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CAP-RES-22 INTERNATIONAL SYMPOSIUM

DISASTER RESILIENCE AND GREEN GROWTH FOR SUSTAINABLE DEVELOPMENT

PROCEEDINGS

nidm

Resilient India - Disaster free India

National Institute of Disaster Management (NIDM)
(Ministry of Home Affairs, Government of India)

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CAP-RES-22 International Symposium

DISASTER RESILIENCE AND GREEN GROWTH FOR SUSTAINABLE DEVELOPMENT

PROCEEDINGS

26-27 September, 2019

Organized by

Centre for Excellence on Climate Resilience (CECR),
National Institute of Disaster Management (NIDM)
and
Department of Science & Technology (DST),
Government of India

Jointly with

The Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ Germany),
World Health Organization (WHO)
Global Green Growth Institute (GGGI) Seoul, South Korea,
IUCN-Commission on Ecosystem Management (South Asia),
UNICEF, and Springer Nature (Global Publishing)

CAP-RES-22 International Symposium

DISASTER RESILIENCE AND GREEN GROWTH FOR SUSTAINABLE DEVELOPMENT

PROCEEDINGS

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- Ms. Richa Srivastav, Consultant (NADMP)
- Ms. Thinles Chondol, Young Professional

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Dr. Akhilesh Gupta
Senior Advisor (DST) &
Head, Strategic Programmes, Large Initiatives
and Coordinated Action Enabler (SPLICE) &
Climate Change Programme

सत्यमेव जयते

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Message

Climate Change and Disasters are going to be the key issues for country like India. The IPCC messages are that the climate change is going to impact at least some key areas, like for example, the temperature, sea level and natural hazards are going to rise. In the context of India this becomes very important, because, India consists of a very different kind of demography along with diverse geographical setting, like we have long coastal areas along the peninsular India and the great Himalayas along the northern and eastern boundary of India, which are very prone to disasters. Therefore, the natural disasters are going to rise with time and changing climate.

This is going to impact the economy of the country. The challenges are for the disaster managers and also for the weather forecasters. The successful disaster management and resilience building would depend on the prior and accurate prediction of the natural hazards with high precision and also the carbon neutral disaster management at the ground level.

In that context the symposium which is organized by NIDM and DST is very relevant and topical. A broad range of participants from different agencies and institutes have participated in this two days International Symposium. The symposium has debated on these challenges and definitely solution will be paved for addressing these challenges.

(Akhilesh Gupta)

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Resilient India - Disaster free India

Maj Gen Manoj Kumar Bindal
VSM

Executive Director

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राष्ट्रीय आपदा प्रबंधन संस्थान
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National Institute of Disaster Management
Ministry of Home Affairs, Govt. of India
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Foreword

Environmental changes, like land-use changes, natural resource degradation and climate change are known drivers of risk and vulnerability. Weather and climate-related disasters have increased dramatically over the past few decades. The most recent climate projections for future also indicate a significant increase in the frequency and/or intensity of extreme events.

The CAP-RES focuses across five thematic areas such as Green Growth and DRR, Resilient Agriculture, Resilient Health, Climate proofing during disaster relief and recovery and Policy Instruments in DRR. Topics within the scope of these five themes were discussed in the symposium.

The purpose of this programme was sharing knowledge and experiences through case studies and best practices by the experts from different institutes including ministries, international agencies and experts. This symposium has enabled us to add value to the present understanding of different approaches for DRR including science, policy planning and practices and facilitate to prepare a roadmap for addressing climate change induced risks and vulnerability. It has also helped in developing network of institutions and experts around each of the thematic areas of the symposium / CAP-RES for addressing knowledge and capacity gaps including case studies, good practices, knowledge-sharing and collaborative programmes.

I am delighted to learn that after conducting a successful two day symposium, the team, has drawn the highlights and key recommendations from the speakers and discussants, and has come up with a compiled report of the symposium which contains valuable insights and recommendations from many eminent experts. I am sure that the contents of this report will be useful in future.

MKBindal

(Manoj Kumar Bindal)

Resilient India - Disaster free India

Prof. Anil K Gupta
Project Director, CAPRES
Professor & Head
Division of Environment,
Climate & Disaster Risk Management

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राष्ट्रीय आपदा प्रबंधन संस्थान
(गृह मंत्रालय, भारत सरकार)
National Institute of Disaster Management
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Preface

CAP-RES 22 i.e., Climate Adaptive Planning for Resilience and Sustainability Development in Multi-Hazard Environment is a network programme focusing on science policy interface. The Department of Science & Technology (DST), Govt. of India, under the National Knowledge Mission on Climate Change (NKMCC) has supported the programme.

CAP-RES focuses towards preparing a network of institutions and experts and developing case studies, undertaking the job of developing knowledge compendium and taking the lessons to ground level to district or sub district level.

CAP-RES-22 International Symposium on Disaster Resilience and Green Growth for Sustainable Development was enriched by a vast number of experts across the disciplines from all the fields related to Green Growth and disaster risk management. The heads and directors of more than 30 institutions and more than 150 delegates had participated in this two days International Symposium. This programme was an open ended programme and a number of National and International agencies have joined hands under this network programme across the thematic areas covered under the project, broadly focused on environment disaster development nexus. This programme aimed towards implementing National Action Plan on Climate Change with a special reference to disaster resilience and capacity building.

(Anil K Gupta)

About the Organisers

National Institute of Disaster Management (NIDM)

National Institute of Disaster Management is a statutory organization under the Ministry of Home Affairs, Government of India, mandated under the Disaster Management Act 2005 to be the apex institution with a vision to play the role of a premier institute in India and the region for capacity building, training, research, documentation and policy advocacy on all areas of disaster management in India. For more details visit: nidm.gov.in

Department of Science and Technology (DST)

Department of Science & Technology (DST) was established in May 1971, with the objective of promoting new areas of Science & Technology and to play the role of a nodal department for organising, coordinating and promoting S&T activities in the country. DST has a dedicated division on Climate Change and is implementing two out of eight national missions on Climate Change including National Mission for Sustainable Himalayan Ecosystem (NMSHE) and National Mission on Strategic Knowledge for Climate Change (NMSKCC). For more details visit:dst.gov.in

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ-GmbH)

GIZ India on behalf of Federal Government of Germany and various other partners has been providing support both, at the national level and at the sub-national level in almost all the key aspects of addressing climate change such as SAPCC development and implementation support; creating enabling conditions for accessing climate finance; capacity development, supporting policy dialogues and multi-stakeholder engagement. For more details visit: giz.de/en

IUCN-Commission on Ecosystem Management (CEM South Asia)

The Commission on Ecosystem Management (CEM) is one of the 6 commissions of IUCN. The South Asian regional network of the IUCN Commission on Ecosystem Management (CEM-SA) is a regional platform of global significance comprised of experts, professionals and emerging leaders (youth) for contributing and sharing knowledge that is helping for up gradation and development of existing knowledge related to the concerns, challenges and prospects of ecosystem management and trans-boundary conservation efforts in the region. For more details visit: iucn.org/commissions/commission-ecosystem-management

Global Green Growth Institute (GGGI)

The Global Green Growth Institute (GGGI) is a treaty-based international, inter-governmental organization dedicated to supporting and promoting strong, inclusive and sustainable economic growth in developing countries and emerging economies. GGGI's objective is to support the design of an innovative debt fund to unlock the decentralized renewable energy market by making available capital to enterprises for capital expenditure and working capital requirements, and at the same time help develop an ecosystem of investors, lenders, and development institutions (for more details visit: gggi.org/country/india).

World Health Organization (WHO)

WHO, as the directing and coordinating authority on international health within the United Nations system, adheres to the UN values of integrity, professionalism and respect for diversity. WHO works worldwide to promote health, keep the world safe, and serve the vulnerable. WHO's goal is to ensure that a billion more people have universal health coverage, to protect a billion more people from health emergencies, and provide a further billion people with better health and well-being (for more details visit: who.int/countries/ind).

National Centre for Disease Control (NCDC)

The institute was established to function as a national centre of excellence for control of communicable diseases. The function of the institute also included various areas of training and research using multi-disciplinary integrated approach. The institute was, in addition, expected to provide expertise to the States and Union Territories (UTs) on rapid health assessment and laboratory based diagnostic services. Surveillance of communicable diseases and outbreak investigation also formed an indispensable part of its activities (for more details visit:ncdc.gov.in).

UNICEF

UNICEF works in over 190 countries and territories to save children's lives, to defend their rights, and to help them fulfil their potential, from early childhood through adolescence. UNICEF India recognizes that the health, hygiene, nutrition, education, protection and social development of children are all connected. Targeting efforts for them at all stages of their growth – infant and mother, child and adolescent – and on a range of traditional programme fronts will see that inroads are made to ensure children not only survive (for more details visit:unicef.in).

Springer Nature

Springer Nature is a global publisher dedicated to providing the best possible service to the whole research community. They help authors to share their discoveries; enable researchers to find, access and understand the work of others and support librarians and institutions with innovations in technology and data (for more details visit: springernature.com).

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Ms. Aakanksha Tyagi, Editor Life Sciences, Springer Nature

Background

Environmental changes, like land-use changes, natural resource degradation and climate change, are known drivers of risk and vulnerability. Weather and climate-related disasters have increased dramatically over the past few decades. The most recent climate projections for future also indicate a significant increase in the frequency and/or intensity of extreme events. As climate change begins to manifest itself, in the form of increased frequency and intensity of hazards such as floods, storms, heat waves, and drought, there is an urgent need to address climate induced risks. The coming decades are likely to bring altered precipitation patterns so that many areas will experience more frequent floods and landslides, while others will experience prolonged drought and wildfires (IPCC, 2001). As many communities are not prepared to cope up with climate change induced disasters, it is a big challenge to build resilience.

Fortunately, disaster management in India is undergoing a paradigm shift that is from “response and relief” to “prevention-mitigation and preparedness” centric approach. The approach calls for a holistic understanding and integration of disaster risk management into planning process at all levels, considering the uncertainties and impacts of climate change along local environmental and anthropogenic background.

Capacity building in terms of improving knowledge base of key professionals and stakeholders, including officials and policy planners, is critical in achieving the goals of climate change action plans through disaster risk management. Objectives and scope of Adaptation to Climate Change and Risk Reduction of respective Disasters have substantial overlap, and hence, complimentary to each other. India, being a country of eco-geophysical, climatic and socio-economic diversity, the hazard and vulnerability settings varies across the regions. Challenges of Himalayan regions are different from those in coastal and in plain areas. Disasters, particularly those related with climate change, like flood, drought, cyclone, and associated aspects like forest fire, El-Nino, heat wave, cold wave, environmental epidemics, etc. are serious challenges for disaster management as well as climate change fraternity.

The National Institute of Disaster Management, looking to this aspect, in the backdrop of the Hyogo Framework of Action (HFA) has implemented an Indo-German programme “ekDRM (Environmental Knowledge for Disaster Risk Reduction”. Sendai Framework for DRR (2015-30) that syncs with the Paris Climate Agreement and the new set of SDGs, now focus equally on underlying causes of risk, investing in resilience building, and sustainable recovery interventions. This calls for the approaches and pathways for low carbon and ecologically sound developmental strategies that help adapt to the impacts of climate change with the aim of reducing the vulnerability and the risk of disasters.

The approach that aligns with co-benefits, synergy, cooperation and interdisciplinary actions, calls for greater science-policy-research interface at all levels. The Department of Science and Technology, Government of India, under the National Knowledge Mission on Climate Change (NKMCC), through the Climate Change Division, has supported the programme CAP-RES (Climate Adaptive Planning

for Resilience and Sustainability) at NIDM's Environment, Climate and Disaster Risk Management Division, to be implemented through the institutional networks and with collaborators and experts at international level.

About Project CAP-RES

The current proposal entitled "Climate Adaptive Planning for Resilience and Sustainable Development in Multi-Hazard Environment (CAP-RES)" aims at developing and implementing capacity building including knowledge and training support system for wider use by related institutions and training centres across sectors and regions. The CAP-RES focuses across three specific regional contexts, i.e. Indian Himalaya Region (special reference to North East), Coastal region and Central-western region. Region specific climate related hazard complex, including flood, drought, water scarcity, forest fire, cyclone/storm surge, coastal erosion, slope erosion/landslide, windstorms, heat wave, disease epidemics, industrial/chemical risks, etc.

The proposal of NIDM aims at value-addition to programme sub-areas of the NKMCC by engaging with the institutions/research centres and network of experts, researchers and practitioners, across following 5 key sub-sets of the project focus:

1. GREEN GROWTH AND DISASTER RISK REDUCTION

The concept of green growth encourages the basic idea of sustainable economic growth wherein development and ecological sustainability reinforce each other. The idea fosters Nature Based Solution (NBS), i.e. investments in ecological assets that can play vital role in climate change mitigation and disaster risk reduction. Economic efficiency and Environmental protection are two mainstays of the green growth. It promotes resource-efficient, sustainable, cleaner and more resilient growth processes while fostering economic growth and development which could be materialized through internalizing ecological cost, maximizing resource efficiency and minimizing pollution. Green growth is expected to switch the current carbon-based economy to an ecological based green economy.

2. RESILIENT AGRICULTURE SYSTEMS

Agriculture sector is one of the most disaster affected sectors. It is adversely affected by weather changes/ variations in physical conditions resulting in huge economic losses and disruption of people's livelihood. The increasing frequency and severity of climate related hazards and risks induced by climate change are adding a new dimension to the existing disaster risk profile of India. There is an immediate need for integrated disaster risk reduction strategies, strengthening the agriculture systems in the country and making them more resilient towards future disasters and climate change consequences. For making agriculture resilient foremost requirement is quantification of losses and damages in terms of production, assets, post-harvest impact for different allied sectors (crops, livestock and fisheries) which can actually help in prioritizing the focus areas for policy interventions.

3. PUBLIC HEALTH RESILIENCE

Public health and well-being is complexly associated with the surrounding environment. Effects of climate change and related disasters on businesses due to effect on health and safety, as well as effect on health business and services are equally important. Unsustainable use and overexploitation of the resources and services provided by the ecosystems degrade the environment and may have disastrous consequences on human health. Disasters impact public health in addition to the social and the environmental aspects. Effects of climate change on public health and coupled with the impact of hydro-meteorological disasters and extreme events on health, and related resources and systems, are key concerns of resilient development and disaster response preparedness.

4. CLIMATE PROOFING DISASTER RELIEF AND RECOVERY

Post disaster phase, which includes response and recovery interventions, is considered to be the most crucial stage of the disaster risk management cycle. Response phase caters to the immediate needs of affected population, providing emergency relief to protect lives and reduce further damages and losses. Whereas, disaster recovery phase take care of reconstruction and rehabilitation activities to ensure restoration of normalcy after the disaster. Climate proofing focuses on mainstreaming environmental sustainability into development planning and it can be a solution for our sustainable disaster relief and recovery needs. Climate proofing can ensure faster, environmentally sustainable and socially inclusive (community based and locally grounded) response and recovery post any disaster. There lies an immediate need to identify the gaps and opportunities across different sectors/areas during response and recovery where climate proofing measures can be mainstreamed.

5. ENVIRONMENTAL POLICY INSTRUMENT IN DISASTER RISK REDUCTION

Policy instruments are the 'tools' useful in formulation of policies and strategies and those in implementing policy decisions. Development planning and disaster risk reduction have to be dealt together, with mainstreaming disaster risk management into development policy, projects, planning and implementation. Modern Environmental Policy Instruments Environmental Impact Assessment (EIA), Life Cycle Assessment (LCA), Risk/Vulnerability Assessment, Audits and new tools like DIA (integrated with EIA), mitigation analysis, etc. helps in mainstreaming Disaster Risk Reduction. Customization and application of EPIs would help in avoiding reinventing the wheels.

Purpose of the Symposium

The purpose of this programme is sharing knowledge and experiences through case studies and best practices by the experts from different institutes including ministries, international agencies and experts. This would enable a platform to add value to the present understanding of different approaches for DRR including science, policy planning and practices and facilitate to prepare a roadmap for addressing climate change induced risks and vulnerability. It would also help in developing network of institutions and experts around each of the thematic areas of the symposium/CAP-RES for addressing knowledge and capacity gaps including case studies, good practices, knowledge-sharing and collaborative programmes.

Objectives of the Symposium

The symposium aimed to review the state of research and knowledge on the subject, across the key themes of CAP-RES and develop a network mode roadmap for addressing knowledge and capacity gaps in the subject by engaging with the institutions, researchers and experts.

