The cultural event showcasing Telangana folk dances and culture added colour to the conference, apart from the sumptuous food including a special day of organic millet-based ethnic food during the conference period.

The conference received valuable support, both in-kind support and funding support from other partners especially CESS, GIZ-India, NIRDPR, TATA TRUSTS, ICSSR, Government of Telangana, NABARD, SANDEE and CEES, Bangalore,

Jeena T Srinivasan
Organising Secretary

Inaugural Address



Vinod Thomas
Distinguished Fellow in
Development Management
and Former Senior Vice
President, The World Bank

Imperatives for Confronting Climate Change and Natural Disasters

Hazards of nature, by all accounts have been on the rise in recent decades, damaging lives and livelihood and presenting a rising cost to economies and societies. Climate-related hazards—floods, storms, droughts and heatwaves—comprise the growing components of these disasters. That brings the climate crisis squarely into the center of disaster risk reduction, obliging countries to actions in climate adaptation and climate mitigation.

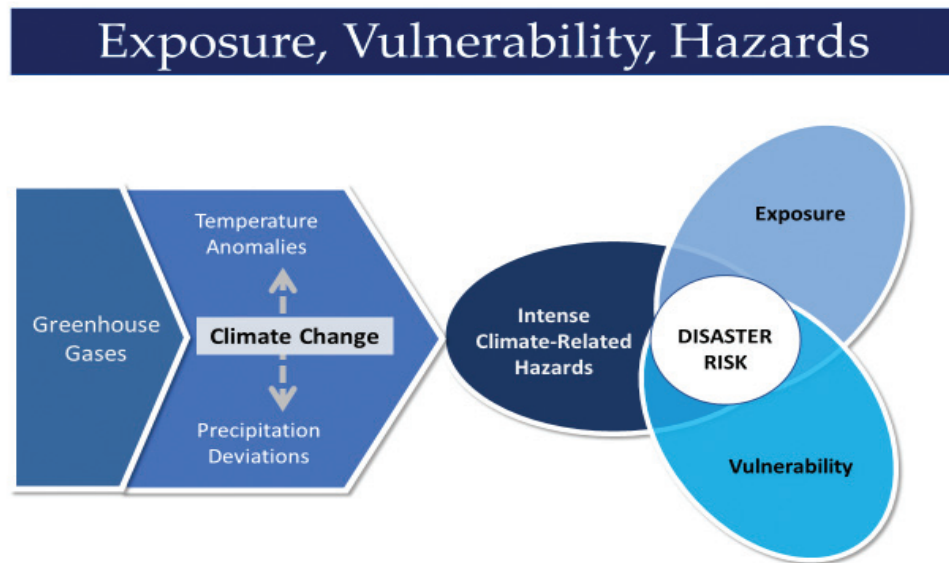
India mirrors the global trend of rising climate disasters—but with a difference. Climate events present extreme impacts in India because of rising population density as well as environmental devastation. The death toll from similar hazards, for example, Odisha 2014 (less than 50 fatalities) versus 1998 (over 50,000), has fallen because of superior early warning and evacuation, but the economic and human toll is sharply higher. That is because climate change is at a tipping point, be it on the foothills of the Himalayas, along the coastlines of the Bay of Bengal or along the Western Ghats where Kerala faced the worst floods and landslides in a century during 2018-19.

Natural Disasters

Policy makers must apply a framework (Figure 1) for climate-related disasters with three elements of risk—hazard, exposure, and vulnerability—. Each of these three elements shows a rising but differentiated trend across the Indian sub-continent. The framework for climate-related disaster risk makes it clear that the threats are increasing. Climate change is transforming the frequency and intensity of floods and storms everywhere.

Rapid urbanization, population dynamics, and migration in India's cities compound people's exposure to these hazards. Large urban populations in low-lying cities, such as Mumbai, is a huge concern. Unplanned growth of cities such as Bangalore, Chennai and Hyderabad pose big challenges. Unsustainable land use worsens rural resilience. While some aspects affecting vulnerability such as early warning and evacuation capabilities have improved, others relating to unsustainable land use and environmental degradation across the country have deteriorated.

Figure 1. A Framework to Assess Natural Disasters



Source: Thomas 2017 1/

This magnification of risks demands a new norm for disaster risk reduction. The needs are urgent especially in South Asia, a region that is in the path of tropical storms originating from the and Indian Ocean. Given the country's vast geographical and ecological lay out in China and India, the same years are witnessing intense heatwaves in some places and excessive rainfall and floods in others.

South Asia must build greater resilience to disasters by ensuring not only adequate financing but also leadership and management in all phases of the disaster risk reduction. Pre-disaster actions should include risk assessment and simulation of stress tests in addition to investments in early warning and channels out of harm's way. Immediate responses rely on the strength *inter alia* of communication networks and inter-unit coordination. We need to rebuild better by ensuring adequate building codes and zoning regulations and making investments more climate-proof.

There are valuable lessons from within India with experiences like the 2018's Great Floods of Kerala, and internationally like the 2017's Hurricane Harvey in Houston and 2013's Typhoon Haiyan in the Philippines. Simply put, disaster responses must be proactive and not just reactive, building in preventive pre-disaster components into the action plan in addition to the post disaster ones.

Reconstruction must involve building back better. Climate proofing calls for structures to be reinforced with wind and water-resistant materials. The higher cost will be more than offset by avoided repairs. People need to relocate out of harm's way. After Haiyan's storm surges, distances from coastlines considered safe for locating were extended. Chennai during the deadly 2015 floods starkly illustrated the price of unrestricted urban development.

Disaster readiness also involves zoning regulations to restrict new development in hazard-prone areas and building codes to protect businesses, homes and neighborhoods. These are an essential part of minimizing the kind of disruption to supply chains and information networks that we saw during the massive floods in Sri Lanka; Chennai, India, and Thailand in the past decade. With rising sea levels and temperatures, previous norms of the safe distance to live from coastline must be revised.

Early warning is vital. Because of investments in these systems, Hurricane Phailin, in 2013, claimed 44 fatalities in Odisha; a storm of a similar magnitude 15 years earlier had taken 15,000 lives. Hurricane Fani too saw a far lower fatality, although the financial cost of damages had doubled. Lacking in many settings, including Kerala was a timely forecast from national weather services: the state needs a reliable flood forecasting capability.

Tougher implementation of logging and mining regulations is essential in fragile ecologies. Deforestation stripping natural defenses worsened the effects of Kerala's floods and mudslides, just as Professor Madhav Gadgil's 2011 Western Ghat Ecology Report had warned. Add to this the climate conundrum: the hill districts of Wayanad, which just had record rainfall, had a severe drought in 2019. In Kerala and elsewhere, environmental studies had assessed what needed to be done differently but these suggestions were not followed.

In the case of Hyderabad, a report on the August 2000 floods by the Geological Survey of India found that new buildings blocked drainage channels. New developments in areas that were once ponds removed water bodies that could retain water. Kirloskar Committee Report of 2003 found that 13,500 illegal structures impaired water flow. *13, f^e* Hyderabad, like Bengaluru, was once a city of lakes. Over the past two decades, 169 water bodies were converted into residential colonies and commercial complexes.”

Comptroller and Auditor General questioned the adequacy of “disaster preparedness”.

Figure 2. Odisha's three Cyclones

	1998	2013	2019
Cyclone (Scale)	<i>Odisha</i> (260 kph)	<i>Phailin</i> (260 kph)	<i>Fani</i> (215 kph)
Deaths	15,000	45	89
Damage	\$ 4.44 B	\$ 4.26 B	\$ 8.10 B

Source: Author's Presentation to the Conference 2/

The economic damage of disasters can have regional and global ramifications, as Thailand's massive 2011 floods in its economic heartland disrupted not just national but global manufacturing value chains. Kerala's flood damages are partially estimated at 2.5% of the state's GDP. Bolstering resilience must be central to recovery. The World Bank and Asian Development Bank can not only provide financing—vital when budgets are stretched—but crucially also knowledge solutions to tackle climate disasters.

The business community can help upgrade early warning capabilities. Technologies that link sensor networks, large-scale data analysis and communications systems provide decision-makers with timely information to guide response. Siemens implemented a levee monitoring system in the Netherlands using sensors to monitor water pressure, temperature and shifting weather patterns to identify areas that are at risk of being breached and trigger alarms. IBM provides a digital command center that integrates real-time information on storm conditions, emergency response assets, and areas at risk.

Companies can help to make infrastructure more resilient, improving the speed of recovery after disasters strike. Redundant systems for critical infrastructure and waterproof or diesel-powered pumping systems can reduce the chance of water and power system failures. System intelligence is another form of hardening; embedding sensors and controls into power lines and water treatment plants can allow cities to assess hazardous conditions, take preventative actions and target repair efforts.

Businesses can also develop new financial models to help cities more efficiently manage risk. Most disasters are low-frequency, high-impact events, and few cities have the resources to finance response and reconstruction on their own.

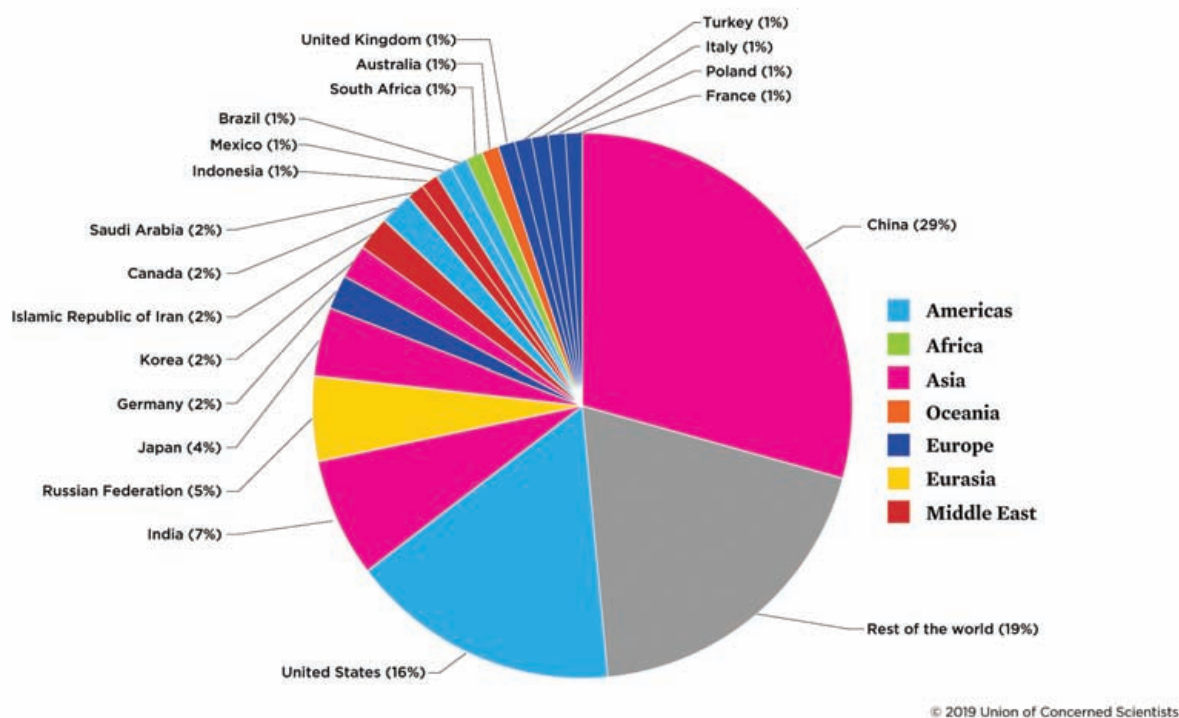
Education, awareness raising, and capacity development will be key to all phases. As seen in India, they help to improve the quality of response, strengthen compliance to directives as well as bring innovations to risk management. Relief and recovery have features of an emergency, but they too need sound protocols and new technologies like the other phases. In reconstruction, climate mitigation should become integral to the infrastructure investments. Governments may be the lead actor in resilience building, but businesses, households and all segments of society need to be actively engaged for effective and sustainable results.

The Climate Crisis

Climate change is the biggest crisis we are facing today, one that the world's leading climate scientists warn we have less than 12 years to contain.¹ Governments around the world are grappling with the rising costs of natural disasters, episodes which are occurring more frequently and with greater intensity as the century unfolds.

While it's hard to know the precise cost of destruction, studies are unequivocal about the devastating damages from accumulating greenhouse gas emissions from human activities. Asia is both highly vulnerable to climate effects and a big contributor to the climate problem. In fact, Asia's largest economies, China, India and Japan are among the top 5 countries in the world which have the largest carbon footprints.

Figure 3. Country Contributions to Carbon Emissions



Source: Brookings (forthcoming) 3/

¹ IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. World Meteorological Organization, Geneva, Switzerland, 32 pp.

And if the world's largest emitters fail to meet their commitments, the goal of holding global warming to a manageable level will remain out of reach. For all the preventive measures and safeguards put in place against climate change, these will not be able to fend off huge socioeconomic setbacks, unless the world's biggest carbon emitters take steps to transition to a low-carbon economy. Epitomizing the disconnect between scientific warnings and human action, global temperatures are now on track to rise by an unacceptable 3.2 degrees Celsius from pre-industrial levels by 2030 while greenhouse gas emissions continue to rise, just hitting an all-time high.