Through the conference, CAP-RES tried to achieve the following:

- To deliberate upon the concepts, case studies, pilots and lessons across the thematic areas,
- To review and recognize the status – strengths, gaps and opportunities for research and science-policy-practice interface,
- To develop networks of institutions/researchers and experts across key themes for knowledge development and capacity promotion,
- To enable and strengthen cooperation with key international and national institutions for co-benefits with CAP-RES
- To enable policy environment, synergy and platform for promoting culture of safety and prevention, in general, and in particular towards the objectives of CAP-RES

Participation

The programme had representation from India and abroad and was attended by more than 150 participants. Dignitaries from Department of Science and Technology (DST), State Disaster Management Authority (SDMA) Sikkim, Deutsche Gesellschaft fürInternationaleZusammenarbeit (GIZ) Germany, World Health Organization (WHO), University Grants Commission (UGC) and NIDM (National Institute of Disaster Management) were present and inaugurated the two day symposium. Senior scientists, lawyers and officers from UNICEF, Gorakhpur Environmental Action Group (GEAG), Nation Centre for Disease Control (NCDC), Honb'le Supreme Court of India, Wetland International (WI), National Disaster Management Authority (NDMA), Council of Scientific and Industrial Research (CSIR), Ministry of Environment Forest and Climate Change (MoEF&CC), Ministry of Agriculture and Farmers Welfare (MoAFW), Indian Council of Agriculture Research (ICAR), International Union for Conservation of Nature (IUCN), India Meteorological Department (IMD), Ministry of Jalshakti, Centre for Science and Education (CSE), Central Research Institute for Dryland Agriculture (CRIDA), TARU Leading Edge, ICLEI-Local Government for Sustainability, NITI Aayog, International Centre for Integrated Mountain Development (ICIMOD), International Water Management Institute (IWMI), National Academy for Agricultural Sciences (NAAS), The Energy and Resource Institute (TERI) and National Institute of Disaster Management (NIDM) actively participated and presented in the respective sessions. Pro-Vice Chancellors, vice-chancellor, directors, departmental heads and professors from esteemed academic universities, colleges and institutes including Indian Institute of Technology (Tirupati, Roorkee and Gandhinagar), Vardhaman Mahavir Medical College (VMMC), Jawaharlal Nehru University (JNU), Guru

Gobind Singh Indraprastha University (GGSIPU), Kumaun University, Tropical Forest Research Institute (TFRI) Jabalpur, Indira Gandhi National Open University (IGNOU), Management Development Institute (MDI), Adamas University, National Institute of Hydrology (NIH), University of Delhi (DU), Wadia Institute of Himalayan Geology, TERI School of Advanced Studies also attended and gave their valuable contributions in different sessions of the workshop. Teachers, research scholars, students, officers, practitioners, environmentalists and conservationists from more than 15 states and 30 institutions attended the workshop and gained substantial knowledge inputs from the programme.

SESSION WISE REPORT

CAP-RES International Symposium
Disaster Resilience & Green Growth for Sustainable Development

Glimpses from the Inaugural Session

Inaugural Session:

Climate Adaptive Planning for Resilience and Sustainability

Session Date and Time:
26th September 2019, (09:30 to 10:30 am)
Name of Organizer:
CECR, NIDM
Name of Rapporteur:
Ms. Pritha Acharya, Research Fellow, CAP-RES, NIDM
Master of Ceremony:
Ms. Swati Singh, Consultant, NADMP, NIDM
Introduction and Context Setting:
Dr. Anil K Gupta, Head, ECDRM, NIDM
Welcome Address:
Major General Manoj Kumar Bindal, Executive Director, NIDM
Guest of Honour:
Prof. D P Singh, Chairman University Grants Commission
Addresses By:
– Dr. Akhilesh Gupta, Advisor & Head-SPLICE & Climate Change Programme, DST-Government of India & Former UGC Secretary. – Mr. Mohammad El-Khawad, Programme Director NRM, GIZ Germany, India Office. – Dr. Hendrik Jan Bekedam, WHO Representative to India – Prof. VK Sharma, Vice Chairman, Sikkim SDMA

CAP-RES: Climate Adaptive Planning for Resilience and Sustainability, is a network programme which aims at developing and implementing capacity building including knowledge and training support system for wider use by related institutions and training centres across sectors and regions. CAP-RES is being supported by the Department of Science and Technology, GOI under the National Knowledge Mission on Climate Change. Capacity building in terms of improving knowledge base of key professionals and stakeholders, including officials and policy planners, is critical in achieving the

goals of climate change action plans through disaster risk management. CAP-RES-22 International Symposium on Disaster Resilience and Green Growth for Sustainable Development was a two day event organized by CECR, at NIDM, MHA and DST, Government of India along with GIZ Germany, World Health Organization India, Global Green Growth Institute, IUCN-Commission on Ecosystem Management, UNICEF and Springer Nature. The symposium had 5 sessions in addition to the inaugural and the valedictory session. The 5 sessions of the symposium were in accordance and aligned with the 5 themes of CAP-RES project which are as follows:

1. Green Growth
2. Resilient Agriculture Systems
3. Public Health Resilience
4. Climate Proofing Disaster Relief and Recovery
5. Environmental Policy Instrument in Disaster Risk Reduction

Ms. Swati then called all the guests on the dais for lighting the lamp and giving the symposium a formal start. After the lamp lighting ceremony, she invited Major General Manoj Kumar Bindal to the podium for his address and remarks.

DR. ANIL K GUPTA, Head, ECDRM, NIDM, extended warm welcome to all the luminaries and opened the session's discussion by setting the context for the programme. He acknowledged the vast number of experts from all disciplines of green growth and disaster risk management. He shared about CAP-RES and said that the beauty of the project is its open ended nature, which have led to successful partnership and participation of various national and international organizations with CAP-RES. These organizations will be working across the thematic areas covered under the project broadly focusing on capacity development in the field of disaster resilience.

MAJOR GENERAL MANOJ KUMAR BINDAL, Executive Director- NIDM, expressed his pleasure to host this symposium where experts and learned individuals from all dimensions of various departments dealing with climate resilience and green growth participated. He further congratulated the international and natural partners for their immense support. Talking about the current climate scenario, he said the worldwide climate change or global warming acts as a catalyst for increasing the frequency and intensity of the natural disasters. Even a small change or increase in the temperature will lead to destruction of entire ecological cycles in some areas or more than a few regional areas. With more and more development, the carbon budget and the greenhouse effect also increases which in itself increases the Earth's temperature and heat budget. This entire process acts as a feedback mechanism in a very short loop by increasing the rate of disasters and hazards like floods, droughts and other extreme events. He further added that sustainable development can be achieved through the ways of green growth, wherein the economical investments would be made to optimize the use of natural resources, so that it does not leads to its exhaustion. Economic efficiency and environmental protection are two main pillars of green growth to ensure disaster risk reduction and disaster resilience. Highlighting the need to develop capacity, in specific areas he said that it is important to touch upon the sectors of disaster resilient agriculture and climate proofing of disaster development. He said that to materialize the actions taken towards climate proofing and disaster resilience effective instruments are needed which are the policy tools. He then talked about the five themes of CAP-RES project and said that the two day symposium will help in identifying the upcoming challenges and the issues that needs to be discussed in detail and addressed properly.

• KEY POINTS •

- The worldwide climate change or global warming acts as a catalyst for increasing the frequency and intensity of the natural disasters.
- With more and more development, the carbon budget and the greenhouse effect also increases which in itself increases the Earth's temperature and heat budget.
- Economic efficiency and environmental protection are two main pillars of green growth to ensure disaster risk reduction and disaster resilience.

DR. AKHILESH GUPTA, Advisor & Head-SPLICE & Climate Change Programme, DST-Government of India & Former UGC Secretary, expressed his gratitude towards the honored guests on the dais and stated his address. He then complimented NIDM for launching the centre of excellence supported by DST as this is the only centre for disaster management in the country. He said that DST has 7 similar capacity building programme under DST with a target of 200 plus trainees in climate change and disaster related issues. Climate change and disasters are well connected; the IPCC report of 2014 clearly brings out three important messages viz the temperature are rising across the world and they will continue to rise, the sea level rise is taking place across the world. He added that among the 45 cities of the world 4 Indian cities- Kolkata, Mumbai, Chennai and Surat are in the list which poses an immediate risk of sea level rise as said by IPCC report. He said by the end of this century, these capital cities will have a rise of 45-60 cm of water. Almost all extreme events and the hydro-metrological disasters are going to rise as they have been in the past 15 years. This is a very important inference from the Indian context, India has a very different geography, socio-economic and population density and therefore the impact of these disasters are going to be very high. He further added that one issue that is not given proper focus by the climate scientists and managers is the impact of climate change on cities. The urban climate has a very different dimension than the global level impacts. The local level impacts in the cities are going to be very different. A study done by DST highlighted that the number of extreme events in the major cities is increasing. Thus, there is an urbanization effect and with this increased urbanization effect in the country the frequency of the extreme events will be more in the cities as expected. In addition the magnitude of the heating, the change of the global impact is going to be much more as there are issues and challenges of heat islands in the city. Dr. Gupta said that increased number of flood incidences has been noted in Indian cities, and these are particularly the short term floods or the flash floods. He added that heat wave is there across the country and it will also be on rise. The large floods are also going to be prevalent in the future especially in the central India. Pointing out to an interesting research finding he said that climate change may cause Rheumatoid Arthritis. Further, he said that the relation between climate change and human health is not direct although they are very much interconnected. Early warning systems are in place but with the current global scenario, there is a need for multi-hazard holistic early warning system. Concluding his speech, he said that there is a need for extensive training and the need for research and development in the field of disaster management is much needed.

NIDM partnered with a few reputed global organizations in developing various kinds of knowledge products. During this session, a few of these knowledge products and publications were released. In total 5 publications were released, which included position papers, reports and training manuals. In addition NIDM launched the global book series on 'Green Growth and Disaster Resilience', which was a joint initiative of NIDM with Springer Nature. Ms. Swati invited the guest of honor and the other guests on the dais to release these knowledge products. The photographs are given in the subsequent paragraphs and the complete list of the publications released throughout the symposium is provided below in Annex II.

• KEY POINTS •

- The rising temperature and sea level across the world poses risk to World as well as to Indian cities.
- Due to climate change, almost all extreme events and the hydro-metrological disasters are rising past 15 years.
- Need for multi-hazard holistic early warning system.

MR. MOHAMMAD EL-KHAWAD,Programme Director NRM, GIZ Germany, India Office, greeted the gathering and expressed his gratitude for the invitation on behalf of GIZ. He said that they have been working and building on a long Indo-German Partnership. GIZ has been working closely with both the state and the national government to find solutions to address the Indian climate concerns that impede development. Changing climatic conditions are increasing the frequency of disasters and off-course causing negative impact on community, livelihood and ecosystems. Climate risk index published in Poland, India ranks 14th in the most negatively impacted country due to climate change and the impacts were on agriculture, water, infrastructure, health and forestry. There is an international recognition, that adaptation on one side and mitigation in the other side to climate change is not enough and in these negotiations it is stressed that there is a need to develop a climate risk assessment and their approaches. India has to work on it as vulnerability and disaster risk are required and thus there is a need of Climate Risk Management Framework. He then talked about the CRM Framework, that GIZ has worked together with NIDM and IIPSA and have developed a generic climate risk framework which is expected to give guidance and access to climate risk and develop appropriate measures to address vulnerabilities. He then congratulated NIDM and DST for launching the CAP-RES project and said that capacity building is an integral part of all the activities and initiatives of GIZ and they are working extensively to increase the knowledgebase of key professional and stakeholders. He further emphasized on the need of mainstreaming these initiatives into the system and identifying appropriate entry points. He stressed on the link between climate change vulnerability and disaster risk and said that the Indian State Action Plans on Climate Change and the disaster management plans which are undergoing revisions provide an excellent opportunity to mainstreaming vulnerabilities and disaster risk reduction. He then shared about GIZ's field of work; he said that GIZ works with the government of Germany with different ministries as well as with the Indian government at the national and sub-national levels as well as with various German and Indian Institutions. Climate finance and accessing climate finance is another sector where the GIZ is working efficiently and CRM framework was developed as a part of this project. Concluding his speech, he said that the there has to be a connect between the policy and practice framework in order to achieve what is required and CAP-RES 22 is one such stage which provided a lot of scope for achieving this.

• KEY POINTS •

- Changing climatic conditions are increasing the frequency of disasters and causing negative impact on community, livelihood and ecosystems.
- India ranks 14th in the most negatively impacted country in agriculture, water, infrastructure, health and forestry.
- Need for Climate Risk Management Framework and mainstreaming, identifying appropriate entry points.

DR. HENDRIK JAN BEKEDAM, WHO Representative to India appreciated the NIDM for organizing and inviting him to the symposium. He then said that presently the society is living in a very challenging time; there are cases of heat waves, more intense cycles, unusual patterns of rainfall, droughts and floods and climate change is crucial to this. The UN climate change has highlighted that it is not just a challenge for India but a global challenge. In addition certain climate challenge may start at one region or country and its effects can be seen in other regions/ counties. For example; the Western Pacific Countries their existence are now threatened. Coming to the human health aspect he said that often the disasters definitely have a lot of human consequences. Giving the example of air pollution, he said that rather than thinking about the causes of air pollution, the focus should be to think about the solutions. The major single contributing factor of the air pollution is the burning of residential biomass burning around the house due to the activity of the households, the second and the third reason are the industries and the energy production, the fourth one is the dust of the construction, the fifth is transport and then the seasonal issues comes. Thus the households can do a lot when it comes to reducing the pollution. Relating to the government schemes, he said the prime minister has done some good work with the LPG schemes where 80 million women have the access to the LPGs rather than burning wood. Challenges are also there in building are also very much prevalent and a lot of work needs to be done there. Giving the example of Netherlands, he said the transportation systems also need to be relooked making it possible and safe for cycles and cyclists. Such initiatives are not just good for the environment, body as well as are cost effective and other benefits. He said as a doctor, he believes in prevention is the best and thus he said that preventing air pollution should be given more focus. As an UN organization, WHO was involved in the Kerala floods and the Odisha cyclone, they have worked very well in managing the challenges in Kerala. In Odisha the preparedness was exceptional and thus could prevent a number of deaths and casualty. Thus prevention is needed but preparedness is integral when it comes to reducing the challenges of disaster and climate hazards. He stated that there is a need to highlight the global attention as well as a local attention to climate change but in the country it needs to be done in the states, the districts and at the national level. Economic growth is very important for the country and India is growing rapidly and it is growing at a rate of 5-7% and for every percent of GDP growth, energy is needed. Alternative resources provide an answer to such growth in GDP and energy requirements. He gladly shred that the Indian PM committed to increase the alternative resources during the New York climate summit.

• KEY POINTS •

- UN has identified Climate change to be a global challenge.
- Residential biomass burning is major single contributing factor for which solution should be identified.
- Prevention is needed but preparedness is integral for DRR.

The session followed on with the Prof. V K Sharma sharing his speech with the participants of the symposium. **PROF. V K SHARMA, Vice Chairman, Sikkim SDMA**, to begin his speech expressed his gratitude towards all the guests in the dais and congratulated NIDM for organizing such a timely and much needed symposium on climate resilience. He said India is emerging as a global leader in the climate sector and a lot of good work is being done in the energy sector, water sector and most importantly there is also a political commitment. This workshop is expected to provide a convergence as every state is having a climate action plan and every district is also having disaster management plan, but the convergence was lacking. He added that the recommendations from this workshop will be very useful for the institutions and organizations present and participating in the event. Moreover, he said with the guidance of UGC chairman; environment, climate change and disaster education will get a boost in getting recognized and used in course curriculums. He stated that Sikkim has set example for all the other state when it comes to climate resilience and green growth. Sikkim is the first state to have organic farming, 57% of the state is under forest cover, the state has banned plastic about 20 years ago and many other good practices have been supported by the state. Giving the example of the extra-ordinary work done by Sikkim state in the Lhonak Lake with the help of UNDP, Swedish Development Agency and DST, he said that not only the glacial lakes are increasing but they are now able to detect the increase in water level (using sensors) and according release water so that it does not create any effect on the local people as well as any hydro power plants in the villages and the cities. He said that it is the state that has revived 4000 water springs which were totally dry and now is giving training to Nagaland and other Himalayan states to revive these springs and adapt and mitigate challenges of climate change. He supported Dr. Akhilesh Gupta on his statement that hydro-metrological disasters have increased and said that such disasters are much more dangerous to the Himalayan states. Although the amount of rainfall is constant over time but the time span of the rainfall has reduced and this is the reason that the occurrences of landslides and forest-fires have increased despite the forest cover being 57% of the state. He emphasized on the need and importance science and technology especially in case of forecasting and early warning systems and appreciated the efforts of IMD and CWC in the remarkable work done during the recent flood events. Moreover, he said that there is a need to develop early warning systems for landslides. Concluding his speech, he said education and universities are important tools when it comes to creating awareness and gave the example of universities abroad, which give a lot of emphasis to Disaster Risk Reduction in their course

curriculums. India should also take note from such universities and develop their course curriculum accordingly. He said that this conference is very important for two aspects; a) providing a common platform where practitioners, professionals, institutions and other important organizations can come together and discuss and brainstorm on the persistent challenges of climate change and disaster risk reduction, and b) understanding the new dimensions and types of disasters that pose a threat to the society in the near future.

• KEY POINTS •
• Recommendations from this workshop will be very useful.
• Environment, climate change and disaster education will get a boost in getting recognized and used in course curriculums.
• Early warning systems for landslides is needed.