Leaders in the top emitting nations need to drive climate action in view of their high share in carbon emissions. The top 10% of countries (20 of them) make up 81% of global carbon discharges, starting with China, the United States, India, Russia and Japan. Given this dominance of these large economies, their national policies make all the difference to whether we can expect a reversal in the carbon intensity of global economic growth. A recent UN report calls for a 7.6% a year emission *decline* for the next 10 years to limit temperature rise to 1.5 degrees Celsius from pre-industrial levels, in contrast to the 3% a year emission *increase* in the past three years, led by the United States, China and India.

To motivate far stronger steps, it would help to be convinced that the payoffs from switching to a low-carbon growth path far outweigh the costs of making the transition. The benefits of climate action include avoided damages from climate change. And there is growing evidence on the damages that can be averted by timely climate action. India, according to a World Bank estimate, could incur damages of 2.8% of gross domestic product (GDP) by 2050 in the current climate trajectory. A recent estimate places the loss from climate change from extreme weather events for 82 countries at 3% of GDP by 2050.

India, like China and Japan, illustrates the two prongs of the climate crisis, floods and storms on the one side and heatwaves and drought conditions on the other. Uttar Pradesh, West Bengal, Karnataka, Kerala, Chennai, and Assam have been battered by deadly floods in recent years. Meanwhile, the national capital joined Rajasthan, Andhra Pradesh, and Telangana in getting scorched by record heatwaves.

India needs to vastly increase financing for climate adaptation—construction of dykes, drainage and coastal barriers, supported by zoning and land use regulations. Pre-disaster actions should include risk assessment, simulation of stress tests, early warning and evacuation. Responses rely on the strength communication networks, inter-unit coordination, education, awareness raising, and capacity development. Time is of the essence in relief and recovery, but they too need sound protocols.

But adaptation without mitigation to decarbonize the economy will not keep pace with runaway climate change. The sliver of good news is that the average cost of solar photovoltaics and wind energy is now in the range of the cost of fossil fuels. Even so, renewable energy still accounts for only 17% of India's electricity needs, with 80% coming from polluting fossil fuels. India and the other top emitters, China, the US and EU, must abandon new coal-fired power plants, retrofit existing ones, and sharply cut the emissions intensity of gross domestic product.

In fact, coal plant capacity is expanding in South and Southeast Asia, which together account for half of the world's planned coal power expansion. India, Vietnam and Indonesia combined alone account for over 30 percent. Bangladesh and Pakistan plan to increase coal-based capacity threefold, and the Philippines wants to double capacity.

To have any chance of sustaining solid long-term growth rates, nations across Asia must abandon plans to build new coal-fired power plants, retrofit existing ones, and sharply cut the emissions intensity of GDP. In its place, the switch to renewables needs to be sped up. This means meeting existing targets and contracts for renewable production, and improving grid stabilization, energy storage and distribution for power.

Encouraging the use of renewable forms of energy is the other part of the equation. It is helpful that the price of renewables, especially solar and wind, has been declining and their competitiveness vis a vis fossil fuels improving. But renewables still

account for just 11% of global energy consumption, compared with 80% for fossil fuels. Solar and wind need to overcome technical and logistical impediments on production, storage and distribution. To counter this, strong policy support and subsidies—justified on grounds of their positive climate effects— could vastly increase their usage.

Knowledge and Learning 41

As I discuss in a publication of Asian Institute of Management 71, risk information including data on vulnerability and exposure to shocks are not available universallyⁱ. Fewer than 20% of cities in Asia and the Pacific have carried out climate risk assessmentsⁱⁱ. These assessments are necessary to inform and guide city and community planning. The risk assessment process includes exposed elements such as population, infrastructure, livelihoods and agricultural assets, and the environment and ecosystems. Factors that influence vulnerability such as organizational and economic capacities, and development status of communities, should also be identified.ⁱⁱⁱ

Global experience tells us that warnings by meteorological institutions are not enough. Public ignorance of prevailing conditions of vulnerability, failure of the recipients to understand or believe in the warning, failure to communicate the threat clearly or in time, lack of local organization, and the absence of clear courses of action, can render warnings useless.

In 2013, Super Typhoon Haiyan struck central Philippines and claimed more than 7000 lives, primarily from storm surges. Storm surge hazard maps prepared seven years prior to Typhoon Haiyan did not reflect the actual storm surge flood extent, mainly due to Typhoon Haiyan's unprecedented strength. Prepared actions were not guided accordingly such that 68% of evacuation centers were affected by storm surges. Another factor was the lack of awareness of storm surges and forecasting. While evacuation was encouraged in several coastal towns, the directive was not followed in many cases since people were not familiar with the term "storm surge."

Updated risk assessments and hazard maps are necessary to inform appropriate action. Hazards and risk reduction education must be conducted at the barangay level and in schools to develop a culture of preparedness. Learning activities include action-oriented problem solving and learning-by-doing, professional trades and skills training, community-based assessment, public discourse, and awareness campaigns.

We have seen in the wake of calamities that information and messages must be understandable and actionable for its end-users. University courses on land use planning, natural resource management, urban and regional planning, and meteorology through theoretical and applied researches, have offered students, planners, and policymakers the opportunity to acquire advanced and quality knowledge on disasters. Research institutions have established networks that are instrumental in identifying community problems and solutions and offer consultancy services to local governments, communities and other stakeholders. An inventory of technologies, methodologies and good practices; critical experiences and lessons learned; from both institutional and individual knowledge and experiences will be most valuable.

Better channels of advocacy and communication are needed to update and inform local governments and community-based organizations. Communication lines between sources of knowledge and end-users of information must be open both-ways. Media should also be a responsible partner.

In the case of the Philippines, while the people of Tacloban were not new to typhoons, the city suffered the greatest number of deaths. Typhoon Haiyan was their first storm surge experience. They were not aware of the storm surge that destroyed Tacloban in 1912^{iv}. Prior to the 2011 Bangkok floods, flood control structures and systems in place have averted floods from weaker events. Knowledge and learning are a continuing process.

Case studies, for example for Indonesia, show that a citizenry educated on resilience creates demand for more resilience and disaster risk reduction actions and services. Return on investments in education and learning are multiplied when knowledge

flows from one person to the next, from one generation to the next. The application of education and learning, once instilled, is difficult to undo and will likely be applied throughout the person's life. Further, one can build on and enhance earlier education, increasing returns even more^v.

Policy and Governance 5/

The above mentioned paper from Asian Institute of Management explains how the government has the responsibility to provide public goods and services. The government should also be looking out for the poorest and most vulnerable. Public policies include knowledge generation and dissemination, preparedness and response measures, zoning regulations, infrastructure standards, and insurance requirements. Land use policy can restrict the construction of hospitals and schools to low-risk areas.

In 2009, the Government of India started requiring natural disaster impact assessment in the approval process of public investment projects over \$16 million^{vi}. Policy instrumentalities can be in the form of legislations, work programs, and budget appropriations^{vii}. Institutional set up of disaster risk reduction must be established to provide direction and coordination.

Policies across government levels and across agencies must be consistent and coherent. Policies and plans must be informed by current disaster risk assessments, climate science, and best practices in disaster response. Local governments units operating on the front lines of disaster and implementing national policy need continuous training and education. Many local governments have limited expertise, and if any are limited to emergency-response management^{viii}.

Time and again, we see that weak government capacity can exacerbate difficult situations in times of emergency and relief operations. But more than that, poor governance can create situations increase exposure and vulnerability. For instance, urban development that encroaches on forests and mangroves increases floods and storm surge risk.

On 26 December 2004, a 9.2 magnitude earthquake in the Indian Ocean created a tsunami that killed 227,000 people across 14 countries, with Indonesia, Sri Lanka, India, and Thailand the hardest hit. In the Indonesian island of Banda Aceh, some 300 international NGOs responded to the disaster, and thousands of individuals arrived to help. This created a huge logistical and coordination challenge. By April, the government was still developing the criteria for NGOs that will stay; and the division of labor among the many actors and NGOs has not been set^{ix}.

Recovery operations after the Indian tsunami also saw instances when poor coordination and engagement with the affected communities led to waste and inefficiencies. Some fishing boats constructed to replace those damaged in the tsunami were never used as fishermen found them to be unsafe. Fishermen beneficiaries were never engaged in the project nor consulted. Competition between agencies also resulted to less than favorable collaboration. In a 2009 evaluation made by OXFAM, the abundance of NGOs that supported livelihood programs led to an oversupply and duplications of small-scale businesses. This depressed the market and led to loan defaults^x.

Japan is known to be a world leader in disaster preparedness. Yet, when the country was hit by the 2011 Tohoku earthquake and triggered a massive tsunami and a nuclear meltdown, Japan Platform was "slow to coordinate the emergency response." According to a report by the Canadian Research Institute on Humanitarian Crisis and Aid, "local communities and NGOs were on their own to coordinate their emergency responses outside the Miyagi prefecture."^{xii}

The international community activated a system-wide level 3 response in the immediate aftermath of Typhoon Haiyan. The international agencies and the Philippine government found that their response framework was not in sync. For instance, international agencies used its own cluster system and neither used nor coordinated with the established government systems. Both missed collaboration opportunities with civil society. The initial typhoon response bypassed provincial governments, making it more difficult to engage with them during the recovery phase^{xiii}.

India's experience suggest that initiatives should begin with public consultations and local dialogue. Policies should be well informed in terms of risks and community needs. The policy to relocate whole communities away from low-lying coastal areas without community consultation and with no consideration of livelihoods is likely to create social tensions and further risks.

Countries like Australia, Japan and the Philippines have developed geo-hazard mapping programs that identify communities at risk from the landslides and flash floods and a computer tablet that provides real-time weather and hazard information. Partnerships with businesses and local stakeholders can make tools such as these available to communities. Professional societies and trade associations also play a key role in developing and implementing standards and practices for disaster risk reduction. Disaster risks are best managed by adopting a multidisciplinary approach and narrowing the gaps between research and practice.

Aside from awareness and advocacy, governments can promote disaster risk reduction by providing incentives. Tax deductions or subsidies can be given for constructions and establishments. Relocations into low-risk zones can be supplemented by enhanced development in relocation sites.

Conclusion: Mindsets on Climate and Disasters 6/

With the risk of climate disasters rising sharply, resilience building has become a top development priority. The mindsets of policymakers and citizenry needs to change to see the centrality of building resilience. It is neither a purely reactive nor stand-alone endeavor to be undertaken when calamities strike. Responding to these new risks are not just environmental campaigns nor special interest either. It is a crucial developmental investment.

Resilience building needs to be tackled across sectors, both infrastructural and social sectors. For example, safe and resilient evacuation centers need clear evacuation protocols. Flood monitoring and storm forecasting equipment and services need proper communication channels, supported by risk awareness and education.

Policy coherence across sectors and institutions will ensure smoother implementation and improve outcomes of resilience actions. For instance, energy programs should conform to new climate mitigation targets. Urban development plans should rethink incursions on natural defenses such as mangroves, forests, or floodways. National economic strategies should complement local resilience building efforts.

Investments in resilience have been shown to work. Limiting structures in flood plains and low-lying coastal areas limit losses. Risk awareness, early warning systems, and evacuation plans and drills save lives. The opportunity and the capacity to minimize disaster risk is huge. With rising urbanization, new investments in city infrastructure are widespread.

Global infrastructure and market systems have locked us into patterns and habits that makes it very difficult to reduce GHG emissions, be it individually, nationally, or globally. Unless climate change mitigation takes center stage, all other efforts towards a safer and more secure planet will be ineffective.

That the Paris agreement was entered into force in November 2016, a result not seen in other international agreements, should not lead us to complacency. Habits and patterns are hard to break, and short-term profits can easily sway decisions. Even under a Paris consensus scenario, we are still confronted by extreme climate disaster risks.

The latest scientific projections are far more dire than previously understood. Climate risk and the costs of inaction continue to rise. We need to exceed the Paris commitments and step up implementation of actions for a low-carbon economy.

ⁱ UNTask Team on Habitat III. 2015. "Urban Resilience (Issue Paper No.15)." United Nations Conference on Housing and Sustainable Urban Development. New York.

ⁱⁱ Carmin, J., N. Nadkarni, and C. Rhie. 2012. Progress and challenges in urban climate adaptation planning: Results of a global survey. Cambridge: Massachusetts Institute of Technology.

ⁱⁱⁱ IPCC. 2012. Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation. Special Report, Cambridge, UK and New York, USA: Cambridge University Press.

- iv Lagmay, Alfredo Mahar Francisco, Rojeelee P. Agaton, Mark Allen C. Bahala, Jo Brianne Louise T. Briones, Krichi May C. Cabacaba, Carl Vincent C. Caro, Lea L. Dasallas, et al. 2015. "Devastating storm surges of Typhoon Haiyan." *International Journal of Disaster Risk Reduction* 11: 1-12. Accessed August 21, 2017. doi:<https://doi.org/10.1016/j.ijdrr.2014.10.006>.
- v Asian Development Bank Institute. 2015. *Disaster Risk Management in Asia and the Pacific*. Edited by Ian Davies. Asian Development Bank Institute and Routledge.
- vi Benson, Charlotte (2016), *Promoting Sustainable Development through Disaster Risk Management* (ADB Sustainable Development Working Paper Series). Manila: Asian Development Bank.
- vii Kuriakose, A.T., Heltberg, R., Wiseman, W., Costella, C., Cipryk, R., and Cornelius, S. 2012. *Climate-Responsive Social Protection*. (Background Paper No. 1210 for the World Bank 2012-2022 Social Protection and Labor Strategy).
- viii Asian Development Bank. 2013. *Investing in Resilience: Ensuring a Disaster-Resistant Future*. 2013. Manila: Asian Development Bank.
- ix ReliefWeb. 2005. "Indonesia: A review of NGO coordination in Aceh post earthquake/ tsunami." ReliefWeb. April 8. <https://reliefweb.int/report/indonesia/indonesia-review-ngo-coordination-aceh-post-earthquake-tsunami>.
- x Masyrafah, Harry, and Jock MJA McKeon. 2008. *POST-TSUNAMI AID EFFECTIVENESS IN ACEH: PROLIFERATION AND COORDINATION IN RECONSTRUCTION*. Wolfensohn Center for Development at the Brookings Institution. https://www.brookings.edu/wp-content/uploads/2016/06/11_aceh_aid_masyrafah.pdf.
- xi OXFAM International. 2014. "Poorest people left behind by Philippines Typhoon response." OXFAM International. February 6. Accessed September 22, 2017. <https://www.oxfam.org/en/pressroom/pressreleases/2014-02-06/poorest-people-left-behind-philippines-typhoon-response>.
- xii Audet, Francois, and Francis Paquette. 2012. *Lessons from the 2011 Japanese Earthquake and Tsunami for Canada's Humanitarian Sector*. Humanitarian Coalition. http://humanitariancoalition.ca/sites/default/files/publication/japan_en-29jan.pdf.
- xiii Carden, David, and Ashley Jonathan Clements. 2015. "Coordinating the response to Typhoon Haiyan." Humanitarian Practice Network. January. <http://odihpn.org/magazine/coordinating-the-response-to-typhoon-haiyan/>.

The other footnotes:

- 1/ Thomas, Vinod 2017. *Climate Change and Natural Disasters*. Routledge.
- 2/ Author's presentation at the 10th Biennial Conference of INSEE/CESS, Hyderabad, November 6, 2019
- 3/ Vinod Thomas in Brookings, *Future Development*, December 2, 2019
- 4/ and 5/ and 6/ 7/ From Vinod Thomas, *Southeast Asia's Resilience of Climate Disasters*, Asian Institute of Management, October 1, 2017.



K N Ninan
President, Indian
Society for Ecological
Economics

Presidential Address

Professor Hanumantha Rao, Professor Revathi, Dr Vinod Thomas, Dr W R Reddy, Mr Rajeev Ahal, Mr Bhagirath Gop, Ladies and Gentlemen
It gives me great pleasure to stand before you and deliver the Presidential Address at the Tenth Biennial Conference of INSEE which is co-organised and held by the Centre for Economic and Social Studies (CESS), Hyderabad in partnership with GIZ-India and NIRD&PR. At the outset I would like to express my sincere thanks to the INSEE members for unanimously electing me as INSEE President for the period 2018-2020. The Tenth Biennial Conference of INSEE marks a milestone since it marks the completion of twenty years since INSEE was registered as a professional society in the year 1999. Hence in my address I will briefly review the growth and development of ecological economics in India, and then discuss about the main theme of the conference on 'Climate Change and Disasters-Challenges, Opportunities and Responses' from an Indian perspective.

Growth and Development of Ecological Economics in India: Some Reflections

It is 20 years since the Indian Society for Ecological Economics (INSEE) was registered as a professional society in the year 1999 following a meeting of experts in the year 1998 at the India International Centre in Delhi.

-But the origins of Ecological Economics as a separate discipline or sub-discipline of economics in India however predates this. The first Ecology Economics (EE) Unit was set up in the country at the Institute for Social and Economic Change (ISEC), Bangalore in 1981 thanks to the far-sighted vision of Late Professor VKRV Rao who founded the Delhi School of Economics (DSE), the Institute of Economic Growth (IEG) and ISEC.

-The Ecology Economics Unit was established and built by Professor M V Nadkarni, the first Professor and Head of EE Unit.

The focus of Initial Research Projects:

Economics and Institutional Aspects of Wastelands Development in India (sponsored by Ford Foundation)

The National Commission on Agriculture (1976) emphasised the need to make productive use of India's wastelands. Several studies were conducted to analyse wastelands development, uncultivated lands and fallow lands, and estimate the extent of wastelands, etc.

Around the same time the Society for Promotion of Wastelands Development (SPWD) was set up in 1982 to promote development of wastelands and address land degradation

(founded by late Mr. V B Eswaran and others). SPWD publishes Wastelands News with research articles, news and data on Wastelands (available data were unreliable with different agencies giving different estimates).

Benefits and the Consequences of the Green Revolution

Another focus of research was on the benefits and the consequences of the Green Revolution (GR). While GR helped raise agricultural yields and eliminate food imports, it led to second generation problems (increasing variability of crop yields; increasing degradation of land and water resources; declining crop productivity, profitability and agro-biodiversity, etc). So, the focus of research was then on topics such as: economies of scale in Indian agriculture; efficiency of small versus large farmers; Farm Size-Productivity debate; Growth and Instability in Indian Agriculture; Costs economics of Indian agriculture, crop-weather relationships, etc. In the context of climate change focus is now on sustainable agriculture, climate-smart agriculture, conservation agriculture, natural farming, etc.

1970s, 1980s, 1990s:

During the 1970s, 1980s and 1990s some of the broad themes of research were as follows:

Sustainable Use and Management of Natural Resources

The focus of research was on integrated development of watersheds across India. Projects were funded by the government and donor agencies such as the World bank, ODA, SIDA, Danida, etc. Several studies tried to evaluate the benefits of watershed development projects, especially its impact on crop yields, incomes and employment, water availability, increasing tree cover, meeting rural needs for food, fuel and fodder, project sustainability, impact of participatory processes, water use organisations, etc.. Experiences across India were mixed with success stories and failures and others with mixed results. We are aware of the well-known case studies of Sukhomajri in Haryana and Mittermari in Karnataka. Some noteworthy studies include: C H Hanumantha Rao, Watershed Development in India: Recent Experiences and Emerging Issues, *Economic and Political Weekly*, November 04, 2000; K N Ninan and S Lakshmikanthamma, Social Cost-Benefit Analysis of a Watershed Development Project in India, *Ambio*, Vo. 30 (3), 2001; Sustainable Development: the Case of Watershed Development in India, *International Journal of Sustainable Development and World Ecology*, Vol. 1, 1994; Gopal Kadekodi and Kanchan Chopra, Watershed Development: A Contrast with NREP/JRY, *Economic and Political Weekly*, Vol 28 (26), 1993.

Evaluation of Social and Farm Forestry Projects

Following the recommendations of the National Commission on Agriculture (NCA) (1976) social and farm forestry projects were promoted across different states in India to improve tree cover, incomes, employment and meet rural needs for food, fuel and fodder and small timber. These projects were funded by governmental and donor agencies. Farmers across India took up to farm forestry in a big way to augment incomes, employment and meet their other needs. Eucalyptus was promoted in a big way. During the 1970s, 1980s, and 1990s several evaluations were done to assess the impact and benefits of social and farm forestry projects in India. (see for example: M V Nadkarni, K N Ninan and S A Pasha, *Economic and Financial Viability of Social Forestry Projects in Karnataka, India*, JFM Working Paper No. 16, SPWD and Ford Foundation, 1994). However, when farmers were ready to harvest their crop there was a big drop in wood prices due to the paper industry colluding and bringing down the prices. Farmers especially in northwest India lost interest in farm forestry and uprooted their plantations. One may be aware of the book entitled: *India's Eucalyptus Craze: The God that Failed* by N C Saxena. There were also considerable social and environmental concerns about social/farm forestry projects such as eucalyptus displacing food crops, depleting groundwater, catering primarily to paper industry rather than meeting rural needs, promoting monoculture species at the cost of biodiversity, etc. (see for example Vandana Shiva and Jayanta Bandyopadhyay: *Ecological Audit of Eucalyptus Cultivation*, Research Foundation for Science and Technology, Dehradun, 1987).

Alternative Institutional Set ups to improve effectiveness, benefits, financial viability, sustainability and sense of participation to improve NRM:

-Joint Forest Management (JFM): involving all stake holders-state, local communities, & others etc; However, experiences were mixed with success stories, failures and others with mixed results. (e.g. local communities didn't get the promised benefits). See for example: Sharachandra Lele and Ajit Menon (eds.), *Democratizing Forest Governance in India*, Oxford University Press, 2014.

-Participatory Irrigation Management/Water Users Associations: Here also results were mixed with some success stories, and failures. (see for example V Ratna Reddy and P P Reddy, How Participatory is Participatory Irrigation Management, *Economic and Political Weekly*, Vol 40 (53), 2005/2006.

There were a number of long-term research programmes which spurred research in environmental economics.

World Bank-aided India: Environmental Management Capacity Building (EMCab) Technical Assistance Project (1999 to 2003) under Ministry of Environment and Forests (MoEF)

The year 1999 was a milestone for environmental economics in India: The Indian Society for Ecological Economics (INSEE) was registered. The Environmental Economics Unit was set up at IEG, Delhi with support from the Ford Foundation.

-The World Bank aided EMCab Project was launched in the year 1999. It covered Teaching (including Faculty Upgradation Programmes), Training, Research, Overseas Fellowships and Library Support. It was implemented by four institutions, i.e. Madras School of Economics; Institute of Economic Growth, Delhi, Indira Gandhi Institute of Development Research (IGIDR), Mumbai and Indian Statistical Institute, Kolkata. The IGIDR oversaw the Research Programme with a budget of US\$ 1.5 Million for research projects. Sixty-One studies were funded under the EMCab Project.

The broad themes of studies and number of research projects completed under the EMCab project are: Wetlands and Biodiversity (9 studies); Common Property Resources and Forests (8 Studies); Water Institutions and Sustainable Use (7 Studies); Marine Ecosystems and Sustainability (4 Studies); Agriculture, Environment and Economics (3 Studies); Industrial Pollution and Policy (10 Studies); Environment, Health and Economics (4 Studies), and; National and International Policy Issues (6 Studies).

Under the EMCab project a number of books were published. These were:

U Sankar, (ed.) *Environmental Economics*, Oxford University Press, 2001.

Ramprasad Sengupta, *Ecology and Economics: An Approach to Sustainable Development*, Oxford University Press, 2001.

Rabindra N. Bhattacharya, (ed.), *Environmental Economics: An Indian Perspective*, Oxford University Press, 2001.

Gopal K Kadekodi, (ed.) *Environmental Economics in Practice*, Oxford University Press, 2001.

Jyothi Parikh and T L Raghu Ram (eds.), *Reconciling Environment and Economics: Executive Summaries of EERC Projects*, IGIDR, Mumbai, 2003.

The research output from the EMCab project were published as books and research papers in peer reviewed journals. See for example:

K N Ninan, Jyothis Satyapalan *et al*, *The Economics of Biodiversity Conservation: Valuation in Tropical Forest Ecosystems*, Earthscan, 2007, 2008, 2012; Routledge 2016.

M N Murty and Surender Kumar, *Environmental and Economic Accounting for Industry*, Oxford University Press, 2005.

South Asian Network for Development and Environmental Economics (SANDEE)

Another major initiative was the setting up of South Asian Network for Development and Environmental Economics (SANDEE) in 1999 and hosted by ICIMOD (earlier hosted by IUCN- Nepal) to promote research, teaching, training and outreach activities in South Asia.

The research themes covered include: Economic valuation of different ecosystems and natural resources accounting. The current research themes are ecosystems management, economics of climate change; and policies and programmes for greener development. During 2009-2013 SANDEE witnessed completion of 70 research projects; 60 peer reviewed publications and 40 training programmes. See for example: A K Enamul Haque, M N Murty, Priya Shyamsunder, (eds.), *Environmental Valuation in South Asia*, Cambridge, 2011.

Indo-Dutch Programme on Alternatives in Development (IDPAD)

The Indo-Dutch Programme on Alternatives in Development (IDPAD) through the Indian Council of Social Science Research (ICSSR) (1980-2010) was another major programme which supported several research projects in development studies including in environmental economics. Under the IDPAD project seventy-nine works in 94 publications were completed.

Among notable works in environmental economics published under the IDPAD project were:

Onno Kuik, M V Nadkarni et al, *Pollution Control in the North and the South*, (Sage, 1998).

Kanchan Chopra and Gopal Kadekodi, *Operationalising Sustainable Development-Economic Ecological Modelling for Developing Countries*, (Sage, 1999)

A. Mishra, N. Nayak, Rucha Ghate and Pranab Mukhopadhyay, *Common Property Water Resources: Dependence and Institutions in India's Villages* by (TERI, 2008).

Some Other Major Themes of Research conducted by INSEE members were as follows:

-Economics & Valuation of Biodiversity & Ecosystem Services/Biodiversity: forests, wetlands and other ecosystems (e.g. Kamal Bawa, Kanchan Chopra, Saudamani Das, Nilanjan Ghosh, Enamul Haque, Pushpam Kumar, M N Murty, K N Ninan, Madhu Verma, Amita Shah, G.Haripriya, Sharachchandra Lele, Pranab Mukhopadhyay, Jyothi Parikh, Kirit Parikh, Jyothis Satyapalan, Priya Shyamsundar, Jeena Srinivasan, L.Venkatachalam, etc.)

-Natural Resources Accounting (e.g. G.Haripriya, Kirit Parikh, Jyothi Parikh, Madhu Verma, etc).

-Economic Instruments for Pollution Control/Costs of Pollution (e.g. Shreekant Gupta, A J James, MN Murty, MV Nadkarni, Rita Pandey, Jyothi Parikh, U Sankar, etc).