PROF. D P SINGH, Chairman, University Grants Commission, at first expressed his sincere thanks and appreciation for organizing and inviting him to the symposium. He congratulated NIDM for launching this initiative along with DST and being the apex body when it comes to educations, courses and curriculums in disaster management it has joined hands with so many agencies. He said that the issues of environment degradation of the nation have been at the forefront of the policy debate over the last four to five decades, however with recognition of ecosystem services of safety and sustainability of mankind and issues of climate change over the past one decade have converted the debate to find solution for these courses. While we are developing new policy protocols towards better management of our environment for protecting people from the miseries of natural disasters and we also the best traditional practices and knowledge on these aspects. He promoted the Indian traditional way of living and gave examples of Indian Vedas, national song and other traditional shlokas and prayers that support such kind of living. Addressing especially to the youth, he said that Indian traditions have been valuing the ecosystems, rivers, mountains, coasts, flora and fauna, by way of worshiping or rituals. There are a number of examples of knowledge of ancient practices in multiple forms and expressions. Adding to this he said that the modern-day challenges are so complex and devastating that they lead to disasters. These traditional and cultural practices should thus be integrated with the modern practices and methods in order to better adapt and address the challenges of environment degradation and climate change. Science and technology interventions in the field of space applications, environmental degradation, medical applications, biotechnology applications, engineering, telecommunication and computer systems; all these disciplines are now working to address the issues to environment and disasters related issues. A blend of all these disciplines within themselves and the social dimension of life is required for effective ground actions. Recalling the historic and the global Agenda 21- Rio Summit, he said that CAP-RES-22 may serve an initiative to help in fostering the development programmes in a manner inflicting environment support and limitations. It is a fact that, when the society fails to understand the limitations of the environment, it enters

into the risk zone. It is not necessary to get afraid of these risks but it is important to adjust the plans in manner to address these risks and living freely with risk. He then highlighted some initiatives he started in universities and some initiatives started by the UGC. In Banaras Hindu University, he integrated many the environment management and disaster management studied under various science and management streams. A dedicated institute of environment sustainable management was also established in the BHU, with support of DST, where climate research and training initiatives are up-taken. Green campus is very much important in today's context and shared examples of some Indian universities which are taking up this initiative. The government of India is taking environment education very seriously and with significant importance. Subsequent to the Hon'ble Supreme Court's order, UGC wrote to all universities in early 2000 to make environmental education essential and compulsory in all general and professional disciplines. The course also supports modules on Disasters and their mgmt. He happily shared that many institutions have created dedicated centres for disaster management and complimented these universities. Under the PM 10 agenda, many institutes supported NIDM to develop course curriculum on disaster management integrating three spheres of environmental studies, social work, development studies and high professional regimes including health, law, engineering field. UGC is also supporting various vocational studies on environment protection, water management and disaster management in colleges and universities. A number of research projects under science and social science domain are also been undertaken by UGC along with numerous MOOCs at undergraduate and post-graduate level through SWAYAM initiative of the Government of India. Guidelines on eco- friendly and sustainable campus and will be shared to universities which will be supported and implemented by the universities as well structured guidelines. He then complemented NIDM and NDMA, two of the apex institutions on policies and emergency response matter related to disaster management coming together with link minded people, agencies to fill the knowledge gaps and implementing ground actions. To conclude his speech, he said that a carbon neutral, eco-friendly, healthy, economically viable and socially viable model is the need of the hour. He wished the symposium success and said that the outcomes of this symposium will go a long way in driving a paradigm shift towards sustainability in our disaster management system.

• KEY POINTS •

- Environment degradation of the nation has been at the forefront of the policy debate to find solution for these courses.
- Promoted the Indian traditional way of living as Indian traditions have been valuing the ecosystems, rivers, mountains, coasts, flora and fauna, by way of worshiping or rituals.
- Traditional and cultural practices should be integrated with the modern practices and methods to better adapt and address the challenges of environment degradation and climate change.

Publications Released

High Level Plenary Session:

Climate Adaptive Planning for Resilience and Sustainability

Session Date and Time:
26th September 2019, (11.00-12.00 pm)
Name of Organizer:
CECR, NIDM
Name of Rapporteur:
- Dr. Sanayanbi Hodam, Research Associate (NADMP) - Ms. Srishti Banzal, Intern NIDM
Session Chairperson:
- Prof. Sudhir Jain, Director, Indian Institute of Technology, Gandhinagar - Prof. Mahesh Verma, Vice Chancellor, Guru Gobind Singh Indraprastha University, Delhi
Session Coordinator:
Dr. Akhilesh Gupta, Advisor & Head- SPLICE and Climate Change Programme, DST-Govt. of India and Former Secretary UGC
Session Speaker:
- Dr. R K Bhandari, Former Director - CSIR-CBRI, Member of Advisory Committee, NDMA - Dr. Anil Kumar Singh, Secretary, NAAS, New Delhi (Former VC, VRS Agriculture University Gwalior & DDG-NRM, ICAR)
- Prof. S P Singh, (FNA) Former Vice Chancellor, Kumaun University, Nainital & ICFRE Chair Professor

COORDINATOR

DR. AKHILESH GUPTA, Advisor & Head - SPLICE and Climate Change Programme, DST-Govt. of India and Former Secretary UGC, talked about how the session will be conducted and that the high plenary session is aimed to set the stage for the upcoming two days programme. He said that the session will end up with some recommendations with some general and specific recommendations.

SPEAKERS

DR. R. K. BHANDHARI, Former Director - CSIR-CBRI, Member of Advisory Committee, NDMA, said that when we talk about disaster management we tend to talk in generics and not specifics and thus lose focus on concrete problems; no focus on concrete targets and our actions do not live up to our words. He stated that time is changing fast and we have not been able to catch up to the demands of today. He stressed on infrastructure projects which are becoming huge, complex and demanding and which is making the targets in front of us unprecedented and daunting.

He said that there should be development but however, it should not lead to disasters and should be resilient to them. He also stated that there is a need to integrate Disaster Management in the planning phase of development projects. He asserted that we must also address the challenge of integrating old and new constructions from a safety perspective along with addressing multi hazard ecosystem challenges. He further added that Risk Assessment and Risk Management are fundamental aspects in a project and due diligence need to be done. Sustainability, Integrated Development etc. should not remain mere words; we need to take actions to ensure that development happens with due diligence. He concluded highlighting that in today's age of AI and software developed by large firms we cannot blindly rely upon these tools for developing contingency plans and project management and that human intelligence is needed to anticipate problems and adapt projects according to individual needs of the projects.

• KEY POINTS •
• Need to focus on concrete problems, targets and actions.
• Need for Disaster Resilient Development.
• Need to integrate Disaster Management in the planning phase of development project.

DR. ANIL KUMAR SINGH, Secretary, NAAS, New Delhi (Former VC, VRS Agriculture University Gwalior & DDG-NRM, ICAR),stated extreme climatic events are becoming more frequent now and we see unprecedented variability in climate patterns and that it's the variation in rainfall that is causing floods and droughts. He added that another worrying trend is the shrinking of agricultural land due to rampant industrialization. Dr. Anil Kumar also spoke about National Initiative for Climate Resilient Agriculture and how there is a need for district level contingency plans to help farmers. Agriculture is also increasing the risk of disasters through increased Nitrous Oxide and Carbon dioxide emissions especially through crop burning etc.

He mentioned that we need green, low emission technology and raise the productivity of factors of production while accounting for fixed land area. He talked on two important limiting factors in farm productivity i.e., soil erosion and limited water resources. He added that nutrient depletion in soil is a cause of concern as it prevents multiple-cropping and that water requirement will increase as average temperatures rise. He highlighted the issues of the per capita availability of water which has been decreasing day by day, rapidly depletion of ground water thereby leading to more severe water shortage problems, low water use efficiency. He suggested that a nature-based ecosystem conservation approach needs to be followed and also sustainable development goals can only be achieved with ecosystem services model based analysis and nature and technology-based approach.

• KEY POINTS •

- Extreme climatic events are becoming more frequent, a nature-based ecosystem conservation approach needs to be followed.
- Agriculture is also increasing the risk of disasters through increased Nitrous Oxide and Carbon dioxide emissions especially through crop burning etc.
- We need green, low emission technology to raise the productivity for fixed land area.

PROF. S P SINGH, FNA, Former Vice Chancellor, Kumaon University, Nainital and ICFRE Chair Professor, talked on how to expedite recovery after landslides in mountainous regions. Landslides are caused by deforestation, earthquakes, heavy rainfall, human constructions, forest fires, silting of water bodies, crop failures, agricultural abandonment etc. Himalayas are unusually vulnerable to landslides due to earthquakes, rainstorms and human construction activities. Landslides can cause extensive damage to cities. The physical and psychological damage due to landslides cause people to migrate away from the mountains. Substandard construction practices and activities raise the risk of landslides.

The muck created during a landslide should be utilized well instead of dumping it in the rivers. The effects of landslides are not all bad. They create new land and lead to an eventual rise in biodiversity of the area. For a quicker recovery of the soil nutrients after a landslide, we must be mindful of the trees that grow after a landslide. Promote oak and other broad-leaved trees, not pine. Species selection is important for bio-restoring sites. We must take steps to avoid the formation of gullies. We should try to create oak-zones and not pine-zones in the landslide affected sites. Pines are more aggressive and appear quickly after landslides but slow down the biorecovery. Mycorrhizae species promote quicker recovery. We must study the effects of various species on the ecosystem during recovery from disasters to make quicker recovery during disasters.

• KEY POINTS •

- Need to expedite recovery after landslides in mountainous regions.
- Substandard construction practices and activities raise the risk of landslides.
- The effects of landslides are not all bad.

CHAIRPERSON

Session Chairs **PROF. SUDHIR JAIN**, Director, Indian Institute of Technology, Gandhinagar and **PROF. MAHESH VERMA**, Vice Chancellor, Guru Gobind Singh Indraprastha University, Delhi, concluded the session giving some insightful outputs from the session. They said diverse viewpoints on the issue of disaster management had been observed. The first perspective was from an engineering point of view, which emphasized on the need to perform due diligence in the projects and inculcate risk assessment and disaster resilience practices in the planning phase itself.

The second perspective was from an agricultural viewpoint which saw agriculture as a victim of as well as a contributor to disasters and emphasized the need to adopt district level disaster management plans, sustainable use of land and water and a nature and technology based conservation approach. The third perspective was from a botany and ecological viewpoint on how by mindfully promoting biodiversity after a landslide, we can expedite the recovery of soil nutrients and biodiversity and hence make a complete recovery after a landslide.

• KEY RECOMMENDATIONS •

- A need to perform risk assessment and prepare for the worst case scenarios. Disaster resilience should be inculcated in an infrastructure project from the planning phase itself.
- To find ways to integrate old and new constructions from a safety perspective along and address multi-hazard ecosystem challenges.
- We cannot solely rely on technology to guide us; Human intelligence is needed to anticipate problems and adapt projects according to individual needs of the projects.
- There is a need for district level contingency plans to help farmers.
- We need Green, low emission technology and raise the productivity of factors of production while accounting for fixed land area.
- We must study the effects of various species on the ecosystem during recovery from disasters to make quicker recovery during disasters.

Cluster Session 1:

Green Growth and Disaster Risk Reduction

Session Date and Time:
26th September 2019, (12:00 to 1:30 pm)
Name of Organizer:
Global Green Growth Institute (GGGI)
Name of Rapporteur:
- Mr. Saurab Babu, GGGI - Ms. Shweta Bhardwaj, Junior Research Fellow, CAP-RES
Session Chairperson:
Dr. Alok Sikka, Country Representative, International Water Management Institute (IWMI), CGIAR
Session Coordinator:
Mr. Shantanu Gotmare, India Country Representative, GGGI.
Session Speaker:
- Mr. Nishant Bhardwaj, Deputy Director and Head of Energy and Policy Division GGGI, Seoul, South Korea - Mr. Mehul Jain, Climate Change Specialist, The World Bank
- Mr. N. Raghu Babu, Senior Advisor, GIZ Germany, India Office
- Dr. Neera Shreshtha Pradhan, Senior Specialist - Water & Adaptation, ICIMOD Kathmandu, Nepal
Session Discussants:
- Prof. A. L. Ramanathan, Dean, School of Environmental Sciences, JNU, Delhi
- Prof. P. C. Tiwari, Head, Dept. of Geography,Kumaun University Nainital
- Prof. Santosh Kumar, Head Inclusive DRR Division, NIDM

ABOUT THE SESSION

Green growth is a socially inclusive, environmentally sustainable and equitable development model that emphasizes that strategically crafted policies can achieve environmental sustainability at low cost, and simultaneously help stimulate growth. The session explored aspects of green growth that

can be applied as a Disaster Risk Reduction strategy in various economic sectors of the country, in order help safeguard future investments from disasters.

COORDINATOR

The cluster session 1 was coordinated by **MR. SHANTANU GOTMARE**, India Country Representative, GGGI. He provided an overview on the session topic and introduced session chairperson, speakers and discussants.

CHAIRPERSON

DR. ALOK SIKKA, Country Representative, International Water Management Institute (IWMI), CGIARwhile addressing the session talked about the large concentration of water and related risk particularly in the South-East Asia region. He stated that climate change is a reality which has led to increase in disaster frequency, intensity and extend of disaster risk. He highlighted the initiatives taken up by IWMI which has a separate research group working on climatic related risk particularly flood and drought. He also talked about various initiatives taken by ICAR in field of agriculture disaster risk reduction during his tenure as Deputy Director General for Agricultural Disaster Management/ Risk Reduction which were highly important considering the huge strategic importance of the agriculture and allied sector in Indian economy. He mentioned that it's time to move away from relief and response (crisis risk management approach) to disaster preparedness centric approach. He stated that Nature Based Solution is very important particularly in disaster preparedness domain. Highlighting IWMI work in the domain he mentioned about separate research groups working on Nature based Solutions, green infrastructure and green growth. He talked about the need to blend green solution with our engineering solutions for sustainable development.

SPEAKERS/ TECHNICAL PRESENTATION

MR. NISHANT BHARDWAJ, Deputy Director and Head of Energy and Policy Division GGGI,in his presentation "*GGGI Approach to Green Growth*" provided an overview about Global Green Growth Institute as an organisation and their vision and values; he also talked about some of the key trends

and their significance; and talked GGGI approaches and some of the case studies from across the world highlighting the initiatives taken up by GGGI to tackle the climate change. He talked about how GGGI is dedicated for promoting sustainable and inclusive growth in developing countries and emerging economies. He highlighted some of emerging socio-economic and earth systems trends starting from 1970 to 2010 and he emphasised that all these trends are good for social economic development however what these mean for earth systems is what we systems is what we have to look at. Talking about the recent disasters he mentioned how in the year 2018 the world witnessed 15 most extreme climate events including India's Kerala floods and IPCC reports highlighted the need to reduce CO^2 emission to net zero by 2050 globally. He talked about GGGI development approach which advocates green growth and its comprehensive delivery model based on diagnosis, green impact assessment, sector/sub-sector strategy & planning and design, financing and implementation. He discussed two case studies through which he talked about GGGI approaches and intervention at global level for promoting green development. First, he discussed the case of Ethiopia in which GGGI helped Ethiopia in building climate resilient green economy, which started in year 2011. Second case study that he discussed was that of the Fiji, where GGGI started its intervention in 2015 and carried out green growth study for feasibility for two of its important islands. He mentioned that both case studies clearly reflect the will at LDC level to convert their progresses and adopt approaches which are green, hence, it reflects if there is will among middle income and emerging countries, they are very well placed to do the same because green initiatives make an economic sense at sustainable cost.

• KEY POINTS •

- IPCC reports highlighted the need to reduce CO2 emission to net zero by 2050 globally.
- GGGI helped Ethiopia in building climate resilient green economy, which started in year 2011.
- In Fiji, GGGI started its intervention in 2015 and carried out green growth study for feasibility for two of its important islands.

MR. MEHUL JAIN, Climate Change Specialist, The World Bank in his presentation on *"Promoting Green Growth & Resilience through SAPCC Implementation"* talked about climate and disaster vulnerabilities that affect India; why and how State Climate Change Action Plans (SCCAPs) are good entry points of climate resilience and discussed key challenges associated with their implementation and put forward some recommendations on the same. He discussed about the increasing number of disaster event and the rise in Global carbon emission.

He stated that India has always been a very proactive nation and in 2008 India has become one of the first nations to come up with National Action

Plan on Climate Change. He discussed various initiatives taken by India towards building climate resilience which included implementation of SAPCC with sector specific approach, commitment towards Sustainable Development Goals and Paris Agreement with its own NDCs. Taking the discussion forward he highlighted some of reasons why and how these SAPCCs are good entry points to build climate resilience and discussed the challenges that are associated with effective implementation of these plans. In key recommendation he suggested working on three pillars which include strategy and policy- linking plans to policy that are implementable; institutional arrangement- inter departmental interaction and their mainstreaming into SAPCC and knowledge- making plans dynamic promoting knowledge exchange with partners and stakeholders.

• KEY POINTS •

- State Climate Change Action Plans (SCCAPs) are good entry points of climate resilience.
- With increasing global carbon emissions, the number of disaster events are increasing.
- In 2008 India has become one of the first nations to come up with National Action Plan on Climate Change.

MR. N. RAGHU BABU, Senior Advisor, GIZ Germany, India Office,in his presentation on *"Planning Green Growth of Industries: integrating disaster risks, climate resilience and sustainability"* talked about the need for 'planning' particularly in case of industrial development. In his presentation he emphasised that just responding to disaster would not help, we need to invest more into disaster preparedness. He mentioned in the times where we are talking about 5 trillion economy coming up- we would need to look into some of the important aspects of green growth for industrial development such as where will be industries developed in the country, kind of industries that will be developed, kind of zones and infrastructure etc. He emphasised all of these are interlinked and needs to be planned otherwise it will leave us more vulnerable and exposed to risk in future. He mentioned Climate change is another add-on factor that increases our risk and needs to be integrated in this planning.