-Forest Use and Forest Management (e.g. Sharachchandra Lele, M V Nadkarni, K N Ninan)

-Non-Timber Forest Products (e.g. Kanchan Chopra, Sharachchandra Lele, K N Ninan, Jyothis Satyapalan, etc.)

-Poverty and Environment (e.g. Shreekant Gupta, MV Nadkarni, Jyothi Parikh, etc).

-Climate Change: Impacts, Mitigation and Adaptation (e.g. Kavi Kumar, Jyothi Parikh, Kirit Parikh, Navroz Dubhash, K N Ninan, Joyashree Roy, etc.).

-Environmental Movements/Forest and Water conflicts (e.g. Jayanta Bandyopadhyay, KJ Joy, Amalendu Jyotishi, Geetanjoy Sahu, etc)

-Gender and the Environment (e.g. Bina Agarwal).

-Water Resources, Water Use, Water Quality, Water Institutions (e.g. Jayanta Bandyopadhyay, Nilanjan Ghosh, Jeena Srinivasan, R. Maria Saleth, R. Balasubramaniam, Rajeswari Raina, V Ratna Reddy, Bejoy Thomas, etc)

-Trade and Environment (e.g. Jyothi Parikh, U Sankar)

-Common Property Resources Management (e.g. NS Jodha, Gopal Kadekodi, etc)

-Non-Market Valuation/Ecological Modelling (e.g. Kanchan Chopra, G. Haripriya, Gopal Kadekodi, Pushpam Kumar, M N Murty, K N Ninan, Madhu Verma, L Venkatachalam; Jyothis Satyapalan, Jeena Srinivasan, etc.).

Here I would like to mention that long ago during the 1950s, 1960s & 1970s, a PhD thesis in agricultural economics was deemed to be incomplete unless you use Cobb-Douglas Production Function! Late Professor V M Dandekar used to jocularly refer to Cobb-Douglas Production Function as Cow Dung Function. Today in environmental economics a PhD thesis is deemed to be incomplete unless you use CVM (Contingent Valuation Method)!

-Economics of Solid Waste Management (e.g. Rabindra N. Bhattacharya)

-Energy Economics/Renewable Energy Resources (e.g. Kirit Parikh, Jyothi Parikh, Ramprasad Sengupta)

-Environmental Policy/Environmental Regulations/Environmental Governance (e.g. Kanchan Chopra, Shreekant Gupta, Jyothi Parikh, Kirit Parikh, Rajeswari Raina).

-Alternative development models/Sustainable livelihoods/Sustainable development (e.g. Asmita Kabra, Ashish Kothari, Sharachandra Lele, Seema Purushothaman)

Climate Change and Disasters: An Indian Perspective

I will now focus on the conference theme on 'Climate Change and Disasters: Challenges, Opportunities and Responses'.

What will be the Impact of Climate Change on India? Table 1 sheds light on the likely climate change impacts on precipitation levels and temperatures in India under alternative climate scenarios (low, medium and high emission scenarios) by 2030, 2050 and 2080. The table shows the climate change will lead to significant changes in precipitation levels and temperatures in India. For example by 2030 changes in precipitation levels are likely to range between -39% to + 16.3%; the rise in temperature levels by 2030 are likely to range between +0.6 to +2.4.

Table 1: Predicted precipitation and temperature change in India under alternative climate scenarios (i.e. A2, A1B and B1 climate scenarios corresponding to high, medium and low emission futures)

Climate Variables	2030	2050	2080
Precipitation departure (%)	-39% to + 16.3%	-14.2% to +27.5%	-42.8% to + 32.1%
Temperature change (%)	+0.6 to +2.4	+1.1 to +3.5	+1.9 to +6.2

Source: Assessing the Costs of Climate Change and Adaptation in South Asia, Asian Development Bank, 2014.

Weather-related Events and Disasters:

Between 1900 to 2007 droughts in India caused over 4.25 million deaths, affected over 712 million people and caused damages valued at over USD 942 million (OFDA/CRED International Disaster database). During the same period floods resulted in over 55,000 deaths, affected 748 million people and damages valued at over USD 21.3 billion (OFDA/CRED International database 2007). The recent IPCC Special Report on Oceans and Cryosphere (2019) notes that sea levels are rising faster than previously thought and further that if sea levels were to rise by 50 cm, 45 cities with over 5 lakh population will be affected. It notes that Indian cities such as Mumbai, Kolkata, Surat and Chennai face increased threats due to sea level rise and that over 1.4 billion people will be affected by sea level rise, melting ice and glaciers.

According to Munich RE, between 1980-2014 weather-related losses was estimated at US\$ 3.3 trillion in 2014 values and US\$ 350 billion in 2017 (Munich RE, 2015/2019). Weather-related events accounted for about 88% of these reported disasters between 1980-2014, 78% of total losses from all disasters and 49% of lives lost caused by weather extremes (10,000 fatalities in 2018 and 13,000 in 2017). Large coastal cities could face annual losses of US\$ 1 trillion from flooding by mid-21st century (Royal Society, 2014).

Impact on Agriculture:

Now let us assess the likely impacts of climate change on Indian agriculture. As per an ICAR study, productivity of cereals would decrease due to an increase in temperature and decrease in water availability, especially in the Indo-Gangetic plains. Global reports indicate a loss of 10 to 40% in crop production by 2100. Greater loss expected in rabi (winter crop). Every 1°C increase in temperature reduces wheat production by 4 to 5 million tons. This can be reduced to 1 to 2 million tons only if farmers change to timely planting. A rise in temperature and CO₂ levels will lead to a reduction of crop yields in India (Table 2). A rise in temperature levels of 2°C to 3.5°C will lead to a -3% to -26% decline in per hectare net agricultural revenues in India (Table 3).

Table 2: Impact of climate change on crop yields in India

Crops	Rise in temperature	Rise in CO ₂	Yield increase/decrease	Study area	References
Soybean	2-4°C		-18% to -22%	India	Lal et al, 1998
Sorghum	1-2°C	50-700 ppm CO ₂	-7%	India	Chatterjee, 1998
Maize	+2°C	425 ppm CO ₂	-7% to -22%	North India	Chatterjee, 1998
Wheat	+2°C		-1 to -18%		
Rice	+2°C		-0.06 to 0.07 t/ha	South India	Sinha and Swaminathan, 1991
Rice	+1.5°C & +2mm rainfall	+460 ppm CO ₂	+12%	South India	Saseendran <i>et al.</i> 1999
Aggregate agricultural production	1.5 to 2.5 °C		Drops in yields/ GDP by 20%	India	Mendelsohn, 1991

Source: K N Ninan and S. Bedamatta: *Climate Change, Agriculture, Poverty and Livelihoods: A Status Report*, ISEC Working Paper 277, ISEC, Bangalore, 2012.

Table 3: Likely impact of climate change on agricultural revenues in India (using Ricardian model)

Study	Temperature change	% change (net agricultural revenue per ha)
Sanghi, Mendelsohn and Dinar, 1998	2°C	-3% to -6%
Kavi Kumar and Jyothi Parikh, 1998	2°C	-7% to -9%
Kavi Kumar and Jyothi Parikh, 2001	2°C	-8%
Kavi Kumar and Jyothi Parikh, 1998	3.5°C	-20% to -26%
Sanghi, Mendelsohn and Dinar, 1998	3.5°C	-3% to -8%

Source: Ariel Dinar et al, *Measuring the Impact of Climate Change on Indian Agriculture*, World Bank (2009)

Impact on Health:

As per the Fourth Assessment Report of the IPCC, climate change will lead to an increase in communicable diseases in India. Malaria is projected to move to higher latitudes and altitudes in India. A study on *Assessing the Costs of Climate Change and Adaptation in South Asia* by the Asian Development Bank (2014) predicted morbidity and mortality from vector and water borne diseases in India will witness an increase under alternative climate scenarios. For instance, by 2030 malaria will affect between 0.37 million to 3.25 million people under high, medium and low emission scenarios; deaths caused by malaria is estimated at between 4520 to 6554.

Impact on GDP:

Climate change will also lead to a decline in GDP. As per the ADB (2014) climate change will lead to a decline in real GDP. The cumulative percentage change compared to the baseline during 2010 to 2050 is estimated at 4% for India, >10% for south Asian Countries and 12% for Nepal. Studies suggest that the costs of climate change on global GDP will range between 0.5% to 2% or more depending on the climate scenarios and time period of analysis.

Impact on Biodiversity and Forests:

The Millennium Ecosystem Assessment (2005) and IPCC Assessments reports suggest that climate change will lead to a decline in species, habitats and ecosystem functioning. For example, it will affect the food chain of highly endangered species such as giant pandas through climate change impacts on the vegetation cover of forests. According to a new study, projected temperature increases in China over the next century will likely seriously hinder bamboo, almost the sole source of food for endangered pandas. Only if bamboo can move to new habitats at higher elevations will pandas stand a chance of survival, the researchers said. A similar fate awaits India's endangered Lion Tailed Macaque in the Western Ghats Biodiversity Hotspot. A study by N H Ravindranath and others from the Indian Institute of Science (Impact of climate change on India's Forests, *Current Science*, December 2005) which tried to assess the likely climate change impacts on India's forests notes that by the year 2085, around 68% to 77% of the forest grids in India are likely to experience a shift in forest types. While a shift to wetter forest types is projected in north east India, a shift to drier forest types is likely in northwest India (in the absence of human influences). There will also be loss or extinction of local species. There has also been a 50% increase in the number of threatened species in India in the last few years due to the impact of climate change and other drivers such as land use change.

Impact on Poverty levels in India:

Global and Studies on India which assessed the likely impacts of climate change on global and Indian agriculture (e.g. see the studies by Kavi Kumar and Jyothi Parikh, Sanghi et al cited in Table 2 and Table 3) suggests that agricultural yields (in the

absence of carbon fertilization benefits) will decline under different climate scenarios in the absence of adaptation to climate change. A study which tried to assess the likely impacts of climate change on rural poverty levels in India noted that climate change using alternative climate change scenarios will aggravate rural poverty levels in India in the absence of adaptation measures and providing safety nets to the poor and vulnerable sections. The study suggests that rural poverty levels in India in terms of headcount ratio, poverty gap index and squared poverty gap index will aggravate sharply (K N Ninan, Climate Change and Rural Poverty Levels in India, *Economic and Political Weekly*, January 2019).

Public Policy:

There are alternative approaches to address climate change. Market mechanisms such as carbon taxes were introduced so that emitters face the full social cost of the emissions caused by their actions. Command and control or regulatory approaches have been used to fix emission standards for transport vehicles and power plants. Cap and trade, allocation of property rights, giving subsidies to encourage a shift to cleaner technologies such as solar energy, renewable energy, etc. are alternative strategies to address the adverse impacts of climate change. A World Bank report (*Status and Trends in Carbon Pricing*, World Bank 2014) notes that prices in existing carbon pricing schemes ranged from US\$ 9/tCO₂ to US\$ 168/tCO₂. India does not have explicit carbon taxes, but India has implicit carbon taxes. For instance, India imposed a cess on coal in the year 2010 (Rs 150 per tonne of coal; raised to Rs 200 later) and raised taxes on petrol and diesel.

Building Climate Resilience:

A question arises as to why we need to build climate resilience. The risks arising from climate change are many such as unforeseen and extreme weather events such as heat waves, typhoons, cyclones, prolonged droughts which can have adverse economic, social and environmental consequences and affect human well-being and the quality of life. There are alternative approaches to build climate resilience. These are: 1. Ecosystem-based approach (e.g. conserving & restoring mangroves), 2. Engineering-based approach (investing in climate infrastructure like sea walls, coastal shelters, disaster warning systems, etc), 3. Hybrid approach (i.e. combination of ecosystem and engineering-based approaches), 4. Social-based approach (community action), 5. Behavioural approach (changing people's attitudes and life styles) (K N Ninan and Makoto Inoue (eds) *Building a Climate Resilient Economy and Society-Challenges and Opportunities*, Edward Elgar, 2017).

India's Climate Action Plan:

As per India's Intended Nationally Determined Contribution (INDC) to the UNFCCC, India's climate action plan emphasises the following measures:

1. **Reduce emission intensity of its GDP by 33-35% by 2030 compared to 2005 levels.**
2. **Increase share of non-fossil fuel-based energy sources to 40% of cumulative electric power installed capacity by 2030 with transfer of technology and low cost international financing including from the Green Climate Fund (Renewable energy goal-raise from 36 GW to 175 GW in next few years). India took initiative for setting Global Solar Alliance with 120 countries.**
3. **Shift from carbon subsidising regime to carbon taxes (cess on coal, reduce subsidies and raise taxes on fossil fuels).**
4. **Increase Forest and Tree cover by 2030 so as to create an additional carbon sink of 2.5-3 billion tonnes of CO₂ equivalent (7.5% weightage for area under forests for distribution of funds from Federal pool to States).**
5. **Incentives for Clean Energy and Adaptation (setting up of National Clean Environment Fund, National Adaptation Fund, Tax-free Infrastructure Bonds to fund renewable energy projects, etc.**

Challenges for India to shift to a Low Carbon Economy:

Let me briefly spell out the challenges that India faces in transiting to a low carbon economy and society. These are:

Meeting development needs and improving human well being and quality of life: (e.g. raising per capita incomes, ensuring access to basic needs etc).

Getting Access to Clean Technologies and International Climate Finance.

India's need for climate finance: US\$ 206 billion (at 2014-15 prices) between 2015 & 2030 for implementing adaptation actions in agriculture, forestry, fisheries, infrastructure, water resources, etc.

Adaptation costs in the energy sector alone: US\$ 7.8 billion by 2030 & US\$ 21.5 bil. by 2050 (as per the Asian Development Bank)

Mitigation Costs for moderate low carbon development: around US\$ 834 billion till 2030 at 2011 prices (as per NITI Aayog)

As per the Paris Climate Agreement countries pledged to raise climate finance of US\$ 100 billion/year by 2020 mainly contributed by the developed and industrialised countries. However, it is sad to note that the pledges so far are far below expectations. To give a sense of the proportion and finances needed we may note that expenditures on military, luxury goods and cars. In the year 2018 US military expenditure was estimated at \$ 649 billion and World military expenditure about \$ 1.8 Trillion (SIPRI, Stockholm). The global market for luxury goods in 2018 was estimated at \$ 1.32 Trillion and for luxury cars at \$ 546 billion in 2018(Bains & Co., 2019).

Before I conclude I may state that during the past two decades INSEE members have excelled themselves by being awarded several prestigious international and national awards. INSEE members have also participated as Co-Chairs, Co-ordinating Lead Authors, Lead Authors and Review Editors of global and national assessments conducted by the IPCC, IPBES, Millennium Ecosystem Assessment, TEEB, Inclusive Wealth Report, assessments conducted by the UNEP, CBD, UNFCCC, national governments and other bodies. Our hearty congratulations to all these INSEE members.

In conclusion I may state that:

If you take care of Nature,

Nature will take care of you,

If you abuse nature,

Nature too will abuse you.

We need to change our production and consumption patterns in order to transit to a low carbon economy and society.

In this contest it is worth recalling the words of Mahatma Gandhi:

Earth provides enough to satisfy every man's needs but not every man's greed.

Thank you.

Photo Gallery



Remarks by Chair Prof. C H Hanumantha Rao, Former President, INSEE



Welcome address by Prof. E Revathi, Director, CESS



Inaugural address by Dr. Vinod Thomas, Former Senior Vice President, The World Bank



Presidential address by Dr. K N Ninan



Address by Guest of honour Dr. W R Reddy, Director General, NIRDPR



Address by Guest of honour Mr. Bhagirath Gop, Tata Trust, Hyderabad



Address by Guest of honour Mr. Rajeev Ahal, GIZ, India

Keynote Speakers



Prof. Kirit Parikh (IRADe, New Delhi)



Mr. Rajeev Ahal (GIZ, India)



Prof. Thomas Sterner (University of Gothenburg, Sweden)



Prof. N H Ravindranath (IISc, Bengaluru)



Prof. Madhu Verma (IIFM, Bhopal)



Prof. Joan Martinez-Alier
(The Autonomous University of Barcelona, Spain)

Felicitations



Prof. Bina Agarwal presenting the Plaque to Prof. Joan Martinez- Alier, Winner of the Bina Agarwal Prize for Ecological Economics



Prof. K N Ninan presenting the Lifetime Achievements Award to Prof. C H Hanumatha Rao



Prof. Kanchan Chopra presenting the honour and title of INSEE Fellow to Prof. M N Murthy



Prof. Amita Shah presenting the honour and title of INSEE Fellow to Prof. Ramprasad Sengupta



Prof. E Revathi presenting the honour and title of INSEE Fellow to Prof. Madhu Verma



Current and Past INSEE Presidents, EC Members, Past ISEE and EAERE Presidents with the Prize Winners

IPCC Outreach Event



Krishna Achut Rao, Thomas Sterner, and Joyashree Roy



Anjal Prakash and Jagadish Krishnaswamy



Cultural Programme: Traditional Dances



Cultural Programme: Music of Telangana



Executive Committee Members, INSEE(Sitting)
 R Balasubramanian, Jeena T Srinivasan, K N Ninan, Shreekant
 Gupta L to R (Standing) Rakesh Kumar Sharma, Santadas Ghosh,
 Manjula Menon, Brototi Roy, Tapas Kumar Sarangi, Pranab
 Mukhopadhyay, Amalendu Jyothishi



Dr. Nandan Nawn delivering a Public Lecture in a Curtain Raiser
 Event at the Department of Economics, Arts College, Osmania
 University on 5th November 2019.



Prof. Pranab Mukhopadhyay delivering a Public Lecture in a Curtain Raiser Event at the School of Economics, University of Hyderabad on 5th November 2019.



Prof. Shreekant Gupta delivering a Public Lecture in a Curtain Raiser Event at the Administrative Staff College of India, Hyderabad on 5th November 2019.



Participants and Resource Persons of the pre-conference workshop on Behavioral and Experimental Economics for Environmental Policy, held on 5th November at the Centre for Economics and Social Studies, Hyderabad.



Participants and Resource persons of the post-conference workshop on Non-Market Valuation of Environmental Goods and Services, held on 9th November 2019 at the Centre for Economics and Social Studies, Hyderabad



Conference Participants

Abstracts of Panel Sessions

Panel Proposals for INSEE Conference, 2019

Day 1: 6th November, 2019

12:00 - 13:30 (Parallel): Panel Session (PS 1)

PS 1.1

How IWRM in India can be more climate resilient?

Chair/Moderator: Rajeev Ahal

(Director, Natural Resource Management, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), India)

One of the most prominent ways in which climate change is manifesting itself is through its impact on global water resources. According to India's Composite Water Management Index (2018), 600 million people in the country (44 percent of the total population) are suffering from an acute shortage of water. A shrinking and sometimes contaminated water supply, heavy reliance on rainfall and lack of efficient irrigation systems are major problems in rural areas, where almost 70 percent of the Indian population live. India is one of the most affected countries by climate change and occupies sixth place in the Global Climate Risk Index 2018. Water is also the natural resource interlinked to food, energy and other critical and essential systems for sustaining life. In this changing climate scenario, climate resilient water security is therefore a prime concern.

Integrated Water Resource Management (IWRM) has been defined by UN Water as *'Promoting the coordinated development and management of water, land and related resources in order to maximize economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.'* The same has been adopted in India by the National Water Mission and other public and private entities working on water. The Indo-German bilateral project 'Water Security and Climate Adaptation in Rural Areas' (WASCA) works on improving convergent mechanisms for planning, financing and demonstrating innovative measures on climate-resilient IWRM.

This session will discuss the evolving strategies of WASCA project, as well as approaches developed and/or piloted by the Government, NGOs, research and academic institutions in India. The panel will focus on introducing the concept and setting the context to then enable a participatory brainstorming discussion on 'How IWRM in India can be more climate-resilient'. The objective is to consolidate learning, successes and challenges from policy makers, researchers and practitioners, thus bringing together various perspectives on this important issue on one platform.

¹ Climate-Resilient Water Management: An operational framework from South Asia: <http://www.indiaenvironmentportal.org.in/files/file/Climate-resilient%20water%20management.pdf>

Speakers

Jagdish Purohit

Programme Director, Society for Promotion of Wasteland Development, New Delhi.

Jyothis Sathyapalan

Professor, National Institute of Rural Development and Panchayati Raj, Hyderabad

(TBA)

Official from Environmental Protection, Training and Research Institute (EPTRI).

12:00 - 13:30 (Parallel): Panel Session (PS 1)

PS 1.2

Climate & Disaster Resilient Urban Development

Chair/Moderator: Jyoti K Parikh

Executive Director, Integrated Research and Action for Development (IRADe), Delhi.

Rohit Magotra

Deputy Director, Integrated Research and Action for Development (IRADe), Delhi.

Introduction

IPCC SREX-2012 report establishes strong links between Climate Change and extreme weather events such as storms, cyclones, floods and heat waves predicting considerable increase in frequency of such events related disasters. During the last thirty years, India has been hit by 431 disasters affecting nearly 150 crore people and damage to property (DMI, 2011), highest among disaster prone displacement with nearly 0.023 crore uprooted (UNIDSR, 2017). This can be attributed to climate induced disasters and partly due to unplanned urbanization and inefficient governance.

During the last thirty years, India has been hit by 431 major disasters resulting into enormous loss to life and property. According to the Prevention Web statistics, 143,039 people were killed and about 150 crores were affected by various disasters in the country during these three decades (NIDM, 2015). Most of the Indian cities are vulnerable to climate induced natural hazards. The frequency and intensity of hazards have considerably affected cities in last decade. Cyclone Hudhud in Vishakhapatnam (2014), Srinagar Floods (2014), Chennai Floods (2015, 2018), Kerala Floods affecting its several cities (2018), cyclone Fani struck cities across Odisha & Andhra Pradesh (2019), Bengaluru Floods (2019) and Patna Floods caused huge economic losses to the cities.

Among the various disasters faced by Indian cities, some are due to sudden onset like floods, cyclones and landslides, some like sea level inundation in coastal cities and Heat Stress are "*silent disasters*" as they develop slowly. Heat waves, can adversely affect the livelihood and productivity of the people and can lead to human mortality. Under the 2-degree Celsius warming scenario of IPCC AR5, the frequency of heat waves in India is projected to increase by 30 times of the current frequency by end of the century, whereas, the duration of heat waves is expected to increase 92 to 200-folds under 1.5 and 2-degree Celsius scenarios. There have been 25,716 deaths from 1992 to 2016 due to heat waves in India (NDMA, 2017). The country recorded a 61 percent increase in heat-related mortality between 2004 and 2013 (NRCB, 2014).

Integrated Research and Action for Development (IRADe) was designated Centre of Excellence, Urban Development and Climate Change, in 2008 by the Ministry of Housing and Urban Affairs (MoHUA). IRADe has been actively working in the

areas of Climate Change, Urban Resilience, Disaster Management, Vulnerability Assessment, Smart Cities and Sustainable Urban Development. Through various projects and initiatives IRADe is furthering the agenda of integrating various urban development response to disaster & climate change and documenting best practices and policy level prescriptions that could be understood and adopted by the state and national level decision makers and local administrations to help them link climate and Disaster Risk issues with the existing programmes in urban development. We organize this session at INSEE to generate awareness and to encourage more work in this area.

Session Overview

- ◆ *Disasters and Climate Change Scenario in Indian Cities - Sudden Disaster*
- ◆ *Impact of Heat Stress (Health, Productivity & Livelihood)- Silent Creeping Disaster*

Session Objectives

The session will focus on the current status/ scenario of the disasters in Indian cities and framework to assess disaster vulnerability, prepare cities so that not all extreme events turn into disasters. Efficient urban spaces can be created through proper management of resources, including water and energy, and better services to citizens.

Disaster Resilience can be assessed on the basis of the severity of hazards, existing urban basic infrastructure, Governance and Socio-economic conditions of the populations and vulnerable groups (HIGS Framework) and Urban Climate Vulnerability Framework. State and National stakeholders need to be sensitized on climate change and climate related vulnerability and work in close coloration with the Urban Local bodies and authorities to develop adaptation strategies for building climate resilience. A comparative analysis of thirty Indian cities will be shown.

The session will further deliberate on the Impact of Heat Stress on health, work productivity and livelihoods of vulnerable populations and the need for developing Climate Adaptive Heat Stress Action Plans for Indian cities - appropriate, innovative and affordable climate adaptation measures for improving health and livelihood resilience in the cities.

Session Questions

Disasters/ Climate Resilience

- ◆ What is the current status (infrastructure, socio-economic and administrative) of India's urban centers/ cities to be climate and disaster resilient?
- ◆ What are the available measures adopted by cities to mitigate disaster and climate change?
- ◆ What is the framework to assess Urban Vulnerability?
- ◆ What are the Policy lessons for improving climate & disaster resilience?
- ◆ What are the economic impacts and benefits of resilience?

AGENDA

Time	Sessions
	Session : Climate & Disaster Resilient Urban Development
	- Overview on Urban Disaster & Climate Change in Indian Cities
	- Framework and Disaster Resilience in 30 Indian cities
	- Case study on Heat Stress Impact - Health, Productivity & Livelihood
	- Mapping, Mitigation and Adaptation measures
12.00- 1.30 am	Lead Speaker:
	- Prof. Jyoti Parikh, Executive Director, IRADe
	- Mr. Rohit Magotra, Deputy Director, IRADe
	Panelist:
	- Prof. V. Srinivasa Chary, Director, Centre for Energy, Environment, ASCI
	- Dr. Lipika Nanda, Vice President, Multi-sectoral Planning in Public Health, PHFI
	- Mr. Rajkiran Bilolikar, Associate Professor, Energy Area, ASCI
Heat Stress	
	◆ What are the socio-economic impacts of extreme heat events on the health, work productivity and livelihoods of vulnerable population?
	◆ What can be done to reduce economic impact of heat stress on health and livelihoods to develop resilience?
	◆ How the policy makers will be facilitated by active use of information and evidence to drive the implementation of the Heat Stress Action Plans into urban disaster strategies?

12:00 – 13:30 (Parallel): Panel Session (PS 1)

PS 1.3

Adapting to Climate Change in South Asian Cities (*SANDEE-ACD Panel*)

Chair/Moderator: E. Somanathan

Professor, Economics and Planning Unit, Indian Statistical Institute, New Delhi

Most fast-growing cities in South Asia face increased waterlogging and water contamination from improperly managed solid waste. Extreme weather events, including floods and droughts, are expected to further aggravate the operation of water supply, drainage, and sewerage infrastructure in the face of climate change. Protecting cities requires reducing waste and improving waste collection, investment in drainage, replacing riverside and wetland dumping with engineered landfills, and identifying sustainable mechanisms to finance waste management.