He talked about various interventions taken by GIZ in the field which included development of sustainability standards and international framework for eco-industrial park jointly with The World Bank, which is now to be tested with Bangladesh for their economic zones. He stated that we need to have a uniform information system to manage our industrial areas better. He discussed the examples of Shanghai chemical industrial park, at Shanghai, China and Chempark, Leverkusen, Germany where industrial zone are well developed and have facilities like common tank forms, centrally located industrial gases, incinerator for waste, pipe racks for chemical/hazardous material transfer, centralised disaster management unit for whole park etc; these facilities helped in reducing vulnerabilities of these industrial areas towards disaster risk. He discussed about the Industrial Disaster Risk Reduction

and Planning Approach for New industrial estates for which he mentioned that we must invest in planning our sites, our industrial zones, take care of landuse around the site in the impact zones, place the disaster management systems and in the case of existing industrial estates we need to retrofit zones and infrastructure, plan the land use of the areas around the site (25 km) and take other such interventions. In his key messages, he suggested to adopt sustainability standards, mainstream climate change adaption strategies in industrial areas for sustainable industrial development, identify more vulnerable areas around the country and plan them and areas around them accordingly and most importantly bring in more rigorous industrial planning systems.

• KEY POINTS •

- Need to invest more into disaster preparedness.
- Use of green growth for industrial development.
- For sustainable industrial development, there is a need to identify more vulnerable areas, adopt sustainability standards, rigorous industrial planning and mainstream climate change adaption strategies in industrial areas.

DR. NEERA SHRESHTHA PRADHAN, Senior Specialist - Water & Adaptation, ICIMOD Kathmandu, Nepal, in her presentation on "*Disaster Risk Reduction and Increasing Resilience in the Hindu Kush Himalayas*", talked about the interventions made by ICIMOD on ground in the field of Disaster Risk Management in the Hindu Kush Himalayan regions. She mentioned that mountain communities live in muliti-hazard environment; they are vulnerable to different hazards and in case of Hindu Kush Himalayan region, the most common disasters are floods which incur maximum losses. She emphasised on the fact that it is always the communities who are the first responders as well as the most affected ones during any disasters, particularly women in the communities. She mentioned that women are more vulnerable in disasters due to lack of information, mobility, decision-making power, and access to resources and training; as well as gender-based socio cultural norms and barriers, conventional gender responsibilities, and high rates of male outmigration in the region. She stated that we need to ask ourselves that the modelling and the graphs that we do, is it reaching to the one who are the most affected by the disasters.

She talked about building resilience through green approaches which can be achieved through economic diversification, ecosystem preservation, energy security, sustainable production and consumption, resource efficiency and increased resources for dealing with uncertainties (floods, flash floods etc). She discussed a case study of Community Based Flood Early Warning System (CBFEWS), which ICIMOD is implementing at the local level and the initiative is awarded by UNFCC by the lighthouse activity award. She mentioned the that it is any not regular prediction or forecast system, it is more comprehensive system that touch upon key elements of effective early warning systems and the major

features of this system include - upstream/downstream linkages, real time information, providing guidance on how to act on warnings and use of low cost ICT tools. She stated that it is important to be well prepared to deal with uncertainties for which it is essential to implement early warning systems in vulnerable areas including in river tributaries and in this regard simple and low-cost technologies combined with human intervention can be highly effective.

• KEY POINTS •

- Flood is the most common disaster causing maximum loss for mountain communities of Hindu Kush Himalaya.
- Communities and especially women are the first responders as well as the most affected ones during any disasters.
- Need for scientific studies and inferences to reach the common people.

DR. SUNIL K. CHOUDHARY, Executive Engineer, Govt. of Bihar, Patna, in his presentation on "*Climate and Disaster Resilient Transport System and Infrastructure Development for Bihar*", discussed how in past two decades state of Bihar has witnessed rapid growth in economy, which has resulted in huge infrastructural development in the state particularly in the transport infrastructure sector (road, highways etc). He stated during disasters, transport infrastructures sector is one of the most critical as well as vulnerable sectors. He mentioned that Bihar is one of the most vulnerable states in the country, which is vulnerable to multi-hazards: flood, drought, earthquake etc; out of which flood and temperature increase are two types of disasters that mostly affect the road networks. He mentioned that there is a huge challenge before the state to develop road networks which are resilient to disasters and discussed the stages of transport infrastructure development linking it to disaster risk reduction investments. He talked about Impact of Climate Change and Disaster on Road Transportation and Potential Design Considerations for the Future. He suggested that road transport sector should adopt two approaches- resistance approach and resilience approach.

He talked about the initiatives taken by climate and disaster resilient road infrastructure by the state government which included- Bioengineering, Bihar Action Plan of Climate Change (BAPCC), Disaster Risk Reduction Road Map, CMBD, OPRMC, waste plastic roads and others. He suggested the key steps that needs to be adopted for Disaster and Climate Resilient Roads in Bihar - Identification of vulnerable roads, Prediction of climate events in the future, Risk analysis and impact assessment, Planning the response, Life cycle costing, Design the infrastructure, Implementation and construction, Disaster Climate Resilient Material, Monitoring and Evaluation, Awareness, Operationalization of road

maintenance practices, Environmental and social safeguards and Enhance institutional capacity. He concluded by emphasising the there is need for as shit from conventional road construction technology to more innovative and advance technologies to build resilience of road transport infrastructure towards disasters.

• KEY POINTS •

- During disasters, transport infrastructures sector is one of the most critical as well as vulnerable sectors.
- Need to identify, impact of Climate Change and Disaster on Road Transportation and Potential Design Considerations for the Future.
- Road transport sector should adopt two approaches- resistance approach and resilience approach.

KEY DISCUSSANTS:

PROF. A. L. RAMANATHAN, Dean, School of Environmental Sciences, JNU, highlighted that climate change is real problem citing an example of a village in Ladakh, where the entire village has to migrate due to the lack of water coming from the glaciers and has become first climate refugee village in the country. He mentioned that 70% of the glaciers are retreating at a faster rate, which has in turn resulted in loss of springs. He highlighted that in Ladakh, people are dependent on these spring for their water needs and the water shortage is now affecting people's livelihood and other activities.

He mentioned not just spring but there are also number other natural processes (Permafrost and other) that have been affected due to climate change and now having adverse impact on communities depend on them. He talked about the various studies which show that we are losing lots of ice particularly in the Himalayan Indian side; almost 7% we have lost in the last twenty years (even considering the data problem inconsistency it would be around at least 5%). He discussed about some of the green initiatives that are taken in the region including storing of water / snow: rainwater harvesting and recharging of the water resources. He also mentioned that tourism has played a major role in increasing pollution in the region which has caused increased pollution in spring and groundwater resources. He stated that we must invest in the natural way of harvesting snow/ water to address this water shortage and we must ensure that development shouldn't come at the price of nature.

• KEY POINTS •

- Village in Ladakh is first Climate Refugee village in the county.
- Tourism has played a major role in increasing pollution in the region which has caused increased pollution in spring and groundwater resources.
- We must invest in the natural way of harvesting snow/ water to address water shortage due to glacier retreat.

PROF. P. C. TIWARI, Head, Dept. of Geography, Kumaun University Nainitalstated that since independence, we have missed out on an important aspect in policy and planning that is, an integrated land use policy framework and now it's high time that government should have a robust and comprehensive land use policy for making any developmental plan and disaster risk reduction plan implementable.

He mentioned that urban areas are more vulnerable than rural areas and the main reason behind this is that our urban expansion is highly unsystematic which in turn has become a major driver of environmental changes as well as exploitation of natural resources. He stated that urban land use policy must be integrated to state, district and sub-district level land use polices to ensure Disaster Risk Reduction. He mentioned that we need to understand what approach we need to adopt while mainstreaming the disaster risk reduction and climate adaptive planning into development process whether it should be sectoral approach or not. He also emphasised that we should understand and define on what spatial level we are planning to integrate these climate adaptive planning, for example maybe due to our high vulnerability to water-induced disasters we might need to have some planning at watershed levels. Also, he mentioned that we have to identify the stakeholders and define their roles in implementation of these climate adaptive and disaster policy and planning.

• KEY POINTS •

- Government should have a robust, integrated and comprehensive land use policy for making any developmental plan and disaster risk reduction plan implementable.
- Urban areas are more vulnerable than rural areas.
- Urban land use policy must be integrated to state, district and sub-district level land use polices to ensure Disaster Risk Reduction.

PROF. SANTOSH KUMAR, Head Inclusive DRR Division, NIDM, stated that role of Governance is very important for effective disaster risk reduction. He mentioned that over decades, our understanding of disasters have evolved so do our response to disaster events. He stated that in present times we are looking at the cause and effect of disasters like finding the reasons for carbon emissions, climate change and others. He suggested that people working in the field of climate resilience should bring in knowledge which is more prescriptive, it should be well stated what all interventions are needed in the area of disaster, climate change, green growth etc. He mentioned that Climate governance should also look at financial mechanisms that are required for dealing with climate change. He stated that there is need to bring in financial institutions and also look at the type of funding they are offering whether it's a green funding or a non-green funding. At last he mentioned that we also have to look at carbon emissions/ carbon footprints during our disaster response and recovery processes and we must explore how green technologies can pitch in this area. He emphasised that doing this is important to ensure that after any disaster we are building back better and safer.

• KEY RECOMMENDATIONS •

- There is a need for sector-specific, location-specific green growth strategies in each stage of the disaster management cycle.
- In Indian context, early warning systems, resilient infrastructure and industrial hubs, and smart/ green urban spaces should be the key focus areas for green development.
- Green growth requires innovative financial and policy instruments integrated with the resource-efficiency and circular economy principles.
- Green growth strategies can become critical tools in disaster mitigation and adaptation ensuring low-carbon development.
- Potential policy vehicles that can be used for mainstreaming green growth-based Disaster Risk Reduction in India include State Action Plan for Climate Change, City and Industry development plans, land use planning, disaster management plans and other national and state development plans.
- Intense capacity building and stakeholder consultations in the field of green growth and disaster management can help in developing DRR strategies which are easily implementable, socially inclusive and cost-effective.

Cluster Session 2a:

Ecosystem for Disaster Risk Reduction; Utilizing Nature Based Solutions for Resilience

Session Date and Time:
26th September 2019, (14:30 to 16:00 pm)
Name of Organizer:
IUCN-CEM South Asia, IUCN India, UNEP India and NIDM
Name of Rapporteur:
- Ms. Pritha Acharya, Research Fellow, CAP-RES, NIDM
Session Chairperson:
- Prof. S P Singh, FNA, Former Vice Chancellor, Kumaon University, Nainital and ICFRE Chair Professor "Ecology and Landslide- lesions from Indian Himalaya".
- Mr. Vivek Saxena, Country Representative, IUNC, India
Session Coordinator:
Mr. Vivek Saxena, Country Representative, IUNC, India
Session Speaker:
- Mr. Dushyant Mohil, Country Programme Manager, Wetland International - Dr. P K Joshi, Professor, SES, JNU, - Mr. Sanjay Upadhyay, Lawyer, Supreme Court and Expert EnviroLegal Defense, New Delhi - Dr. U N Rai, Retd. Senior Principal Scientist, CSIR-NBRI, Lucknow
Session Discussants:
- Prof. S. Mahapatra, Dept. of Geography, Delhi & Chairperson SCDR Institute of Science, Delhi - Dr. R. B. Lal, Additional Director, MoEF&CC

ABOUT THE SESSION

Nature Based Solutions (NbS) is the answer to this dichotomy that exists between societal development and reducing risks from climate change related disasters. The session focused on the different approaches and practices adopted under NbS to increase resilience through reducing the disaster risks.

In this session thematic technical presentations were presented by different experts from important government department, organizations, educational institutions and law firms.

CHAIRPERSON

MR. VIVEK SAXENA, Country Representative, IUCN began the session by stating that various mitigation and adaptations measures taken up for reducing disaster risk reduction especially from the climatic changes. However, the activities which are undertaken for societal development may also have their own set of challenges. For example the migration of people from rural areas to urban areas requires up-scaling and bringing up of new engineering structures and utilization of land resources. This transforms the existing land use and land cover pattern, thus increasing the vulnerability to disasters. In addition, there is a need to address the ongoing challenges of reducing climate change related disasters. Highlighting the example form Himalayan river streams and associated Himalayan ecosystems, he further said that ecosystems provide enough traditional knowledge which may help us in combating the climate induced disasters. As NbS leverages on the traditional knowledge that ecosystem provides, he pointed to the need for localizing the NbS strategies and targets. He mentioned that IUCN has developed the standards for the Nature Based Solutions, that suggest what NbS are, what type of activities are associated with NbS and how they are benefitting the society and how can they be integrated in a landscape level. How integration of all the surrounding ecosystems is critical for NbS and taking the help of technology and introducing the technological innovations to support these innovations.

PROF. S P SINGH, FNA, Former Vice Chancellor, Kumaon University, Nainital and ICFRE Chair Professor greeted all the speakers and discussants to the session. He spoke about the importance of resilience in ecology. Resilience of an ecosystem is the ability of the ecosystem to come back to its original state of function and with the given conditions for today's ecosystem, primarily stability and results is what we aim for. He further added that after any disturbance, a system will definitely revert back to its original state, but the time taken by it to revert to the original state is not certain. Simple systems come to their original state compared to complex systems, which takes longer time. He said that it is thus upon us to implement action- on ground that will aim to reduce this time span. He referred to his discussions with the UGC Chairman and said that there is a need to make the University Campuses more sustainable not just energy wise and biodiversity aspects, but also in terms of waste management, disposal, water conservation etc. Bringing understanding to not just the theme but to the concept of sustainability as well is needed. With this, he invited the speakers and the discussants to share their presentations one by one.

SPEAKERS/ TECHNICAL PRESENTATION

MR. DUSHYANT MOHIL, Country Programme Manager-Wetland International, presented on Integrated Risk Management: Role of wetlands in reducing water mediated risks. He started his presentation by pointing out that disaster risk reduction involves identifying risk drivers, countering haphazard development, tackling climate change and reducing land degradation. Landscapes are important ecological units and ecosystem risks are embedded in landscape structures. Thus, landscape risk assessments should be addressed and done keeping in mind the development of local adaptation strategies. He then gave a short scenario of the water mediated risks in Asia. He said that 90% of the disasters in Asia including India are water mediated and wetlands are essential for comprehending these disasters. Wetlands are an important buffer against such water mediated disasters; they mitigate disasters and help build resilient communities.

He added that despite these benefits, India is rapidly losing their wetlands and approximately 60-70 of the wetlands have been lost to haphazard development. Such ecosystem loses are directly related to increase the vulnerability of a place and its people to water mediated disasters. Quoting the example of 'Kanwar Taal' in Bihar, he said that with degradation of these ecosystems, the livelihoods that are dependent on them become vulnerable too. In another example he said that Kerala lost 50% of its backwaters and these areas which saw the loss of backwaters now face the maximum water logging. He then shared a case study of Indonesia, where Hybrid check dams along the Java coast in Indonesia have helped recover the coastline and mangrove forests. In this scenario Natural building in combination with engineering solutions promote defence against disasters. He concluded his presentation by saying that to integrate wetland wise use in village and district level planning, an integrated approach is required for which community based implementation should be mobilized.

• KEY POINTS •

- Disaster risk reduction involves identifying risk drivers, countering haphazard development, tackling climate change and reducing land degradation.
- Landscapes are important ecological units and ecosystem risks are embedded in landscape structures.
- Ninety Percent of the disasters in Asia including India are water mediated and wetlands are essential for comprehending these disasters.

DR. PK JOSHI, Professor-School of Environmental Sciences (SES) and Chairperson – Special Center for Disaster Research (SCDR), JNU gave a presentation on anticipatory adaptation planning- an Inherent Vulnerability Approach. Through his presentation, he tried to talk on inherent approach as vulnerability assessment is very important for adaptation strategies. Focusing on the agriculture sector, he stated that there is a causal relationship between climate change, climate variation and decline in agricultural productivity. Male migration and adverse temperature and rainfall variations caused due to climate change are affecting agriculture in mountainous regions. He highlighted the alternate paradigm - change in perspective from impact assessment of disasters to inherent vulnerability approach through his talks.

Describing about the definitions of vulnerability through various approaches, he said that vulnerability assessment can be outcome based or contextual vulnerability. But before applying this, the question to answer is that, what characteristics make a system vulnerable to disasters? He then added that in mountainous agriculture, one paradigm can be to see the impact of climate change induced disasters in terms of damage. The other will be to use the inherent vulnerability framework, which considers the social, ecological and economic factors in identifying vulnerable population. He also said that sensitivity and adaptation to disasters can be increased by looking at the biophysical as well as social factors. As altitude affects the attitude and sensitivity towards disasters thus understanding geographical neighborhood is important for understanding inherent vulnerability. Mid altitude zones have high population and high land utilization. But they also have a highly vulnerable community to disasters. He also stated that everyone talks about adaptation and resilience in agriculture as an activity but the inherent vulnerability approach should be considered for the agricultural community. The vulnerability of communities is affected by access to infrastructure and resources; and social frameworks. Thus, there is a need to better anticipate and predict disasters accurately as prevention is always better than cure. With this, he explained the inherent vulnerability framework which takes into use; i) biophysical sensitivity; ii) social sensitivity; iii) biophysical adaptive capacity; and iv) social adaptive capacity. Giving a case of Uttarakhand, he pointed out the biophysical and social vulnerability and inherent vulnerability hotspots. Concluding his presentation he said that three important 'M's in anticipation and prediction of disasters are important which are: Mainstreaming, Monitoring and Measurement.