Amongst the many threats from climate change in South Asia, responding to flooding and extreme rain events is a priority for cities. The effects of climate-driven heavy rainfall and storm surges are exacerbated in urban centers because of inadequate drainage systems and unplanned growth of the cities. Exposed cities are at risk from immediate costs from losses on lives, assets and productivity and by the disease outbreaks from waterlogged drains and contaminated drinking water. To enable waste to be managed under circumstances of extreme or frequent flooding and heavy rainfall, cities will need to become more resilient.

In this panel, we will share and discuss the results of ongoing research in two South Asian cities - Bharatpur in Nepal and Sylhet in Bangladesh. This panel mainly focuses on:

- a) Understanding city flooding and water logging under different climatic and non-climate scenarios in two cities and examining the role of hard interventions and soft interventions for mitigating the problem, including the role of solid wastes deposits on the canals and drainage system,
- b) Identifying preference of the city residents for managing solid wastes better,
- c) Understanding behavioral aspects of urban dwellers in properly managing the solid waste, and
- d) Estimating the benefits of cleaner neighborhood in terms of residential property price.

Co-coordinators:

Dr. E. Somanathan, Professor, ISI Delhi,

Dr. Mani Nepal, South Asian Network for Development and Environmental Economics –International Center for Integrated Mountain Development (SANDEE-ICIMOD), Kathmandu, Nepal.

Panelists:

1. Dr. A K Enamul Haque, Professor, East-West University and Executive Director, Asian Center for Development, Bangladesh.
2. Dr. Mani Nepal, SANDEE-ICIMOD, Nepal.
3. Dr. Muntaha Rakib, Associate Professor, Shahajalal University of Science and Technology, Sylhet, Bangladesh.
4. Ms. Ismat Ara Pravin, Institute of Water Modeling, Bangladesh.

Day 2: 7th November, 2019

16:30 – 18:00 (Parallel): Panel Session (PS 2)

PS 2.1

Local Action Plan on Climate Change: Methodology and Action (KILA)

Chair: Dr. Joy Elamon

Director, Kerala Institute of Local Administration, Thrissur.

The global warming and the consequent climate change and its negative impacts are the major challenges facing the world over. In this context, United Nations (UN) has set up Intergovernmental Panel on Climate Change (IPCC) for assessing the science related to climate change. In the similar line, the State of Kerala has set up Directorate of Environment and Climate Change (DoECC), a nodal agency in the State in formulating climate change related schemes, plans, programmes and their execution. As a premise to this, DoECC has published State Action Plan on Climate Change (SAPCC). The global phenomenon of climate change requires local actions. In a state like Kerala where vibrant local governance system is in place, Local Self Government Institutions (LSGIs) can play a pivotal role in addressing the issues of climate change. It is in this context that Kerala Institute of Local Administration (KILA) has initiated action programme for facilitating the LSGIs to prepare Local Action Plan on Climate Change (LAPCC) at the local level and for undertaking activities at the local level. KILA, being the nodal institute for strengthening local governance in the state, has been deeply involved in the capacity building on climate change for LSGIs. In this process, KILA associates with other institutions like India Meteorological Department (IMD). In view of focused capacity building of LSGIs on climate change, KILA has set up a Centre for Climate Change and Local Governments.

This session will discuss the initiatives of KILA on LAPCC. The tentative programme of this session is given below.

Chair: Dr. Joy Elamon, Director, KILA, Thrissur, Kerala.

Presentations:

1. Conceptual Framework for Local Action Plan for Climate Change Dr. Sunny George, Professor, KILA.
2. Methodology for Local Action Plan for Climate Change Dr. J. B. Rajan, Associate Professor, KILA.
3. Experience of Perumbalam Grama Panchayat on Local Action Plan for Climate Change Mr. K. S. Shibu, President, Perumbalam Grama Panchayat, Alappuzha District, Kerala.
4. K. Sobha, Secretary, Perumbalam Grama Panchayat.
5. Sasidharan Nair, Resource Persons, Perumbalam Grama Panchayat.

16:30 – 18:00 (Parallel): Panel Session (PS 2)

PS 2.2

Martin Weitzman's contributions to Environmental Economics

Chair/Moderator: Thomas Sterner

Professor of Environmental Economics, University of Gothenberg, Sweden.

Martin Lawrence “Marty” Weitzman (April 1, 1942 – August 27, 2019) was a distinguished and influential scholar whose research spanned many areas of economics. In particular, he made seminal contributions in the field of environmental economics where his work has left a deep and lasting impression. This session focuses on Weitzman’s contribution in three specific areas within environmental economics that illustrate the depth and breadth of his scholarship. While these are not the only areas of environmental economics where Weitzman left his imprint, they showcase his ability to apply rigorous analysis to real world problems and provide unique new insights into their resolution.

Shreekant Gupta will discuss Weitzman’s path breaking work on climate change especially on the economics of catastrophes. Through a rigorous examination of deep structural uncertainty in climate change processes as manifested through “fat tail” probability distributions, Weitzman singlehandedly changed the economic discourse on climate change. Weitzman’s so-called Dismal Theorem that was first articulated in his seminal paper “On Modeling and Interpreting the Economics of Catastrophic Climate Change” in *Review of Economics and Statistics* (2009) demonstrated why urgent and deep cuts in greenhouse gas (GHG) emissions are required. This heavily cited paper (more than 1500 times on Google Scholar) is accompanied by about a dozen other papers on this topic and also a best-selling popular book *Climate Shock*. This adds up to a body of work that has left a lasting impact on the economics of climate change.

M.N. Murty will focus on Weitzman’s contribution to the choice of environmental policy instruments, namely, the choice between price instruments (such as taxes) and quantity instruments (such as tradable quotas) in the presence of uncertainty. Weitzman first analysed this issue in his classic paper “Prices vs. Quantities” in *Review of Economic Studies* (1974). While the paper was written more broadly for economic regulators, with almost 4,000 citations it is now perhaps one of the most influential papers (if not the most influential) in all of environmental economics. The paper proves the famous “Weitzman Theorem” which is now found in environmental economics textbooks. It also provides valuable insights to environmental policymakers on whether emission fees/taxes and emissions trading are equivalent and if not when should one be chosen over the other. In the context of climate change this paper has become central to the discussion on carbon taxes versus carbon trading and is yet another remarkable contribution of Weitzman to climate policy.

Ramprasad Sengupta will examine Weitzman’s work on sustainable development and Green NNP as a national accounting concept that subtracts from GNP not just depreciation of capital, but also depletion of environmental assets. In an influential paper “On the Welfare Significance of Green Accounting as Taught by Parable” in *Journal of Environmental Economics and Management* (1997) Weitzman showed the consequences of technical change being absent from the standard time-autonomous model might be quite serious for the basic welfare interpretation of Green NNP. In particular, he showed a remarkable result that Green NNP would in fact have to be adjusted upwards by as much as 40 percent if technological progress were accounted for.

Speakers

Shreekant Gupta,

Professor, Delhi School of Economics, Delhi.

M N Murty,

Professor (Retired), Institute of Economic Growth, Delhi.

Ramprasad Sengupta,

Professor Emeritus of Economics, Centre for Economic Studies and Planning.

And Former Dean, School of Social Sciences, Jawaharlal Nehru University, Delhi.

16:30 – 18:00 (Parallel): Panel Session (PS 2)

PS 2.3

MGNREGS Contribution to Climate Change Mitigation and Adaptation

Chair/Moderator: Jyothis Sathyapalan, Professor and Head, Centre for Wage Employment, National Institute of Rural Development and Panchayati Raj (NIRDPR), Hyderabad.

MGNREGS aims to augment rural livelihood security by creating sustainable natural and human-made assets through public works, which is implemented in convergence with other development programmes to develop synergies in rural development. There are many examples of such synergies which not only helped to enhance rural livelihoods (social safety nets) but also promoted sustainable natural assets. It is also one of the most extensive programmes with high potential to address the adaptation needs of rural India to climate change. The MGNREGS also contributes globally by promoting large scale plantations in rural India. A study reveals that drought-proofing activities alone provide about 40% of the total carbon sequestration under MGNREGS, considering all-natural resource management works at the national level. The afforestation programme of degraded land benefited the local communities by providing material and non-material benefits. Similarly, farm ponds provide water not only for irrigation but performs other ecological functions like recharging aquifers. The proposed panel discusses many such contributions MGNREGS to climate change adaptation and mitigation at a national scale. Integrating climate solutions in the planning and execution of works under MGNREGS can strengthen environmental linkages with human livelihoods. It will also encourage the local self-governments (nodal agencies at the grassroots levels) to modify their perspective plans towards achieving the United Nations 2030 agenda of Sustainable Development Goals (SDGs), particularly on climate change.

Speakers

Dr. N.H. Ravindranath,

Former Professor, Indian Institute of Science, Bengaluru.

Dr. Neeraj Mishra,

Associate Professor, Centre for Wage Employment, National Institute of Rural Development and Panchayati Raj (NIRDPR), Hyderabad.

Dr. A. Digambar,

Associate Professor, Centre for Wage Employment, National Institute of Rural Development and Panchayati Raj (NIRDPR), Hyderabad.

Dr. P. Anuradha,

Assistant Professor, Associate Professor, Centre for Wage Employment, National Institute of Rural Development and Panchayati Raj (NIRDPR), Hyderabad.

Day 3: 8th November, 2019

11:30 – 13:00 (Parallel): Panel Session (PS 3)

PS 3.1

Climate Change and Indian Agriculture: Methodological Issues

Moderator: Anubhab Pattanayak (Assistant Professor, Madras School of Economics, Chennai)

Context:

Climate change raises several issues in the context of agriculture in India. There is perhaps little disagreement within the scientific community that agriculture, being a climate sensitive sector, is likely to get adversely impacted due to climate change by the end of 21st century. However, there are aspects relating to agriculture which find little space in climate change policy in India and have taken a backseat in the broader policy discussions relating economic development in a climate constrained world. One of the foremost aspects to understand is the likely magnitude and nature of impacts on agriculture and robustness of these impact projections. A related question is pertaining to climate-induced hydro-meteorological events such as droughts and their direct impacts on agriculture. Being one of the poorest countries, where agriculture provides livelihood options for most of its employed population, any shock to agriculture is likely to have significant socio-economic-political consequences such as farmer suicides. Further, climate change is likely to influence other co-evolving physical processes (e.g., land degradation) resulting in significant system-level effects. The proposed panel will focus on these aspects through the following four papers:

❖ **Climate Change Impact Assessment: Methodological Review (Anubhab and Kavi Kumar)**

Sufficient evidence exists in the literature pertaining to the direct impacts of climate change on agricultural productivity. Various methodologies applied to assess climate change impacts on agriculture differ not only in terms of their scope but also in their theoretical foundations. Recent developments in the statistical methods of impact assessment, backed by more systematic availability of data, present important opportunities to examine the various issues relating to climate change and its associated effects and challenges. The role of climate econometrics which lies at the core of such analysis cannot thus be undermined. The paper (a) compares various methodologies that exists in the impact assessment literature, highlighting important methodological developments and differences in the impact assessment literature (b) discusses its implications for adaptation assessment and (c) presents their application in the context of Indian agriculture, focusing on key crops such as rice.

❖ **Rice Production Systems and Drought Resilience in India (Kavi Kumar, Brinda and Anubhab)**

Extending recent evidence in the literature which suggests that rice has become more resilient to drought over time in India, this paper examines the robustness of the result to alternative methodology and different definitions of drought. The paper further examines drought resilience of other crops that are important from food security perspective.

❖ **Farmer Suicides: Climate and Agricultural Productivity Linkages (Sonal, Kavi Kumar and Brinda).**

Challenges associated with climate change are likely to have manifestations in the broader socio-economic-political context. Farmer suicides are one such issue that is not only a politically charged issue but also a hard ground reality presently in India. Does climate change play any role in influencing farmer suicides? Though recent literature provided evidence in this direction, it is important to firmly establish three-way link between climate variability, agricultural distress and farmer's suicide. Therefore, a more relevant question to ask is the following: controlling for economic and other socio-political factors, does climate induced agricultural impacts influence farmer suicide? The paper explores these aspects.

❖ **Crop-sensitivity and Weather Variations: National and Regional Analysis (Anubhab, Dayakar and Kavi Kumar)**

Climate change is a gradual process and its effects will be realized over a very long time period. Land degradation is another biogeophysical process that is gradual in nature. If environment is visualized as a system, changes of any kind within the system are likely to affect the changes in other aspects of the system. This induces one to consider the role of climate in affecting the process of land degradation and vice-versa. This paper explores how temperature and precipitation changes could lead to exposure of soil to natural elements such as wind and water, resulting in enhanced soil erosion rates in Indian crop land.

While the papers in the panel cover a wide-range of issues under the broad theme of climate change impacts on Indian agriculture, they are connected by the similarity in the overall statistical approach followed for the analyses. The panel thus contributes towards the emerging field of "Climate Econometrics". The papers in the panel will be presented by the researchers from Madras School of Economics, Chennai including Dr. Anubhab Pattanayak, Dr. K.S. Kavi Kumar, Sonal Barve and Mr. Dayakar Peddi .