• KEY POINTS •

- There is a causal relationship between climate change, climate variation and decline in agricultural productivity.
- Male migration and adverse temperature and rainfall variations are affecting agriculture in mountainous regions.
- The inherent vulnerability approach should be considered for the agricultural community.

MR. SANJAY UPADHYAY, advocate Supreme Court and managing partner Enviro-Legal Defence gave his presentation on Ecosystem Based Disaster Risk Resilience. Starting his presentation he talked about the legal meaning of disasters and disaster management. He said that the Legal Response Law in India recognizes the man-made components, including negligence in disasters. He further added that the legal response has been reactive and not proactive and thus the law has hitherto been a step behind. It is only after a major disaster has struck, laws are put in place; and never before any such disasters. It took a 'Bhopal tragedy' to have 'Environment Protection Act' and 'Tsunami' to precipitate a 'National Disaster Management Law'. He also shared that the word 'Disaster' as a concept is missing in the constitution.

Speaking briefly on the Disaster Management Act 2005 and National Disaster Management Authority, he said that there is a need to review and update it annually. Pointing out to certain loopholes he said that despite good intentions and proper framing, the guidelines often lack legal teeth. He said to combat disasters joint preparedness is the way to go. Coordination between various govt. and private bodies is needed. Adding to this he shared a few examples of legal acts and rules for implementation of Ecosystem approach in DRR. He further quoted that ecosystem approach is also essential as- the law has provided for creation of wildlife and nature protection zones, there are policies and guidelines for specific disasters like fires, earthquakes etc. In addition, he highlighted a list of management interventions which still lack legal attention and laws are yet lacking. To conclude his presentation he focused on two areas: i) need for proper guidelines for eco-restoration; and ii) legal frameworks are robust, the implementation is lacking.

• KEY POINTS •

- Legal Response Law in India recognizes the man-made components, including negligence in disasters.
- Legal response has been reactive and not proactive and thus the law has hitherto been a step behind.
- 'Disaster' as a concept is missing in the constitution.

DR. U N RAI, Retired, Senior Principal Scientist, CSIR-NBRI, Lucknow, presented on Relevance of Green Clean Technologies in Ameliorating Disaster Impacts and their Role in Sustainable Development. Though his presentation he tried to focus on using green and clean technologies to ameliorate the adverse impact of disasters. To begin with he stated what green technology is, he said green technology means using renewable resources. It is eco-friendly, promotes sustainable use of resources and conserves resources; there are no side effects of using such technology. It brings in a change in the radical thinking and environmental consciousness. Continuing the presentation, he gave a list of some upcoming green technology.

Focusing on Green Clean, he said green cleaning involves the use of natural means (especially plants) to clean up chemicals and pollutants from soil, sludge, sediments and ground water through contaminant removal, degradation, or containment to render them harmless. It is emerging as the new eco-ally that can cut the cost of clean-up, non-intrusive and restore much larger sites than has been possible with traditional remediation methods. phyto-mediation, phyto-extraction, rhizo-filtering, phyto-degradation, phyto-volatilization, phyto-stabilization etc. are some methodologies. Continuing with rhizo-filtration, he said it can be aerobic (for inorganic degradation) or anaerobic (for organic degradation). Green clean technologies are needed for a proper recovery of toxicants, and at the same time they promote reduction of carbon dioxide, reduction of cost of cleaning up and mitigation of disaster caused losses. Highlighting a case study of phytoremediation of chromium contaminate industrial wastes, he shared how chromium contamination can be cleaned using plants which convert an insoluble form of Chromium to a soluble form of Chromium. After the process, these pants can be used in biogas plant later and generate fuel - a sustainable, green clean energy model. Plants play an important role in mitigation of, response to and recovery from disasters; aquatic plants reduce acidity of water, improve TDS rating, and reduce BOD. He concluded his presentation by pointing out the advantages of green, clean technologies include decrease of cost of clean up after disasters, disaster risk, vulnerability and impact reduction, reduction in greenhouse gas emissions, changes in waste generation pattern for better economic growth. He also added that there is a need to develop more low Carbon emission technologies and carbon sinks in the future. The Green, clean technology is here to stay.

• KEY POINTS •

- Green Technologyis eco-friendly, promotes sustainable use of resources and conserves resources.
- Green Clean involves the use of natural means (especially plants) to clean up chemicals and pollutants from soil, sludge, sediments and ground water.
- Green clean technologies promote reduction of carbon dioxide, cost of cleaning up and mitigation of disaster caused losses.

KEY DISCUSSNANTS

PROF. S MAHAPATRA, Dept. of Geography, IGNOU Delhi & Chairperson SCDR Institute of Science, Delhi briefly shared a few important points as part of his discussions. He first congratulated all the speakers and said that the importance of NbS was realized during the Gandhian time. However, people understood the importance of wetlands after 1999 super-cyclone. This natural disaster highlighted the role and importance of Mangroves in coastal protection. This was confirmed by the remote sensing techniques and satellite imagery, as places with less mangroves showed much more devastation than other areas with more mangrove cover. He further added that one thing to understand is that the scientific interventions no doubt are helpful but without

community participation, it can't be realized. Making communities understand and making them realize the importance of NbS and ensuring their participation is the key to achieve the goals in a sustainable way. Quoting Prof. Swaminathan, he said that for any NbS project in India to be successful it should be implemented keeping in mind three primary things; the project should be in a block mode, through nature and taking gender risk reduction in account. If these three can participate in an equal and integrative manner then only can development be successful. He said that in this context, Mangroves play a vital role not only form environmental point of view but also from livelihood point of view. He then quoted UN University's (Bonn) document titled 'measuring the un-measurable' by Bartmann and Weissman. They said the document could not produce much on intrinsic vulnerability, they said during the process of setting indicators, it is very difficult but at the same time it is very important as well. External factors may affect but the internal vulnerabilities are sometimes more dominant. So a lot of thought has to be given identifying different measures to measure vulnerabilities. Coming to the last point, he said that for sustainability projects the measures should be anticipatory and participatory, it should be reactive as well as proactive. A balance has to be maintained between the two. He ended his short note by saying that these points should be taken into account when we talk about NbS.

• KEY POINTS •

- The importance of NbS was realized during the Gandhian time.
- The Super-Cyclone highlighted the role and importance of Mangroves in coastal protection.
- NbS awareness should be created among the communities to ensure community participation.

DR. R. B. LAL, Additional Director, MoEF&CC first congratulated the organizers, speakers and presenters for organizing this on timely event and presenting such diverse and informative sessions. He said a lot needs to be learned from these discussions. He further said that MoEF&CC will take a lot of inputs and learning points from this and try to implement in their policies. Mentioning to Mr. Upadhyay's presentation, he said that the government is trying to address the gap areas and a lot has been done so far. However, since India is a big country with unique set of challenges that it offers. Thus, it takes time to implement mechanisms to bring in the desired change. Ecosystem contribute to reduce disaster risk in two different ways; i) ecosystems can reduce physical exposure to natural hazards by serving as natural protected barriers and thus mitigating hazards impacts ii) they enrich ecosystem disaster risk by reducing socio-economic vulnerability to hazard impacts. It is known that challenges of mitigating and adopting to cc achieving inclusive food, water, energy and health security and unethical burden of the nature deterioration needs urgent attention. He mentioned about UNCCD COP-14 and shared how excellently India showcased all its good work in it. He further added that there were approximately 35 decisions that came up during COP-14 and one or two among these were relevant and related to

the theme of the conference. 'Combating desertification, land degradation and drought and achieving land degradation neutrality play an important role in maintaining and restoring the land based natural capital by tackling climate change, conserving and ensuring sustainability using biodiversity and maintaining ecosystem services while ensuring shared prosperity and sustainable livelihood' was one key decision taken. In addition he mentioned about the Intergovernmental science-policy report on ecosystem services, which also talks about a lot of framework and vision for a future that minimizes the impacts. He concluded his points by stating that India has just 2.5% of total global land where 18% of world's (which is very less) population is scattered with 12% livestock population. India being a big country, there are a lot of problems but we have the solutions through the technologies we have, but it is a shared responsibility between the government as well as the citizens that will help in achieving the national targets.

• KEY POINTS •

- MoEF&CC will take a lot of inputs and learning points from this symposium and try to implement in their policies.
- Challenges of mitigating and adopting to climate Change, achieving inclusive food, water, energy and health security and unethical burden of the nature deterioration needs urgent attention.
- India has just 2.5% of total global land where 18% of world's population is scattered with 12% livestock population.

Concluding Remark: After the presentations were over, the chair, Mr. Vivek Saxena, gave a few comments which are listed below. Importance of wetlands, water interventions best practices using mangroves as nature based solutions. Wetlands and mangrove ecosystems have a very important role in DRR. He added that in NbS mangroves are concerned with the coastal areas and the inland/urban ecosystems it is the urban wetlands. Understanding and implementing various types of vulnerability assessment frameworks especially in the mid Himalayan ecosystems, where the climate change is affecting the local people is essential. He also said that legal frameworks are useful and needful in achieving the DRR and mitigation. How green technologies are important when it comes to restoration and providing answers for various types of challenges and what role they can provide in resilience building. Prof. S P Singh said that it was an interesting session and all the points discussed by the presenters as well as the discussants very extremely important. He said that wetland is one area where a substantial amount of work has to be done from the policy point of view. He gave an example of America, and said there if any wetland area is reduced a new wetland has to be created and this is done by third party markets. In India, there are provisions for forestry, wherein re-forestry is promoted however no such concept like the third party markets exists. Rules are made without putting a thought that if they can be achieved or not. Summing the session he said, a lot of efforts are being done and a lot of on-ground work is also implemented. On one hand India is doing very well, however on the other people have created a chaos and have learned to live in a disaster created prone in some ways and some areas. Pointing to Dr. Joshi's presentation, he highlighted a very interesting point, he said a country can get a lot of food but it doesn't mean that the farmers are not vulnerable to climate change. He further added that the aspects of vulnerability should be brought up and discussed frequently.

• KEY RECOMMENDATIONS •	
•	Landscape risk assessment should be done to develop local adaptation strategies.
•	Wetlands are an important buffer against such water mediated disasters; thus, extremely important to utilize solutions of NbS to reduce disaster risks.
•	Need to mobilize and implement integrated and community based approaches.
•	Emphasis has to be given to develop technologies for anticipation or accurate prediction of disasters as prevention is better than cure.
•	Social frameworks and access to infrastructure and resources affect communities and their vulnerability.
•	A more thoughtful approach has to be applied while making laws and rules.
•	Legal frameworks are robust, but the implementation is lacking.
•	A substantial amount of work has to be done in the policy front.
•	Despite good intentions and proper framing, the guidelines often lack legal teeth.
•	Proper guidelines for eco-restoration are needed.
•	Green technology means using renewable resources; green tech is eco-friendly, promotes sustainable use of resources and conserves resources too.
•	The advantages of green, clean technologies include decrease of cost of clean up after disasters, disaster risk, vulnerability and impact reduction, reduction in greenhouse gas emissions, changes in waste generation pattern for better economic growth.

Cluster Session 2b:

Peri-Urban Ecosystems for Urban Resilience

Session Date and Time:
26th September 2019, (4.15 to 5.30 pm)
Name of Organizer:
ICLEI/CDKN & Gorakhpur Environmental Action Group (GEAG)
Name of Rapporteur:
- Ms. Nivedita Mani, GEAG - Ms. Richa Srivastava, Consultant, NADMP, NIDM
Session Chairperson:
- Prof. V K Sharma, Vice Chairman, Sikkim State Disaster Management Authority, Former Senior Professor IIPA
Session Coordinator:
Mr. Emani Kumar, Deputy Secretary General ICLEI & Executive Director, ICLEI South Asia
Session Speaker:
- Dr. Shiraz Wajih, President, Gorakhpur Environmental Action Group (GEAG) - Mr. Manu Prakash, Chief Executive Officer, TARU Leading Edge - Prof. Vishal Narain, Professor, Public Policy and Governance, Management Development Institute (MDI) - Dr. U N Rai, Retd. Senior Principal Scientist, CSIR-NBRI, Lucknow
Session Discussants:
- Prof Rana Pratap Singh, Chairman, State EIA Committee, Govt. of UP - Mr. Sajan John, Head Marine Conservation Project, Wildlife Trust of India - Ms. Nivedita Mani, Programme Manager, GEAG, New Delhi

ABOUT THE SESSION

Peri-urban areas can be described as fringe areas of cities or adjoining rural areas, which are intrinsically linked with the city economy, experience constant transformation, and are characterised by a mix of rural and urban activities. The areas could be imagined as intermediary zones overlapping

rural and urban jurisdictions and are inhabited by the native population—who are normally engaged in agro-based activities, livestock rearing, and fishing—as well as by a migrant population who pursue non-farm interests. "Small farmers, informal settlers, industrial entrepreneurs, and urban middle class commuters may all co-exist in the same territory, though with different and competing interests, practices and perceptions." The broad objective of the session was to disseminate and advocate the important role of peri-urban ecosystems that enhance the resilience of urban areas.

COORDINATOR

The session was coordinated by **MR. EMANI KUMAR**, Deputy Secretary General ICLEI & Executive Director, ICLEI South Asia.

In this session thematic technical presentations were presented by different experts from very important government departments, organizations and institutions and a policy paper jointly developed by NIDM, CRIDA and ICAR was released during the session.

CHAIRPERSON

PROF. V K SHARMA, Vice Chairman, Sikkim State Disaster Management Authority, Former Senior Professor IIPA, was the chairperson for the session. He have his comments recorded in subsequent paragraphs. Population relocations driven by economic reasons or caused by land speculation have led to people settling in peri-urban areas (or areas in the periphery of the urban). The in-migration of population and emergence of new activities is transforming such areas, as seen in changes in land use and occupational patterns, reduced farm activities, and growth of built structures. Inadequate planning and governance of peri-urban areas by local governments is resulting in various problems. With India urbanising and the scarcity of land in megacities, the pressure on peri-urban areas will only grow further. This brief calls on India's national government to formulate a broad policy for planned spatial growth of megacities to ensure the sustainable development of the country's peri-urban areas. It builds understanding of the deficiencies in peri-urban areas, and gives suggestions for overcoming these.

SPEAKERS/ TECHNICAL PRESENTATION

DR. SHIRAZ WAJIH, President, Gorakhpur Environmental Action Group (GEAG) has talked about how Peri-urban areas suffer from double exposure of climate change and urbanisation and how the social capital is constantly eroded. He talked about urban, peri-urban and rural connect with food and resilience. Ecosystem based peri-urban spaces were also described in detail. What are the peri-urban farming characteristics and challenges.

Policy issues were also addressed like Resilient agriculture and Food Production: Integral part of Urban (DM) Planning, Risk informed extension (and insurance), Governance, Ecosystem based resilience and S & T – Indigenous knowledge for resilience by him.

• KEY POINTS •

- Peri-urban areas suffer from double exposure of climate change & urbanization.
- Peri-urban farming offer their own set of characteristics & challenges.
- Ecosystem based peri-urban spaces are important & needs to be considered.

MR. MANU PRAKASH, Chief Executive Officer, TARU Leading Edge has talked about Peri-urban: Economy, Environment and Resilience. Peri-urban areas play an important role in lending resilience to cities including resilience of food, services and climate change. He talked how the peri-urban ecosystems provide the needed buffering capacities to the cities by increasing the water holding capacity. He mentioned how peri-urban contributes heavily to urban economy without much support/ return investment in their areas in terms of infrastructure and services. Peri-urban areas and its economic activities like farming, animal husbandry, cottage industry, industrial expansion, land speculation and daily labour contribution was explained by him. He explained the governance loopholes of no regulation, poor engagement, no planning, no/low investment and no accountability. The environmental impact, resilience and stress were explained in the context of - urban ecosystem. In way forward he talked about the need of data and deeper insights on peri-urban economy, services levels, people and infrastructure. There should be economic policies for peri-urban areas that cater to both rural and urban linkages and concentrate on redistribution of wealth, ensuring environmental - spatial justice. He talked about the need of engagement model between municipal and peri-urban should be strengthening through integrated planning, and service delivery. State and local governments need to ensure adequate public financing for resilience planning for both urban and peri-urban. Division between urban and peri-urban should end now, Uttarakhand, for example, is taking steps to merge peri-urban areas with urban local bodies.

• KEY POINTS •

- Peri-urban areas play an important role in lending resilience to cities including resilience of food, services and climate change.
- Peri-urban ecosystems provide the needed buffering capacities to the cities by increasing the water holding capacity.
- Need for data and deeper insights on peri-urban economy, services levels, people and infrastructure.

PROF. VISHAL NARAIN, Professor, Public Policy and Governance, Management Development Institute (MDI) gave presentation on peri-urban ecosystems for urban resilience. He talked about how rural- urban dichotomy extends to vulnerability and losses of access to commons have implications on poor and landless households. He discussed about Institutional transformation & changing natural resource access. He explained the uniqueness of peri-urban vulnerability in terms of double exposure like climate change and Urbanization (loss of access to land and water). Also differential capabilities to straddle the rural-urban divide translate into high differential vulnerabilities. He discussed the Socio-technical mediation of water insecurity and urged the need to research and document human agency in the peri-urban.

• KEY POINTS •

- Rural-urban dichotomy extends to vulnerability and losses of access to commons have implications on poor and landless households.
- Peri-urban vulnerability is unique in terms of double exposure like climate change and Urbanization.
- Need to research and document human agency in the peri-urban.

DR. DIVYA SHARMA, Senior Consultant and Portfolio Leader, Urban Planning and Policy, Oxford Policy Management gave presentation on Land use change and linkages with CCDRR. She talked about Urbanization which can cause significant damage to the natural environment. The result is that traditional livelihoods are compromised and residents of peri-urban areas are increasingly vulnerable to the impacts of climate change. She discussed how change in land use does work in our favour-building resilience and if protected and promoted it could contribute to resilient economies and societies. Discussion was how this can be done

in terms of guidelines and policy like Framing Guidelines for Model Land Uses, Development Controls, and Service Level Benchmarks with Appropriate Enforcement Mechanisms for Rurban Clusters by adopting and ensuring strict compliance. She talked about how to strengthen city strategies, DRR plans of the cities giving due considerations to peri-urban areas and their buffer zone functions.

• KEY POINTS •

- Urbanization can cause significant damage to the natural environment.
- Traditional livelihoods are compromised & residents of peri-urban areas are increasingly vulnerable to the impacts of climate change.
- Change in land use does work in our favour- building resilience, resilient economies & societies.

DR. ANANDITA SENGUPTA, Faculty, Adamas University, West Bengal gave presentation on for risk-informed land use planning framework for industrial peri-urban area. She talked about the world urbanization prospects: 2025 and related concerns like due to its dynamic nature, the peri-urban area often fallen in between the cracks of rural and urban development planning hence need a critical review.

The implementation of land use plans has been weak in such urban-peri-urban areas also no integrated system for assessing uses of land managing risk arising out of hazardous industries. She explained that there is no regulatory requirement to incorporate industrial risk as a consideration for land use planning decisions.

A case study of Haldia town was presented by her where she discussed about a typical land use pattern of Haldia peri-urban area and changes in land use pattern in this area. She also talked about the cohabitation of industries & residential areas and approach towards it. Cadastral-level land use map, Population database, Individual Risk (IR) Contours, Cumulative Risk Maps of Haldia was discussed in detail and a proposed risk-informed land use planning framework was given at last.

• KEY POINTS •

- Peri-urban areas often fall in between the cracks of rural and urban development planning hence need a critical review.
- Need to implement land use plan & integrated system for assessing uses of land managing risk arising out of hazardous industries.
- There is no regulatory requirement to incorporate industrial risk as a consideration for land use planning decisions.

CHAIRPERSON

PROF. RANA PRATAP SINGH, Chairman, State EIA Committee, Govt. of UP told in the absence of clear-cut conceptions of peri-urban areas and the related governance mechanisms, the peri-urban areas are completely mis-managed which is adversely impacting not only the lives and livelihoods of the inhabitants living there but also affecting urban resilience.

• KEY POINTS •

- Clarity in governance mechanisms for peri-urbans.
- Peri-urban mis-management adversely impacts & affects lives, livelihoods & urban resilience.

MR. SAJAN JOHN, Head Marine Conservation Project, Wildlife Trust of India told that peri-urban areas play an important role in lending resilience to cities including resilience of food, services and climate change. The peri-urban ecosystems provide the needed buffering capacities to the cities by increasing the water holding capacity. The peri-urban ecosystems also play an important role in regulating the micro climate of the region.

• KEY POINTS •

- Peri-urban areas play an important role in lending resilience to cities including resilience of food, services and climate change.
- The peri-urban ecosystems provide the needed buffering capacities to the cities by increasing the water holding capacity.
- The peri-urban ecosystems regulate the micro climate of the region.

Ms. NIVEDITA MANI, Programme Manager, GEAG, New Delhi talked citing examples of eastern Indian cities, GEAG's experiences show that the peri-urban ecosystems such as water bodies, agricultural area, forests, open spaces, flood plains and so on are rapidly degrading and decreasing owing to urbanisation and changing land use patterns. The peri-urban spaces suffer from dumping of solid.

• KEY POINTS •

- Peri-urban ecosystems such as water bodies, agricultural area, forests, open spaces, flood plains & so on are rapidly degrading and decreasing owing to urbanization and changing land use patterns.
- The peri-urban spaces suffer from dumping of solid waste, soil mining, land pressure etc.

• KEY RECOMMENDATIONS •

- To look at how peri-urban communities innovate technologically and institutionally to adapt to the combined effects of urbanization and climate change and use that as a basis for capacity building programmes or DRR strategies.
- Challenge the assumption that there is a governance vacuum (non-statutory governance is more pronounced).
- To build social capital by promoting civic engagement
- Strengthening city strategies, DRR plans of the cities giving due considerations to peri-urban areas and their buffer zone functions need to be done
- To promote peri-urban farming, in particular vegetables and commercial agriculture that incentivizes agricultural use of the land
- To protect and stimulate urban agriculture and forestry, wetland management
- Using city runoff, waste water for irrigation purposes in these areas and for managing forestry are important.
- Addressing the urgent need of data and deeper insights on peri-urban economy, services levels, people, infrastructure
- Economic policies for peri-urban areas that cater to both rural and urban linkages and concentrate on redistribution of wealth, ensuring environmental-spatial justice is needed.
- Urban centers are engines for economic growth, focus on peri-urban can significantly growth rates
- Developing engagement model between municipal and peri-urban should be strengthening through integrated planning, and service delivery
- State and local governments need to ensure adequate public financing for resilience planning for both urban and peri-urban
- Division between urban and peri-urban should end now, Uttarakhand, for example, is taking steps to merge peri-urban areas with urban local bodies.

Cluster Session 3:

Climate Risk, Adaptation & Sustainability Mainstreaming

Session Date and Time:
27th September 2019, (9:30 to 11:15 am)
Name of Organizer:
German Technical Cooperation (GIZ) Germany – India Office
Name of Rapporteur:
- Mr. Rohit Sharma, GIZ - Ms. Thinles Chondol, Young Professional, NIDM
Session Chairperson:
- Dr. Alka Bhargaua, Additional Secretary Department of Agriculture & Farmers welfare
- Dr. K Alagusundaram, Deputy Director General (NRM), Indian Council of Agricultural Research
- Dr. Sharad Jain, Director, National Institute of Hydrology, Roorkee
- Prof. R B Singh, Vice President, International Geographical Union
Session Coordinator:
Dr. G. Ravindra Chary, Director, ICAR-CRIDA Hyderabad
Session Speaker:
- Mr. Kirtiman Awasthi, Senior Policy Advisor, GIZ India - Dr. Vikram Gupta, Principal Scientist, Wadia Institute of Himalayan Geology, Dehradun - Dr. Chandra Sekhar Bahinipati, Faculty, IIT Tirupati - Dr. G. Ravindra Chary, Director, ICAR-CRIDA Hyderabad - Dr. G. Ravindra Chary, Director, ICAR-CRIDA Hyderabad
Session Discussants:
- Mr. Deepak Chamola, Technical Advisor, GIZ - Prof. V K Sehgal, Principal Scientist and Professor, Dept. of Agricultural Physics, IARI, ICAR, New Delhi - Mr. Sundershan Pal Takur, DG, Acdemy of Administration & Addl. Chief Secretary, Odisha - Dr. K J Ramesh, Former DG, IMD - Dr. G Rajeshwar Rao, Director, Tropical Forest Research Institute, ICFRE, Jabalpur

ABOUT THE SESSION

Globally, climate risks causing losses and damages have increased significantly in the past few decades. The recent climate projections indicate a significant increase in the frequency, duration and intensity of extreme weather events as well as severe slow-onset climate-related changes. These pose a growing risk to sustainable development of communities and countries. Internationally there is an increasing recognition that adaptation and mitigation may not be enough to manage the impacts of climate change and both climate science and the international climate negotiations stress the urgent need to develop and implement effective climate risk assessment and management approaches in order to avert, minimize and address losses and damages. This session aims to address the climate change adaptation and disaster resilience aspects of vulnerable regions by highlighting the needs, priorities and institutional arrangements for climate risk management in different sectors of the country.

In this session thematic technical presentations were presented by different experts from very important government departments, organizations and institutions and a policy paper jointly developed by NIDM, CRIDA and ICAR was released during the session.

COORDINATOR

The cluster session 3 was coordinated by **DR. G. RAVINDRA CHARY**, Director, ICAR-CRIDA Hyderabad. He started the session by mentioning about climate change in India's context that the impact of climate change are visible evidently everywhere especially in vulnerable sectors like agriculture as it comprises nearly 80% of small and marginal farmers. He also mentioned how the risk of food insecurity, nutritional insecurity and the extreme weather events like droughts and floods is managed and focused on the importance of understanding of timely risk management.

CHAIRPERSON

DR. ALKA BHARGAUA, Additional Secretary Department of Agriculture & Farmers welfare stated that agriculture is majorly impacted by climate change and it is a major contributor to climate change. She spoke of national strategy of resilient agriculture in brief. She focused on building resilient agriculture system; enhance water productivity, control of pest infestation, issue and maintenance of soil health card, energy management, agri-waste utilization, strengthening value chain, reduction of food waste. She mentioned that amount of food waste accounts

for 60% of food globally. She emphasised on practice of organic farming, integrated agroforestry, as there is no better means for reduction in disaster risk and enhancing of disaster resilience by growing vegetation like mangroves for cyclones. She showed an example of bamboo houses in Uttarakhand for disaster resilience. She concluded by stating that India is self-sufficient in every aspects accept oilseeds which is imported from outside now but oil seed mission will be launching to manage oilseeds in India.

DR. K ALAGUSUNDARAM, Deputy Director General (NRM), Indian Council of Agricultural Research talked about Nagapattinam tsunami (2004) when hundreds and thousands of people died and nobody knew how to handle the dead bodies. Huge pits were dug and lined all the bodies in it and put a layer of salt and sand on it until the pit is full. Nagapattinam model is to teach people how to manage post disaster and mentioned that early warning systems can prevent occurrence of such huge number of casualties. He emphasized on need to work on how to warn and issue of early warning systems with high probability.

DR. SHARAD JAIN, Director, National Institute of Hydrology, Roorkee mentioned that climate risk is a very well-known issue and it is a major environmental threat that human kind is facing. It is the right time to initiate activities to avoid climate risk and come forward with mitigation measures. He mentioned that many initiatives have been taken and all over the world the younger generation are now showing their displeasure and eagerness to combat climate change. He stated that many uncertainties in data occur due to variability like GCMs, impact assessments models, socio-economic land-use and land-cover changes. He mentioned that a ground-based sensor called cosmos is being used to measure soil moisture, which measure soil moisture, by using cosmic rays.

DR. R B SINGH, Vice President, International Geographical Union mentioned about the various research and study reports that are coming up to restrict the temperature rise to 1.5 degrees and the recent study report with a forecast of 1.6 degree rise in India between 2030-2050 which is why he gave special emphasis on preparedness and mitigation measures. Special effort to tackle low probability and high impact disasters like Kerala flood and Kashmir flood need to be done particularly in integration of agriculture and livelihood assessment where different biophysical and human parameters are combined together in GIS framework and then we take region specific issues. He emphasized on prioritization of problem and focussed diversification of agriculture, doubling the

farmers' income. He concluded by giving an example of food technology which can bring livelihood security of the people living in the rural area and income generation by doubling the farmers income.

SPEAKERS/ TECHNICAL PRESENTATION

In this session, first technical presentation was presented by **MR. KIRTIMAN AWASTHI**, Senior Policy Advisor, GIZ Germany, India office on *Framework for Integrated Climate Risk Assessment & Management*. He started his presentation by briefing the objectives and overview of Climate Change Adaptation in Rural Areas India. He stated that it is important to do climate risk management and bring on climate risk assessment in whole planning process especially in reference to roads and other infrastructure primarily in mountain regions and other vulnerable areas in India. Bringing communities in the whole process of DRR and disaster management planning and in this context, he highlighted about the development of framework in terms of a methodological guidance for integrated climate risk assessment and management. He emphasized on the need to address climate change impact and disaster risk whether its agriculture sector, infrastructure, community livelihood and community which is exposed to extreme events.

He highlighted the project that GIZ is working on i.e. Indo-German Climate change adaptation programme in rural areas of India implemented in cooperation with MoEFCC at both national and state level. He mentioned that it is important to know the cause of loss and damage in order to come out with certain instruments to address loss & damage through insurance method or through compensation. He spoke about six steps Climate Risk Management Framework that is being used to know state level climate risk and adaptation management processes by conducting an integrated risk assessment for rural infrastructure and rural livelihood. He elaborated the six steps citing the example Tamil Nadu filed study which included i) Assessing information needs and objectives ii) Identification of the system of Interest iii) Developing context specific methodology iv) Risk Assessment v) Evaluation of Risk tolerance and limits and vi) Identification and assessment of adaption options. He concluded with a way forward that this type of framework will provide us a scientific evidence on climate risks to enable informed decision-making on adaptation needs and offerspotential guidance and leanings for scaling up to other districts and states by engaging with local stakeholders which is an opportunity to build local capacities on climate hazards, impacts and risk.

• KEY POINTS •

- Need climate risk assessment & management in planning process especially in reference to roads & infrastructure in mountain regions.
- Need to bring communities in the whole process of DRR and disaster management planning.
- Need know identify instruments to address loss & damage through insurance method or compensations.

DR. VIKRAM GUPTA, Principal Scientist, Wadia Institute of Himalayan Geology, Dehradun gave a presentation on *an overview of landslides vis-à-vis climate change in the Himalaya*. He begun by mentioning that the landslides are natural and a complex geomorphic phenomenon that occurs due to various causes due to the interplay of geomorphology, geotechnical, environmental as well as anthropogenic characteristic and it is a primary as well as secondary hazard. He briefed about the formation of Himalayan young fold mountains with its length ranging from 2000-3000kms and width 200-300kms. He pointed out the various sectors in Himalayan Region affected due to climatic change- water, glacier, forest, biodiversity, agriculture, energy, livelihood and major disaster mainly earthquake and landslides. He mentioned that Himalayas could be geologically divided into five regions differentiated based on various tectonic zones- Trans Himalaya, Tethys Himalaya, Higher Himalaya, Lesser Himalaya and sub-Himalaya. He mentioned that nearly 300-400 people get killed due to landslides in Himalayan region annually. He mentioned that the frequency and magnitude of landslides is increasing year by year in the present day climatic scenario and the cumulative effect of landslide is much higher than the earthquake. He showed the mapped area of study in 1990 and 2016 and he stated that the frequency of landslides have increased in 2016 with most of the landslides occurring in lesser Himalaya which is primarily because of climate change. He highlighted the major causes of landslides- rain induced landslides, earthquakes induce landslides, reservoir induced landslide, neo-tectonic induced landslides and man-induced landslides. He stated that 90% of Himalayan population lives in landslide prone areas.

He explained the longitudinal profile of Himalayan Rivers and stated that in Tethyan Himalaya there is long and steep slope, relief is very high with frequent talus and rock fall. Higher Himalaya has steep slope and high relief with frequent debris slide and rockfalls whereas in lease Himalaya, the slopes are gentle with moderate to low slope and frequent occurrence of debris slides and no rockfall He also explained about geomorphic indices- Ks Steepness Index and VfValley floor width to valley height ratio, which can serve as proxy for naturally occurring landslides.

He concluded by stating that Himalayas is a hotspot for landslides and emphasized on the understanding of the causes of landslides before attempting to stabilize it by building a retaining wall. He also stated that different types of landslides should be tackled differently based on their cause.

• KEY POINTS •

- Landslides are natural and a complex geomorphic phenomenon which is a primary as well as secondary hazard.
- Annually 300-400 people get killed due to landslides in Himalayan region.
- The frequency and magnitude of landslides is increasing year by year and the cumulative effect of landslide is much higher than the earthquake.

DR. CHANDRA SHEKHAR and BAHINIPATI, Faculty, IIT Thirupati, he gave a presentation on *Integrated Climate Risk and Vulnerability Assessment for Himachal Pradesh and Tamil Nadu* with detailed explanation about the application of climate risk management framework to estimate risk and vulnerability. He briefed about the 6 steps climate risk management steps- i) Define status quo ii)Identify system of interest iii) Develop context-specific methodology iv) Identify climate change risks v) Evaluate risk tolerance and limits to adaptation and vi) Identify feasible options to address potential loss and damage. He explained how the risk index is calculated using hazard, vulnerability and exposure assessment considering the variability like slope, slow onset disasters, extreme disaster, area specific disasters and demographic features. He showed the hazard and vulnerability map for Kullu block, Anni village and Banjar village by taking current as well as mid-century scenario into consideration and projection of both RCP 4.5 and RCP 8.5 in these areas.

He highlighted both direct and indirect impact of climate change in Himachal Pradesh focussing on direct impacts like flash floods, landslides, soil erosion, etc and indirect impacts like loss of flora and fauna, disruption in roadways, crop diversity damage, migration, poverty and health impacts. He also talked about different adaptation options in Himachal Pradesh- Incremental measures with respect to different types of disaster (Informal/formal borrowing, income diversification, and crop-diversification), fundamental measures with respect to the intensity of disaster (Pucca house, e-NAM, and income diversification) and transformation measures (development of critical infrastructure, building codes).

He also talked about results obtained in similar study conducted in Tamil Nadu, which was conducted with respect to fisherman and farmers community. It was found that the impact of cyclonic storms to the farmers are majorly damage to crop diversity, increase in irrigation cost, fallow land, migration, selling of assets and livestock and informal burrowing whereas impact on fishing communities are poverty, migration, psychosocial stress, reduced consumption expenditure, selling of livestock and assets. Adaptation options (Incremental/ Fundamental/ transformation) were suggested for both farmers and fisherman communities.