Speakers
Sonal Barve (Research Intern, RBI, Mumbai)
Dayakar Peddi (Assistant Professor, CESS, Hyderabad)
K.S. Kavi Kumar (Professor, MSE, Chennai)

11:30 – 13:00 (Parallel): Panel Session (PS 3)

PS 3.2

Climate Change, Adaptation and Mitigation – A Focus on Rainfed Agriculture

Chair/Moderator: Prof.E Revathi,

Director, Centre for Economic and Social Studies

The risks from climate change are arising in many ways- extreme weather events like heat waves, cyclones, river flooding and prolonged droughts. The impact of climate change is witnessed more severely in developing countries with no exception to India. Agriculture is still a predominant livelihood generating activity in these countries with majority depending on rainfed agricultural systems. Changes in the climate are already disrupting production of main crops in rainfed regions and with no concern to climate adaptation and mitigation efforts, this trend may accelerate and continue to increase. In view of the dual challenge (adaptation and mitigation) of climate change, coupled with the need for diversified agricultural production to meet food requirements of growing population, a comprehensive approach is needed. The proposed panel attempts to address the following questions 1) What are the appropriate adaptation technologies to tackle the climate change in rainfed agriculture? 2) What are the current strategies/programmes undertaken to address this and their outcomes? 3) What are the alternative policy options to address the risks posed by climate change to rainfed agriculture? In the Telangana State, 54 percent cultivated area falls under dry land category, 63 percent of crop is rain-fed and exposed to climate change events. Therefore, a focus on the above mentioned issues in the Telangana State would be appropriate.

List of speakers:

Dr. B.Venkateswarlu	Former Vice-Chancellor, Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra and Former Director, CRIDA, Hyderabad, Telangana
Dr. Ravindra Chary	Director, CRIDA, Hyderabad, Telangana.
Dr. Nambi Appadurai	Director (Climate Resilience Practice), WRI, Bengaluru, Karnataka.
Dr.S. Naresh Kumar	Professor and Principal Scientist, Centre for Environment Science and Climate Resilient Agriculture, PUSA, New Delhi

11:30 – 13:00 (Parallel): Panel Session (PS 3)

PS 3.3

Building Climate Resilience: Lessons from ‘Commoning’ the Commons

Panel Coordinator: Rucha Ghatge

Foundation for Ecological Security (FES), Anand, Gujarat.

In India, more than 350 million small holder farmers, tribal populations and livestock keepers depend on the Commons to meet the basic needs of food, fodder, firewood, medicines and timber as well as ecosystem services in terms of water, nutrient, pollination and pest control which are critical for the viability and growth of small holder farming systems. However, in absence of secure property rights and weak governance mechanisms, these resources have been prone to elite capture, degradation and inefficient use, leading to reduced availability of water, fodder, biomass, declining soil health and biodiversity. The panel session organized by Foundation for Ecological Security (FES) draws lessons from a growing body of work on Commons-interweaving tenure, local governance and restoration to address interrelated objectives of economic opportunities, social justice and ecological health. Based on findings from action research and field studies the session aims to share insights and perspectives on:

Speakers:

Themes	Presenters
Land tenure, collective action and climate action (A system perspective for improved land use and climate action)	Pratiti Priyadarshini
Potential of non-forest Commons for livelihood resilience and carbon sequestration	Himani Sharma
Institutional architecture for commoning and climate action	Shiwanaya Rawat
Methods and tools (Experimental Games, Community Based System Dynamics, Mobile apps such as Composite Landscape Assessment and Restoration Tool) to trigger commoning for enhanced climate resilience	Liya Thomas

11:30 – 13:00 (Parallel): Panel Session (PS 3)

PS 3.4

Climate Change Vulnerability Assessment in the Indian Himalayan Region

Shyamasree Dasgupta¹ and Anamika Barua²

¹ School of Humanities and Social Sciences, Indian Institute of Technology Mandi, Himachal Pradesh.

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email: anamika.barua@gmail.com

Preamble:

Indian Himalayan Region (IHR) is one of the most sensitive regions to climate change and variability. Realizing the high vulnerability of IHR, Government of India launched the National Mission for Sustaining the Himalayan Ecosystem (NMSHE). The Department of Science and Technology (DST) is coordinating the implementation of NMSHE with support from the Swiss Agency for Development and Cooperation (SDC), under the Indian Himalayas Climate Adaptation Program (IHCAP) initiative. One of the key areas identified by NMSHE is to build capacities of the 12 IHR states for robust assessments of climate change vulnerability based on a common methodology that will adhere to IPCC 2014 framework of vulnerability. These states include Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, Arunachal Pradesh, Sikkim, the hilly districts of West Bengal in the eastern part of IHR, Himachal Pradesh, Uttarakhand and Jammu and Kashmir in the Western part of IHR. With this objective and with support from DST and SDC, IIT Guwahati and IIT Mandi in collaboration with IISc Bangalore worked towards capacity building of 12 IHR states. The outcome was a state level and within states, district level vulnerability maps along with potential drivers of vulnerability both at the state and district level. This panel will deal with the common methodological framework, its application and results demonstrated by the State representatives.

Panel Format:

- Moderator gives brief introduction of panelists and discussion guidelines – 10 minutes
- Panelist position presentations (15 minutes each)
- Questions & answers (20-30 minutes)

Speakers:

Panel Moderator:

Anamika Barua

Associate Professor, Department of Humanities and Social Sciences, Indian Institute of Technology Guwahati, Assam.

Topic: Climate Change, Vulnerability, Impacts and Adaptation

An Overview of evolution of vulnerability concept and framework in the context of vulnerability assessment and adaptation to climate change in the Himalayan states.

Speaker: Prof. N. H Ravindranath

Professor, Indian Institute of Sciences, Bangalore

Topic: Common Vulnerability Assessment Framework: An Indicator based Approach

A state level vulnerability assessment in the IHR based on the common methodological framework with detailed explanation of steps.

Speaker: Shyamasree Dasgupta

Assistant Professor, Indian Institute of Technology Mandi

Topic: Capacity Building in Vulnerability Assessment in 12 States in the Indian Himalayan Region

A critical evaluation of the capacity building process to carry out vulnerability assessment in the IHR states including the steps and outcomes.

Speaker: Team Leader, Indian Himalayas Climate Adaptation Programme (IHCAP), SDC

Topic: Vulnerability Assessment: A case study from the Eastern Himalayan Region

Speaker: Shri. T. Brajakumar Singh

Topic: Vulnerability Assessment: A case study from the Western Himalayan Region

Speaker: State representative from one of the eastern Himalayan states

Representatives from eastern and western Himalayan States will present their district level vulnerability assessment.

About the Organisers/Supporting Organisations

Indian Society for Ecological Economics

Indian Society for Ecological Economics (INSEE) was established in New Delhi (India) on September 24, 1998 . It was registered as a Society under the Societies Act in January 1999. It is a regional society affiliated to the International Society for Ecological Economics (ISEE). INSEE aims to further the cause of sustainable development by providing a forum for continuous dialogue among scholars, practitioners and policy analysts working at the interface of the economy, society and the ecosystem.

In that sense, the Society seeks to fulfil the felt need for a catalytic agent and a platform that would facilitate interaction between scholars from various disciplines, particularly economics and the ecological sciences, and including both natural and social sciences. It strives to promote new thinking and better understanding on a range of issues of national and international interest, such as institutions and instruments for natural resources management, energy analysis and policy, environment and trade, toxic waste management, environment and development, the valuation and accounting of ecosystem functions and services, climate change and the global commons.

INSEE works to disseminate the results of research and its policy implications to national and international bodies (governmental and non-governmental) through multiple avenues such as conferences, workshops, networking and publications

Centre for Economic and Social Studies

Centre for Economic and Social Studies was established as an autonomous body registered under the Societies Act in the year 1980. Appreciating its role in the promotion of research and training, the Indian Council of Social Science Research (ICSSR) recognized it as a national institute in the year 1986 and included CESS in its network of institutions for annual grant. The CESS has also been approved by the Department of Scientific and Industrial Research, Ministry of Science and Technology, Government of India. The Centre has been receiving maintenance grants from the State Government and the ICSSR and projects-specific grants/consultancies from the state government, central government, World Bank, UNICEF, and other International Organisations. The main objective of the Centre is to undertake mutually supportive and interrelated research and training activities in the field of economic and social development in Telangana, Andhra Pradesh and India. It functions, thus, as a Resource Centre for the Planning machinery of the Government on various inputs needed by it on socio-economic aspects. Over a period of time, CESS has developed expertise on several themes especially on natural resources and environment , agriculture and livestock development, food security, poverty alleviation, unemployment, district planning, resettlement and rehabilitation, state finances, industrial development and economics of health and demography, urban development, trade and services, etc. The Centre also undertakes research projects sponsored by different agencies such as the State Government, Central Government, Asian Development Bank, World Bank, UNICEF, UNDP, DFID, GIZ, European Union, Volkswagen University–Germany, Ford Foundation, the International Foundation for Science, Sweden, Rockefeller Foundation-New York, ODI- the UK, Tata and other organizations in India and abroad. The Centre has collaborations with universities and research institutions abroad such as the Oxford University, the Reading University, University of East Anglia and University of Manitoba etc.

CESS has been recognized by the Telangana University for full time Ph.D and by Dr. B. R. Ambedkar Open University and the University of Hyderabad for external registration for Ph.D programs in Development Studies. The Centre is situated in the heart of Hyderabad and housed in the 5 acre campus given by Osmania University in the premises of the Nizamiah Observatory at Begumpet.

GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH)

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is a public-benefit federal enterprise owned by the German Government that provides services worldwide in the field of international cooperation for sustainable development. With a global footprint in over 120 countries, GIZ leverages its regional and technical expertise for local innovation.

In India GIZ has been working for over 60 years, jointly with partners in India for sustainable economic, ecological, and social development. The focal areas of Indo-German cooperation currently are Energy, Environment, Climate Change and Biodiversity, Sustainable Urban and Industrial Development and Sustainable Economic Development. The Indian Government has launched numerous important initiatives to address the country's economic, environmental and social challenges, and GIZ is contributing to some of the most significant ones including Smart Cities, Clean India Mission and Skill India.

The thematic area of Environment, Climate Change and Biodiversity in India supports communities, public and private institutions to improve and conserve natural resources, minimise risks from climate change and enhance rural livelihoods. The project 'Water Security and Climate Adaptation in Rural India' is one of the newest Indo-German projects launched in cooperation with the Ministry of Rural Development, and the Ministry of Jal Shakti for the period April 2019 – March 2022. The project aims to improve integrated and climate-resilient water resource management in rural areas. The project is operational at the national level and four States, namely Madhya Pradesh, Rajasthan, Uttar Pradesh and Tamil Nadu.

National Institute of Rural Development and Panchayati Raj (NIRDPR)

The National Institute of Rural Development and Panchayati Raj (NIRDPR), an autonomous organisation under the Union Ministry of Rural Development, is a premier national centre of excellence in Rural Development and Panchayati Raj. Recognized internationally as one of the UN-ESCAP Centres of Excellence, it builds capacities of rural development functionaries, elected representatives of PRIs, bankers, NGOs and other stakeholders through inter-related activities of training, research and consultancy. The Institute is located in the historic city of Hyderabad in Telangana state. The NIRD&PR celebrated its Golden Jubilee Year of establishment in 2008. In addition to the main campus at Hyderabad, this Institute has North-Eastern Regional Centre at Guwahati, Assam to meet the NE-regional needs. The vision of NIRD&PR is to focus on the policies and programmes that benefit the rural poor, strive to energise the democratic decentralization processes, improve the operation and efficiency of rural development personnel, promote transfer of technology through its social laboratories, Technology Park and create environmental awareness. As a "think-tank" for the Ministry of Rural Development, NIRD while acting as a repository of knowledge on rural development would assist the Ministry in policy formulation and choice of options in rural development to usher in the changes.

Government of Telangana

Telangana was created by passing the AP State Reorganization Bill in both houses of Parliament. The Telangana state was inaugurated formally on June 2nd 2014. Telangana is the 29th state of India and has 33 districts. The state has an area of 1,12,077 Sq. Km. and has a population of 3,50,03,674. The Government of Telangana, has been implementing many schemes to improve the wellbeing of the people. Some of the major ones are the *agriculture investment support scheme "Rythu Bandhu"* which is being implemented from the year 2018-19 to enhance agriculture productivity by meeting the initial investment needs of every farmer and generating income of the farmers besides breaking the vicious cycle of rural indebtedness. To support irrigation needs of the farmers, a flagship programme "*Mission Kakatiya*" is being implemented, aimed at restoring around 46,000 tanks in five years. Under the Telangana Drinking Water Supply Project, "*Mission Bhagiratha*", a mammoth 1.30 lakh km stretch of pipelines would be laid to quench the thirst of Telangana towns and villages apart from providing water for the industrial needs. Another flagship programme of the government, "*Telanganaku Haritha Haram*" envisages increasing the green cover of the State from the present 25.16 to 33 percent of the total geographical area.

National Bank for Agriculture and Rural Development (NABARD)

NABARD came into existence on 12 July 1982 by transferring the agricultural credit functions of RBI and refinance functions of the then Agricultural Refinance and Development Corporation (ARDC). It was dedicated to the service of the nation by the late Prime Minister Smt. Indira Gandhi on 05 November 1982. Set up with an initial capital of Rs.100 crore, its' paid up capital stood at Rs.10,580 crore as on 31 March 2018. Consequent to the revision in the composition of share capital between Government of India and RBI, NABARD today is fully owned by Government of India. NABARD's mission is to promote sustainable and equitable agriculture and rural development through participative financial and non-financial interventions, innovations, technology and institutional development for securing prosperity.