• KEY POINTS •

- Explained Climate Risk Management Steps.
- Discussed the applications of climate risk management framework to estimate risk and vulnerability.
- Discussed the direct and indirect impact of climate change in Himachal Pradesh and adaptation options.

DR. G. RAVINDRA CHARY, Director, ICAR-CRIDA Hyderabad gave a presentation and shared his experiences with the NICRA programme. He stated that 52% of India's net sown area is rain-fed and with the increase in extreme weather events, the small and marginal farmers will get affected severely. Increase in all aspects of temperature, increase in rainfall intensity and more sporadic are the impacts of climate change occurring in all over India. Drought and floods have been affecting the agriculture production of the country since past many years. He mentioned that the energy sector contributes nearly 73.2% in GHG emissions and agriculture contributes to about 16.2% majorly by enteric fermentation. Many initiatives by government of India like- National Project on Climate Change (2004), NAPCC (2010) under this National Water Mission, Green India Mission, etc are there.

He mentioned that in NICRA, they come up with adaptation measures and coping mechanism to reduce vulnerability, data generation for different events, global commitments and standing parliament recommendation. He also mentioned various objectives of the project that included bringing resilience to the agriculture, capacity building of various stakeholders and to prepare policy and guidelines and submit to the GoI. He stated that the three major components in the project are- research, recommendation and capacity building. He mentioned that project covers all the sectors of agriculture (Horticulture, livestock, fisheries, etc), technology demonstration of climate resilient agriculture in farm centres and capacity building to various stakeholders including farmers. He focused on the inventory of GHG emissions from the wetlands and agriculture activities. He mentioned the various interventions under this project that included- NRM interventions, crop-based interventions, livestock based interventions, fisheries etc and so many interventions were demonstrated to farmers. He stated that farmer's contingency plan is being prepared for 650 villages. He concluded by stating that these plans and interventions are giving farmers some coping mechanism to climate change and adopting climate resilient agriculture and making climate resilient village.

• KEY POINTS •

- Fifty two percent of India's net sown area is rain-fed and vulnerable.
- The energy sector contributes nearly 73.2% in GHG emissions and agriculture contributes to about 16.2% majorly by enteric fermentation.
- NICRA comes up with adaptation measures & coping mechanism to reduce vulnerability.

MS. SWATI SINGH, **Research Scholar TERI SAS**, gave a presentation on integrating water-energy-food dimensions in plans and policies: Framework for sustainable urban development. She begun by giving a brief about urban landscape in India and stated that 34% of Indian population lives in urban area. She mentioned that statutory towns in India have grown by 6.4% and census town by 186%. She further mentioned that in urban landscape there is an increase in demand of every key service such as water, energy and food by 5-7 times. She highlighted that vulnerability of urban landscapes are increasing by unplanned urbanization and other reasons like migration, over population of people living in slums, food security, water scarcity, energy insecurity, health problems, social insecurity and extreme weather events. This is why water energy-food nexus is important. She stated that WEF nexus recognizes the synergies between water-energy-food systems and aims to provide framework for optimal use of all resources. She also elaborated the three aspects of WEF- food security, water security and energy security in detail and the synergy between them. She mentioned some key elements of food security that included food availability, food accessibility and food utilization. In water security elements included is water accessibility, water safety, water affordability which the elements of energy security that she highlighted are continuity of energy supplies, physical availability of supplies and supply sufficient to satisfy demand at a given price. She elaborated the methodology adopted to integrate water-energy-food. She havecategorised the factor affecting WEF nexus at city level in four category- Regulatory factors Institutional factors, Socio-economic factors and technological factors. She also explained the WEF urban adaptation framework in 4 steps which comprises of Identifying adaptation options, stakeholder involvement, formulating new policies/ regulations and aligning with sustainable city goals linking global agendas like Milan Urban Food Policy Pact (2015), SDG (2015), New Urban Agenda (2016) and Montreal Declaration (2017). She concluded her presentation stating the relevance and signification of her study and mentioned that WEF nexus needs to be integrated in developmental plans, policy and decision making to promote synergies across the sectors.

• KEY POINTS •

- Thirty four percent of Indian population lives in urban area & statutory towns in India have grown by 6.4% and census town by 186%.
- Vulnerability of urban landscapes is increasing by unplanned urbanization, migration etc.
- Water-Energy-Food (WEF) Nexus is important.

KEY DISCUSSNANTS

DR. K J RAMESH, Former Director General, IMD, spoke about ensuring sustainability of the resource-land, water, fertile soil and air about which everyone has sufficient knowledge. Extreme events can be clearly seen these days and new extreme events due to heat, cold, heavy rainfall associated with low

pressure, depression and cyclones, etc. He mentioned that we lack to knowledge to tackle the issue from effecting crops like pulses, wheat, etc and emphasized on focusing on these crops. He also focused on sustainability of Himalayan ecosystem, which is prone to landslides, and delineation of landslides can be possible with good knowledge of types and causes of landslides. He also highlighted the reassessment of availability of water, which is the basis of management of surface water.

• KEY POINTS •

- Ensuring sustainability of the resource - land, water, fertile soil & air.
- We lack knowledge to tackle the issue from crop effects.
- Sustainability of Himalayan ecosystem is important, which is prone to landslides.

MR. DEEPAK CHAMOLA, Technical Advisor, GIZ talked about an umbrella programme with NABARD for creating sustainable livelihood model in terms of better SRI practices, loans are given to farmers from corporative, NGOs, FPOs and 93% of the loan has come back that shows that they are successful business model. These business models can be up scaled through bank finance; can be integrated to policy framework. He stressed on community engagement in climate action providing loans to SHGs and Joint liability groups, JFM and other communities based institutions. He emphasized on training of bankers with new sustainable business models and mitigation of risk factors.

• KEY POINTS •

- GIZ has an umbrella programme with NABARD for creating sustainable livelihood model.
- Recovery of Ninety three percent loan proves the successful business model.
- These business models can be up scaled through bank finance & integrated policy framework.

MR. SUNDERSHAN PAL THAKUR, Director General, Academy of Admistration & additional Chief Secretary Odisha, mentioned that in naxal belt of Odisha has hills which is being constantly denuded but keeping these hills away from any kind of biotic interference is helping in regeneration as nature has its own way of regeneration. He emphasized that the nature and communities dependent of forest and forest products should be left on their own way from external biotic interference. Each government programme there is a process of evaluation to check about any faulty development process. He also stated that sometimes misuse of power by government officials in public interest could protect forests.

• KEY POINTS •

- Communities dependent of forest and forest products should be left on their own way from external biotic interference.
- Sometimes misuse of power by government officials in public interest could protect forests.

DR. G RAJESHWAR RAO, Director, ICFRE, mentioned that only few rivers (Ganga, Yamuna and Indus) are from glacier melting and most of the rivers are rain-fed in which forest act as a sponge, it receives water and doesn't allow water to run and slowly contributes to the flow of rivers. However, the current rate of deforestation there is reduction in flow rate of these rivers. He mentioned that ICFRE is working on 13 such rivers in which riverine ecosystem, agriculture ecosystem and urban ecosystem is being addressed. He concluded by stating that studies have to be done on how climate change is affecting the main economic species and research has to be done on different biodiversity with respect to climate change.

• KEY POINTS •

- Forest act as a sponge for rain-fed rivers.
- Current deforestation rate causes reduction in river flow rate.
- Need to research the impact of climate change on main economic species and different biodiversity.

PROF. V K SEHGAL, Principal Scientist and Professor, Dept. of Agricultural Physics, IARI, ICAR, New Delhi, he begun by stating, "If you can measure, you can manage". The climate change has two dimensions- long- term changes and short-term changes. He mentioned that the stimulations models that were used back then to predict 2020s climate scenario was wrong as the variability used were not ground based. That is why he emphasized on validation of data with the ground level reality and the community perception. He stated that the data scale and time period is not sufficient to use in any of the scheme/ policy at the ground. He concluded by stating that we need to define clearly what this climatic risks with data of all types of data including soil moisture. The data of soil moisture are generated by using models but to validate it ground level data in participation with community is very important to declare a situation like drought.

• KEY POINTS •

- The climate change has two dimensions- long- term changes and short-term changes.
- We need to define climatic risks with all types of data including soil moisture.

• KEY RECOMMENDATIONS •

- There is need to develop futuristic scenarios to better understand the repercussion of the natural disasters.
- There is a need to encourage the usage of Model Simulations/Model based projections in climate change adaptation.
- There is a need to develop contingency plans against the increasing daily rainfall, rain frequency as well as the quantity of the rain.
- Different climate scenarios to be considered in developing different contingency plans.
- Integration of climate adaptation, disaster resilience and SDGs into one framework at state and sub-state level is critical for sustainable inclusive development.
- New business models should be developed based on the agriculture.
- The mobilisation of finances through banks and NABARD institutes needs to be better understood.
- Effective use of technology, communication and local actions by addressing knowledge and capacity gaps through systematically designed programmes to be encouraged.
- Understanding of the causes of landslides before attempting to stabilize it by building a retaining wall.
- WEF nexus needs to be integrated in developmental plans, policy and decision making to promote synergies among different sectors.
- Reassessment of availability of water, which is the basis of management of surface water.
- Nature and communities dependent of forest and forest products should be kept away from external biotic interference.
- Validation of data with the ground level reality and the community perception.

Publications Released:

Cluster Session 4:

Resilient Health

Session Date and Time:
27th September 2019, (11:30 am to 13:15 pm)
Name of organizer:
World Health Organization, National Centre for Disease Control, UNICEF India
Name of Rapporteur:
- Ranuka Saroha, WHO - Dr. Sweta Baidya Das, Research Associate, CAPRES, NIDM
Session Chairperson:
- Dr. Sujeet Singh, Director, National Centre for Disease Control (NCDC), Ministry of Health & Family Welfare
- Mr. Sarbjit Singh Sahota, Emergency Specialist, DDR Section, UNICEF, India Coordinator
Session Coordinator:
Mr. Manjeet S. Saluja, National Professional Officer (Environment & Public Health), WHO
Session Speaker:
- Dr. Shikha Vardhan, Deputy Director, Centre for Environment and Occupational Health, Climate Change and Human Health Division, NCDC - Prof. Jugal Kishore, Director, Professor, VM Medical College and Safdarjung Hospital, New Delhi - Ms. Somya Bhatt, Technical Advisor, GIZ,Germany (India Office) - Prof. N C Gupta, Dean, School of Environment Management, GGS Indraprastha University, Delhi
Session Discussants:
- Dr. K J Anandha Kumar, Principal Scientist, Ministry of Jalshakti (Water Resources) - Dr. Indrani Chandrashekharan, Former Advisor, Planning Commission & MoEF, GoI - Prof. Amita Singh, Centre for Legal Studies & Former Chairperson, SCDR, JNU

ABOUT THE SESSION

The session was planned to highlight importance of health in building climate resilience. In India, huge population depend on public health services, thus it is important to start building its resilience.

Early investment will reduce financial burden of state and minimize impacts on human health. The objective of this session was to understand how the climate change is inducing the increase of health issues related and different health problems faced during the disaster situations.

- How to overcome the situations and build health resilience towards sustainable development.
- Capacity of the health systems to protect and improve the population health in an unstable climate and changing climate. How our health gets protected in different types of changing climatic impact.

COORDINATOR

MR. MANJEET S SALUJA, National Professional Officer (Environment & Public Health), WHO was the session coordinator. He introduced the session and explained about the objective of the session. Moreover, he emphasized that evidence generation is important but it is only a part of the entire problem. Therefore to prepare the operational framework we need to put all the building blocks together. There are six building blocks

1. Leadership and governance: In India leadership has been taken, like there was announcement on special submission on human health, National action Plan on Climate Change and Human Health has been developed. There are policies and strategies in place for climate change, especially in health determining sectors like water, energy, food, nutrition. We have increased the sanitation from 24% to 99.9% through Swatch Bharat Mission but how that is connected to health issues are discussed.
2. Health Workforce: Staff nurses has to be informed and trained about the infection prevention and control due to the climate change
3. Health information System: He emphasized that we need to give importance to health information system like components of vulnerability capacity assessment, risk monitoring, health and climate research etc. India has done major work in terms of vulnerability assessment in SAPCCs, we have a mechanism working in terms of Integrated risk monitoring in terms of integrated disease surveillance programme and now we are moving towards integrated health information platform which will help us to forecast some climate sensitive diseases, will it help us to focus on vector behaviour, what is the threshold temperature in which the vectors would modify which will have an impact on the health outcome would be discussed.
4. Essential medical products and technologies and infrastructure and health care facilities, how the architecture and buildings have to be suited and needs change for specific disasters.
5. Service delivery: In order to effectively protect the health of the population, the health sector has to strengthen outside its spheres of influence.
6. Financing aspects: It is seen that even in the international regime 0.5 to 1% funds are being given to the health sector, which is not enough. Therefore, we need to look at the investments going in the health sectors. After explaining these six building blocks he concluded that in order to protect

the health sector, has to be strengthen outside the sphere of influence. We need to develop some kind of normative guidelines to determine the acceptable levels of exposure and its effects on health for health sector and finally he requested the chairpersons to continue the session.

CHAIRPERSON

DR. SUJEET SINGH, Director, National Centre for Disease Control (NCDC), Ministry of Health & Family Welfareexplained how the natural disasters are impacting our health and said that we all know about the various climatic changes that have effect on us for last few years we are continuously monitoring several disasters like cyclones, tsunami, floods, earthquake etc. and other climatic phenomena which are regularly affecting like heat wave, air pollution etc. Later while explaining the role of NCDC he mentioned that National Centre for disease control has been designated as the nodal agency for health issues and it is developing a Health Adaptative Plan. For this National Level Plan has already been prepared but Multi Sectorial Approach has to be taken in District and block level planning. For this we need to identify the districts which are vulnerable to the climatic condition and identify the vulnerable population. For this Centre of Excellence are identified who would prepare the plans. He said that we need to have focused approach and preparedness and identify major requirements so that the mitigation plan could be fool proof and the critical health care should be in resilient manner.

DR. SARBJIT SINGH SAHOTA, Emergency Specialist, DDR Section, UNICEF, India Coordinatorsaid that we saw that whether its water or sanitation, policies or transport policies etc. it all comes to us. In the end it is left to the health sector. It supposed to be an important social sector, whose performance is equally important, and climate does impact their performance. No one can deny that our health facilities or supply chain management systems of the health sector do get impacted by the climate. It evokes contradiction that though it is such an important sector, it directly not the part of ADCs. We did not see any project happening in the health sector using climate finance, which needs to be addressed. We need to use more climate finance for improving the climate resilience of health systems.

SPEAKERS/ TECHNICAL PRESENTATION

DR. SHIKHA VARDHAN, Deputy Director, Centre for Environment and Occupational Health, Climate Change and Human Health Division, NCDC, discussed about the health impacts which are connected to the climate change.Inspite of having similar geophysical setting in different countries the health issues are different as it depends on level of development of the country, the health services and infrastructure, the social determinants of health and the personal protection which people are undertaking. She explained NCDC's focus to be creating awareness to strengthen the capacity, preparedness and response, develop partnership and synergy with other missions and other sectors

and extend research. Diseases are climate sensitive therefore, the diseases have to be looked from the climate change perspective and how the vector pathogens affect the occurrence of disease.

We have 13 Centre of Excellence and 5 are added who are preparing the health adaptation plan. As air pollution is a major issue in our country NCDC has established central surveillance which is being looked after by a steering committee. NCDC is studying the acute respiratory illness cases and air quality index of respective dates to ensure the effects of the air pollution. NCDC ensure the awareness activities keeps on going through various means. They are also working on green health care facility, integration of interdisciplinary data. Sensitization of policy makers and politicians are important. Mitigation activity has to be taken care by other ministries but health care has to be taken in loop so that health is not affected during the disaster. She reminded that climate aspect has to be integrated in disease surveillance and meteorological data should be incorporated to have a clear combined picture. Focusing on the capacity building, preparedness and early warning system is important.

• KEY POINTS •

- The severity of health issues depends on the level of the development of the country.
- Diseases are climate sensitive therefore; the diseases have to be looked from the climate change perspective.
- Mitigation activity has to be taken care by other ministries but health care has to be taken in loop so that health is not affected during the disaster.

PROF. JUGAL KISHORE, Director, Professor, VM Medical College and Safdarjung Hospital, New Delhi stated his presentation by saying that health system and Health is affected by all kinds of climate change and disasters. Disaster is nothing but a health issue; if human health is not affected then people would be less bothered about disaster. Air pollution should be considered as disaster, particularly in area like Delhi as we have large number of cardiovascular disease, asthama, cancer, immunological disorders, arthritis etc. are affected by disasters. Delhi and surrounding areas are contributing to the air quality of Delhi. Many other states particularly cities are having air pollution situation and they are notified for prevention. Dust is normally not considered but dust is one of the most important contributor of the air pollution if it is controlled by engineering and environmental method we can save lot of life. Waste burning and crop residue burning, industries and vehicles are major contributing factors of air pollution.