Indian Council of Social Science Research (ICSSR)

Indian Council of Social Science Research (ICSSR) was established in the year of 1969 by the Government of India to promote research in social sciences in the country. The Council aims to review the progress of social science research and give advice to its users, sponsor social science research programmes and projects and administer grants to institutions and individuals for research in social sciences, institute and administer scholarships and fellowships for research in social sciences, indicate areas in which social science research is to be promoted and adopt special measures for development of research in neglected or new areas, give financial support to institutions, associations and journals engaged in social science research, arrange for technical training in research methodology and to provide guidance for research, co-ordinate research activities and encourage programmes for interdisciplinary research, develop and support centers for documentation services and supply of data, organize, sponsor, and finance seminars, workshops and study groups, undertake publication and assist publication of journals and books in social sciences, advise the Government of India on all matters pertaining to social science research as may be referred to it from time to time and take such measures generally as may be necessary from time to time to promote social science research and its utilization.

Centre for Economics, Environment and Society (CEES)

Centre for Economics, Environment and Society (CEES) is registered as a no profit organisation working in the interface of economics, environment and society. Its mission is to address the development and environmental challenges facing governments and societies, and promoting environmentally sound and socially just development, human wellbeing and sustainable development. CEES is guided in its mission and work by a distinguished panel of international and national experts and aims to undertake research, teaching, training, outreach and other activities to address the development and environmental challenges facing governments and societies, conduct courses and training programmes to upgrade skills and knowledge of scholars, researchers, policy makers, NGOs, etc., conduct seminars, workshops, conferences, dialogue and other programmes, promote dialogue and undertake research and other activities to bridge the gap between the natural and social sciences, and between science and policy and undertake programmes and activities to promote environmentally sound and socially just development, and human wellbeing and sustainable development.

TATA Trust

Tata Trusts are amongst India's oldest, non-sectarian philanthropic organisations. Since its inception, Tata Trusts have played a pioneering role in transforming traditional ideas of charity and introducing the concept of philanthropy to make a real difference to communities. Through grant-making, direct implementation and co-partnership strategies, the Trusts support and drive innovation in the areas of healthcare and nutrition; water and sanitation; energy; education; rural livelihoods; natural resource management; urban poverty alleviation; enhancing civil society and governance; media, arts, crafts and culture; and diversified employment. The Trusts engage with competent individuals and government bodies, international agencies and like-minded private sector organisations to nurture a self-sustaining eco-system that collectively works across all these areas. In order to enhance impact and ensure that interventions are sustainable, the Trusts have adopted a cluster-based approach, supporting multiple interlinked activities in identified clusters of contiguous villages across select geographies across India. Coupled with this, is the Trusts' strict adherence to ensuring that robust financial systems are put in place with all partner organisations. Today, spread over 21 states and close to 200 districts across the country, programmes supported by the Trusts reach out to millions of households through an efficient network of 450 plus partner organisations. Additionally, the Trusts' projects and initiatives, especially in the area of educational attainment, significantly contribute to building intellectual capital in the country.

Two-thirds of of India's people continue to depend on rural employment for a living, while the gap between the earning capacities of the rural and the urban populations continues to increase. The need to ensure inclusion of the rural communities in the economic growth process of the country now widely reflects in the efforts of the government in the form of various development and social welfare programmes being implemented across states. Through its Rural Upliftment portfolio, the Trusts support direct field action for innovations, effective delivery systems for livelihood support services and building strong community institutions for sustained impact of programmes. For increased coverage and impact, the Trusts further focus their investments within the portfolio in line with the national strategy of fund flows. Natural resource management, agriculture, Livestock development and Community Institution Building are cross-cutting thematic areas. The projects

target rural income generation through farm and non-farm activities, water conservation and irrigation systems, fisheries, and the production, post-harvest activities and marketing of produced goods. The development, strengthening and handholding of Farmer Producer Organisations and other such institutions is a major part of this activity. The many years of experience have allowed the Trusts to identify and evolve best practices and learnings which are replicated across issues and regions, adapting to and shaping large initiatives, while integrating projects for larger and more sustainable benefits. The core of the programme remains innovation and the integration of ideas and projects with a focus on sustainability through the development of strong exit policies.

South Asian Network for Development and Environmental Economics (SANDEE)

The South Asian Network for Development and Environmental Economics (SANDEE) is an initiative of the International Centre for Integrated Mountain Development (ICIMOD) under the regional programme on Mountain Knowledge and Action Networks (MKAN), based in Kathmandu, Nepal. SANDEE brings together researchers and decision makers from South Asia and the Hindu Kush Himalaya (HKH) region to address development-environment challenges. It strengthens the capacity of individuals and institutions in South Asia and the HKH region to undertake research on the interlinkages among economic development, poverty, and environmental change and to disseminate practical information that can be applied to development policies. SANDEE's current research focuses on Economics of Natural Resource Use and Environmental Change including Ecosystems Management, Economics of Climate Change, and Policies and Programmes for Greener Development. SANDEE operates under the principle that greener growth and sustainable development are necessary in South Asia and the HKH region, and are possible with the implementation of evidence-based solutions.

Specifically, SANDEE:

- strengthens the ability of researchers to undertake multi-disciplinary research on the economics of environmental and natural resource problems by managing two annual research grant cycles
- supports the growth of rigorous policy-relevant literature on economic development, poverty reduction, and environmental change
- supports environmental and natural resource economics in teaching and research institutions by hosting a three-week Summer School , featuring leading economists from around the world as faculty
- influences policy processes through analyses, training, networking, dialogue, and dissemination of research findings

Intergovernmental Panel on Climate Change (IPCC)

The IPCC provides regular assessments of the scientific basis of climate change, its impacts and future risks, and options for adaptation and mitigation. Created in 1988 by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), the objective of the IPCC is to provide governments at all levels with scientific information that they can use to develop climate policies. IPCC reports are also a key input into international climate change negotiations.

The IPCC is an organization of governments that are members of the United Nations or WMO. The IPCC currently has

195 members. Thousands of people from all over the world contribute to the work of the IPCC. For the assessment reports, IPCC scientists volunteer their time to assess the thousands of scientific papers published each year to provide a comprehensive summary of what is known about the drivers of climate change, its impacts and future risks, and how adaptation and mitigation can reduce those risks.

An open and transparent review by experts and governments around the world is an essential part of the IPCC process, to ensure an objective and complete assessment and to reflect a diverse range of views and expertise. Through its assessments, the IPCC identifies the strength of scientific agreement in different areas and indicates where further research is needed. The IPCC does not conduct its own research.

The IPCC is divided into three Working Groups and a Task Force. Working Group I deals with The Physical Science Basis of Climate Change, Working Group II with Climate Change Impacts, Adaptation and Vulnerability and Working Group III with Mitigation of Climate Change. The main objective of the Task Force on National Greenhouse Gas Inventories is to develop and refine a methodology for the calculation and reporting of national greenhouse gas emissions and removals.

Alongside the Working Groups and the Task Force, other Task Groups may be established by the Panel for a set time period to consider a specific topic or question. One example is the decision at the 47th Session of the IPCC in Paris in March 2018 to establish a Task Group to improve gender balance and address gender-related issues within the IPCC. [Source: <https://www.ipcc.ch/about/>]



List of Rapporteurs

	Event	Name of the Rapporteur	Date	Time	Venue
	Inaugural Session				
Panel Session 1.1	How IWRM in India can be more Climate Resilient?	E.B. Uday Bhaskar Reddy Sourav Mohanty	6 th November	09:15-11:30	Auditorium
Panel Session 1.2	Climate & Disaster Resilient Urban Development	Gandam Thilothu Rao Anwsha Mohanty(BITS) Medha.A.S	6 th November	12:00-13:30	Auditorium Seminar Hall
Panel Session 1.3	Adapting to Climate Change in South Asian Cities (<i>SANDEE-ACD Panel</i>)	Gundapu Bhanu Chander N. Shankar Annemalla Ramesh	6 th November	12:00-13:30	Seminar Hall I Main Building
Plenary Session 1	Climate Resilient Growth in India: Strategies and Measures	Shoeb Ahmed Srija Mitra	6 th November	14:30-16:00	Seminar Hall II Main Building
Technical Session 1.1	Growth, Human Well Being and SDGs	Gattu Ramesh Gayathri Bhonagiri (TISS)	6 th November	16:30-18:00	Auditorium Seminar Hall
Technical Session 1.2	Vulnerability, Impact and Adaptation to Climate Change	D. Ramdas Arun Balaji	6 th November	16:30-18:00	Seminar Hall I Main Building
Technical Session 1.3	Vulnerability to Floods	Tamatapu Rama Priya Sravani Labisetty	6 th November	16:30-18:00	Seminar Hall II Main Building
Technical Session 1.4	Environmental and Climate Justice	B.Padmapiya Guguloth Jeevan	6 th November	16:30-18:00	Classroom, Ground Floor, Main Building
Plenary Session 3	The Work and Findings of the Intergovernmental Panel on Climate Change	Bishaka Ghosh YS.Prakash Anil	7 th November	10:30-12:00	Auditorium Main Hall
Technical Session 2.1	Climate Vulnerability: Agriculture and Food Security	Moulkar Rajeshwar Saroja Sree	7 th November	14:00-16:00	Auditorium Seminar Hall
Technical Session 2.2	Adaptation of Agriculture to Climate Change	M.Ravikumar Lingaiah Meesala	7 th November	14:00-16:00	Seminar Hall I Main Building
Technical Session 2.3	Climate Resilient Measures in Rural India	Rincy Simon Sourav Mohanty	7 th November	14:00-16:00	Seminar Hall II Main Building

Event		Name of the Rapporteur	Date	Time	Venue
Technical Session 2.4	Institutions and Sustainability	K. Yadagiri Annemalla Ramesh	7 th November	14:00-16:00	Classroom, Ground Floor Main Building
Panel Session 2.1	Local Action Plan on Climate Change: Methodology and Action	Dayakar Peddi M.Shimron Rao (TISS)	7 th November	16:30-18:00	Auditorium Seminar Hall
Panel Session 2.2	Martin Weitzman's Contributions to Environmental Economics	R. Smrithi Dr. P. Usha	7 th November	16:30-18:00	Seminar Hall I Main Building
Panel Session 2.3	MGNREGS Contribution to Climate Change: Mitigation and Adaptation	Predeep Kamble Medha.A.S	7 th November	16:30-18:00	Seminar Hall II Main Building
Plenary Session 5	Climate: Economics and Institutions	Jogindhar Naik R. Shital	8 th November	09:30-11:00	Auditorium Main Hall
Panel Session 3.1	Climate Change and Indian Agriculture: Methodological Issues	Dayakar Peddi T. Devi Priya	8 th November	11:30-13:00	Auditorium Seminar Hall
Panel Session 3.2	Climate Change, Adaptation and Mitigation –A Focus on Rainfed Agriculture	G. Bhanu Chander D. Veerabhadra Rao	8 th November	11:30-13:00	Seminar Hall I Main Building
Panel Session 3.3	Building Climate Resilience: Lessons from 'Commoning' the Commons	Raju Cheviti Vinay Sankar (BITS)	8 th November	11:30-13:00	Seminar Hall II Main Building
Panel Session 3.4	Climate Change Vulnerability Assessment in the India Himalayan Region	Bishnu Prasad Mohapatro Chetana VM	8 th November	11:30-13:00	Classroom, Ground Floor Main Building
Technical Session 3.1	Ecosystem Services, Resource Dependency and Disaster Recovery	E.B. Uday Bhaskar Reddy Rituparna Bhattacharya	8 th November	14:00-16:00	Auditorium Seminar Hall
Technical Session 3.2	Climate Mitigation: Industry and Infrastructure	Abhinav Deekonda Arun Balaji	8 th November	14:00-16:00	Seminar Hall I Main Building
Technical Session 3.3	Conservation, Economic Value and Climate Change Impact	Shoeb Ahmed Ayushi Gupta	8 th November	14:00-16:00	Seminar Hall II Main Building
Technical Session 3.4	Sustainability: Infrastructure, Health and Water	M.Rajeshwar Kopal Khare(BITS)	8 th November	14:00-16:00	Classroom, Ground Floor Main Building
	Valedictory Session	Chakradhar Jadhav B.Padmapriya	8 th November	16:30-17:30	Auditorium Seminar Hall

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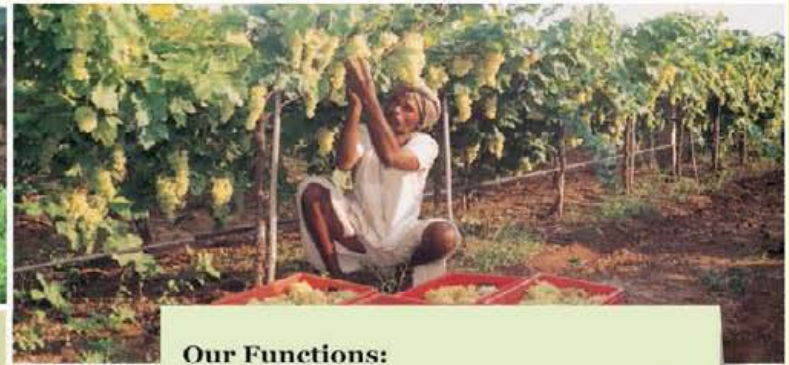
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