Other important contributor is air traffic which is less considered. Dellhi has 1000 flights per day and 41 flights per hour which emits nitrous oxide, nitrogen di oxide, vapour, particulate carbon di Oxides, Sulphides etc. which in total is 645 kg to 2500 kg per hour therefore, per day it is releasing six lakh forty five thousands kg to 25 lakh kg Carbon Di Oxide in Delhi. To make a resilient climatic condition we can cut down this by 50 percent and which is affordable for us. Air pollution because

of Yamuna and drains is another matter of concern. People living beside Yamuna are continuously inhaling harmful gases like Hydrogen Sulphide, Methane, Ammonia etc. There are 22 drains coming to Yamuna. There are many causes of air pollution, among them some are controllable by proper understanding and engineering method and lifestyle behavioral change as environment is nothing but your way of thinking development and thus sustainability could be achieved.

• KEY POINTS •

- Health and Health system is affected by all kinds of climate change and disasters.
- Disaster is nothing but a health issue.
- Air pollution should be considered as disaster, particularly in area like Delhi. Air traffic is one of the most important and least considered contributor to the air pollution.

MS. SOMYA BHATT, Technical Advisor, GIZ Germany (India Office), brought out the point that Health has not been prioritized as it should have been not only in the National Level but also at the state level. She talked about how health has been included in various climate change policies, what can be done in order to make it more prominent at give it the needful significance in the mainstream climate change adaptation policies. She showed the climate change policy landscape of India to understand present scenario in health sector in India. At the International Level India has been a nationally determined contribution which is committed to UNFCCC, at national level the missions of India, at the state level state action plans on climate change for operationalizing the NAPCCs at state level. GIZ is working with several districts and panchayats to downscale the SAPCCs to integrate climate change in the main stream climate change plans and policies. While talking about India's International commitments, she mentioned that Health as a sector there is no quantifiable targets as far as is concerned in NBC. There I sonly one mention of Vector borne disease control program in which India aims to eliminate Malaria by 2030. NBC talks about enhance investment in vulnerable sectors including agriculture, water and health etc. The NAPCC was launched in 2008 and took 8 years to have a mission on Health at the national level. But this has greatly affected the state level plans and policies when it comes to the health sector. The privates who are coming out in terms of health are very limited. National Adaptation fund on climate change, which was launched in 2015, by Govt. of India, to implement priority adaptation projects in the state level linked to the priorities that were identified in the state action plans. There are 25 or 28 projects ongoing under NAPCCs, not a single project is linked to health and adaptation, and most of them are focused on agriculture, water or animal husbandry. Even at the International Level, one percent of climate finance is dedicated to health and adaptation. The synergies between climate change adaptations have not been optimized to the affect it should have been even after 10 years of consultation regarding Climate change plans and policies both at the National and State levels and also talking about climate change funds. There are certain direct impacts of disasters Physical injury because of floods and heat stress exposure, respiratory distress and cardio disease etc. there are certain indirect impacts will happen or already happening because of temperature disruption and

changing precipitation patterns which lead to crop failures or less crop production etc. and ultimately it affects the health of the communities. Post disaster trauma anxiety stress has to be taken care of. 12% increase in the Anaemia has been reported from Himachal and Uttarakhand and it linked to the climate change impact though we do not have very strong evidence for this. Concept of accelerating health Service delivery, based on the gaps and challenges that we identified they developed a concept for national adaptation fund on climate change which essentially looks after doing a vulnerability and risk assessment for health sectors in the chosen areas and develop adaptation options. It is important to look at the health sector holistically, we need to identify risk exposure vulnerability and hazards from a health perspective but not neglecting all the other sectors those are also contributing to it, then the adaptation options could be in the form of legislative education communication, better surveillance or ecosystem interventions which sometimes the health sectors may not be looking into. Infrastructure development is needed, whether it is health sector infrastructure or infrastructure for preventing floods. As a way forward 3 points to be focused on:

A. When we talk about health and climate change adaptation we really need to focus on multi stake holder engagement. It is very important to recognize that most activities that impact health are not actually addressed by the health sectors, for example when we look at the indirect impact of the ecosystem disruption, or agriculture supply chains, or even floods, slow onset events like salinization.

B. We need to enable and empower the communities digitally so that they can be part of the process in institutional building and jointly make decisions specially in the climate hotspots, as they are more prone to be affected by climate change impacts otherwise and also in the health sector.

C. Institutional Capacities: we have to have an integrated climate change approach which effectively integrates climate risks and adaptation options in health sector planning and implementation.

• KEY POINTS •

- Health has not been prioritized as it should have been not only in the National Level but also at the state level.
- Health as a sector there is no quantifiable targets as far as is concerned in NBC.
- Need to enable and empower the communities digitally.

PROF. N C GUPTA, Dean, School of Environment Management, GGS Indraprastha University, Delhi,identified the gap areas in health air pollution and its sources are important risk to health and capacity to estimate health benefits from policy from all sectors, communication to support for clean field policies, better data, evidence of effective interventions, policy change and part of SDGs particularly in the health sectors and ministries. Air pollution is one of the greatest problems of the society now an average man breath ~22000 times a day and inhales 15 cubic meter of air. For last 10 years air pollution is extreme in Delhi and posing a major health risk. Small scale industries and vehicles are the reason for air pollution in the urban areas. PM 1 is also equally harmful

but we talk only about PM10 and PM2.5. Air pollution has shortened life span by 2.5 years in South Asia and in India also. Outdoor and indoor air pollution concluded to over 1.2 million deaths in India until 2017. More number of people are dying worldwide every year due to pollution, road accidents and vector borne diseases especially death caused by Malaria is third highest. Long term exposure to outdoor and indoor air pollution has contributed to 5 million various diseases. UjwalaYojna i.e., household LPG use escalated for stage 6 and the air pollution programme of Govt. of India, have the potential as a part of sustained commitment to air quality. In the hilly and Himalayan areas both the outdoor and indoor are equally polluted due to biomass fuel burning at home. Use of coal and Kerosene can be replaced by efficient cooking stoves. Cooking stoves and LPGs have reduced the air pollution in these areas. Integration of land use and transport will define the shape of an urban energy use. Sustainable transport system can help in reducing the air pollution in India and help in achieving the resilient health.

• KEY POINTS •

- Air pollution is one of the greatest problems of the society now.
- For last 10 years air pollution is extreme in Delhi and posing a major health risk.
- Small scale industries and vehicles are the reason for air pollution in the urban area.

KEY DISCUSSNANTS

DR. INDRANI CHANDRASEKHARAN, Former Advisor, Planning Commission & MoEF, GoI,talked about construction of a disaster reduction and preparedness Index for the country. To monitor the states and come up with an idea of where we stand. The main relationship DRPI of our goals and targets of sustainable development i.e., relationship between DRPI and SDG. 4 SDGs, 5 Targets and 10 indicators are what we are supposed to look at and report very soon. She explained the criteria and parameters for monitoring. She also mentioned that according to many of the reports the threats of Polio and typhoid is going to come back again after a recession. She showed how the population exposure scores to be put down and monitored, the economic losses and disaster management plans that exists, the agriculture area that is affected and causes problems, complete disaster score of all the states based on the DRPI. Maharashtra scores top in terms of monitoring, there risk is high and resilience is also high. She also showed the score board at district level prepared by Ministry of Home Affairs.

• KEY POINTS •

- Talked about construction of a disaster reduction and preparedness Index for the country.
- The threats of Polio and typhoid is going to come back again after a recession.
- Maharashtra scores top in terms of monitoring, where both risk & resilience are high.

DR. K J ANANDHA KUMAR, Principal Scientist, Ministry of Jalshakti (Water Resources), flagged some issues directly related to the health especially the water. Recent report shows that many patients who are suffering from unidentifiable diseases have lead or zinc in their blood, as per the blood test reports. Therefore, if we try to find the source, it is seen that indirectly the origin of these disease is water. Water is inevitable for producing food as well as for maintaining good health and it also works as the source of the diseases. But for this multi stakeholder engagement is needed.

• KEY POINTS •

- Many patients who are suffering from unidentifiable diseases have lead or zinc in their blood, the origin of these disease is water.
- Water is inevitable for producing food as well as for maintaining good health and it also works as the source of the diseases.
- Multi stakeholder engagement is needed.

PROF. AMITA SINGH, pointed that disease does not observe boundaries, that's why it is a multidisciplinary approach and has an embedded trans-disciplinarity in making a society more resilient to health problems. She further explained that there are two aspects one is health problems and another is disease control which is a mega budget thing which needs high technology high collaboration international aspects and a large part of money and GDP goes into this. She gave example of Bhopal Gas Tragedy and Amazonian forest fire in this regard. She raised a question that, were the health workers were ready to deal with that kind of situation? Health statistics are needed to be shared to create awareness regarding avoidable health hazards. UNICEF created awareness in South 24 Paraganas of West Bengal, regarding how to be safe from avoidable diarrhea, malaria, and dehydrating diseases which brought the death incidences to zero from 800 to 4000. In cases of oil spill, fishes from those locations are carcinogenic even after two years of oil spill but there is lack of studies regarding this. Post disaster effects are being passed on from generation to generation. It is mandatory in the municipal corporations to implement the Animal Birth Control program to save the city from the contamination from animal dead bodies during a flood disaster situation. To conclude she mentioned that we need to have contentious SDMAs and DDMAs who are willing and happy to collaborate and share information.

• KEY POINTS •

- Disease does not observe boundaries, that's why it is a multidisciplinary approach.
- Building health resilience is possible if proper timely guidance is given and awareness is generated.
- Health statistics are needed to be shared to create awareness regarding avoidable health hazards.

• KEY RECOMMENDATIONS •
• India needs to work on climate proofing health facilities, starting from Primary Health Centres to super specialised hospitals.
• Public must be educated about climate change and its impact. This will help them prepare for disasters and take precautions.
• States should build comprehensive action plan for health. Smallest governing unit should have their own plan as well. Health should be kept at centre for all planning exercises.
• Health workforce should be sensitized about climate change and how it will impact human health.
• Scientific and medical researchers should focus on health impacts of climate change, environmental degradation, and local environmental factors. There is need for India specific data and studies liking such issues to public health.

Publications Released:

Cluster Session 5:

Higher Education and Research Promotion Strategies

Session Date and Time:
27th September 2019, (14:30 to 16:00 pm)
Name of organizer:
Springer Nature and NIDM
Name of Rapporteur:
- Ms. Aakanksha Tyagi, Editor Life Sciences, Springer Nature - Ms. Pritha Acharya, Research Fellow, CAP-RES, NIDM
Session Chairperson:
- Prof. Prof Manipadma Dutta, Vice Chancellor, TERI School of Advanced Studies, New Delhi
Session Coordinator:
- Dr. N K Aggarwal, Editorial Director Medical & Environ. Group, Springer Nature Publishing
Session Speaker:
- Dr. Suneel Pandey, Director, Environment & Waste Management Division, The Energy and Resource Institute, New Delhi - Dr. Mahua Mukherjee, Head, CDM, IIT Roorkee - Dr. Ray Taylor, co-founder of ALLFED

ABOUT THE SESSION

The session focused to explore, through an interactive discussion with the key academicians and experts, about the trends and trials of India academia and research. The intent was to set up maximise interaction between academia and publisher on pertinent issues in research and academics. Scholarly communication being an important aspect of research, this session aimed at exploring avenues of cooperation and setting up a dialogue between researchers and publisher for addressing the issues that matter to the research community. The session was designed in an innovative manner. There were no presentations during the session rather it was more interactive in nature. There were a set of questions that were addressed to the speakers and their responses were recorded.

The session began with the release of the report on Sectoral Consultation Workshop on National Agriculture Disaster Management Plan (NADMP).This report defines the guiding principles for NADMP, the practical template/framework to conduct hazard-risk vulnerability and capacity assessment (HRVCA) at the national level and helps in better understanding the capacity needs.

COORDINATOR

Cluster Session 5 was coordinated/ moderated by **DR. NAREN AGGARWAL**, Editorial Director – Books, Asia. Dr. Naren greeted all the members on and off the dais and set the content for the session. India is a large country with equally large education and research needs. He talked about the recently published All India Survey report on higher education, and said that India is home to 993 universities, 39, 931 colleges and 10, 725 standalone institutions. Total enrolment in higher education has been estimated to be 37.4 million. Out of these 79.8% students are enrolled in undergraduate level program, while only less than 0.5% are enrolled in Ph.D. programs. In 2018 India awarded 40,813 PhD degree with 23,765 males and 17,048 females recipients. These facts and figures paints an interesting picture of Indian research and academic landscape, which is changing very fast and is faced with unique challenges. He further added that Springer Nature is one of the leading scholarly publishers in the world and as a company they are committed to connect researches tackling the world's toughest challenges with the practioners who are working on the ground and such group of people need SDG related contents and Springer Nature is committed to bring this research, body of information and knowledge in form of journals and books to them especially in Asia, South East Asia and Africa.

CHAIRPERSON

The session was chaired by **PROF. MANIPADMA DUTTA**, Vice Chancellor, TERI School of Advanced Studies, New Delhi. Prof. Dutta started the session by stating that humanity is the main challenge to humanity, he added that the disasters we face today are a result of the original sin that mankind has done in the past history. He then congratulated NIDM for taking up this timely initiative which attracts dialogues from various sectors at the international and national level. Giving the example of Pakisthan Earthquake, he said that disaster makes people more self-centric and thus how disaster management should be taken into account needs to be understood clearly. Should the role of managing disaster come after a disaster happened and there is a need to manage disasters or should disasters should be prevented. He added that designed thinking and designed structure are very meaningful in case of disasters and these should be the way forward. Coming to higher education, he said that there is difference between educated and literate and thus what is needed is

out of box thinking and documentation of indigenous technology. When it comes to capacity building, the people, who don't have anything, should be enabled so at-least he has his fundamental right to acknowledge disasters.

KEY DISCUSSNANTS

There were six questions that were flashed on the projector and circulated among the esteemed speakers. The themes of the questions asked are given in the following paragraphs and the viewpoints of each speaker are reflected next to these questions:

1. Indian research and higher education landscape: current trends and future prospects:

DR. SUNEEL PANDEY, Director, Environment & Waste Management Division, The Energy and Resource Institute, New Delhi, said is the current Indian standard of education capable of generating jobs or are they job worthy. Giving a few examples of early 80s, he said that during those years, people went for higher education for two reasons; a. lack of jobs in their relevant field; and b. for the sake of doing a PhD. However, he said that today the challenge is if there is a slight change in the currently offered courses in universities and colleges to more evolved, issue oriented and specific courses at the graduate and the post graduate; are their enough job opportunities available. Another point of concern in today's scenario is that in some universities also, the prime objective to undergo any research is to publish papers.

• KEY POINTS •
• Current Indian standard of education capable of generating jobs or are they job worthy.
• Currently offered courses in universities and colleges should be more evolved.
• The prime objective to undergo any research has become to publish papers.

DR. MAHUA MUKHERJEE, Head, CDM, IIT Roorkee, spoke about her views on the communicated question. She started in a focused way and tried to answer the question in terms of disaster risk reduction. She said that one part deals with the social and economic environmental education oriented and another part is techno-managerial and policy level. If we see it in those terms all the three are important especially when it comes to Disaster Risk Reduction. But if keep on working

in silos, there may be development at the individual level, however for an improved and better educational landscape, it is essential that there are interactions as well as dialogue building between these sectors. She further added that three important terms sustainable development, disaster risk and climate change are discussed differently, however, if they are discussed together that helps with the communities as well.

• KEY POINTS •
• One part of our education deals with the social and economic environmental education oriented and another part is techno-managerial and policy level.
• But if keep on working in silos, there may be development at the individual level, for an improved and better educational landscape.
• Three important terms sustainable development, disaster risk and climate change should be discussed together.

To this **DR. RAY TAYLOR**, co-founder of ALLFED, congratulated India on this front and said that the size of the student population, enthusiasm, optimism especially among the female participants is a pat on back for the country. Taking the case of Sri Lanka, he said that, Sri Lanka is trying to improve the colloquial English for past 20 years and have failed. In addition he pointed out the big lack of carrier guidance for the students in relevance to getting jobs. He further pointed out that participants or students should not take up a subject because just they are interested, rather they should talk to people who are working in those fields and knows what exactly is requirement in those sectors. Inspired by Bill Gates, the 'eightythousandhours.org' is helping students planning their carriers.

Not quite agreeing to the subject, **PROF. DUTTA** said that the answers to these questions are obvious and not very bright. Referring to the education system of America, Scandinavian countries, UK, European countries, he said that the contributions of British to establish this education system. The main challenge is the India, lacks its own education system. In addition he said that for job you need skills and not education. Skill development is not the goal of education. For jobs skill is needed however for higher education the purpose is to spread education and not develop skill.

DR. RAY TAYLOR then shared a very valid point by saying that a lot of good research never come out globally because of the local language barriers and mentioned that such challenges needs to be addresses.

• KEY POINTS •
• Big lack of carrier guidance for the students in relevance to getting jobs.
• Students should talk to people who are working in those fields and know the requirement in different sectors.
• Need to overcome local language barrier.

2. Status of professional v/s basic sciences education

DR ANIL KUMAR GUPTA, from the organizing team opened the discussion for the question and gave his views against the question displayed on screen. He said that the distinction between professional

and basic courses was quite logical about approximately 15 years back but now in terms of the type of delivery of these courses, there are not much distinction. A student pursuing botany also needs to develop an understanding of subjects like economics and they go to field to take up various researches and work like that. So there is not much of a difference and distinction between the two in today's scenario. Dr. Sunil Pandey also shared the same view and he said that lately the PhD programmes as well as the researches have become interdisciplinary in approach where a student from engineering background may be as relevant as a student form life science background, as the products that are to be put in the market needs to socially accepted in order to generate markets. Dr. Mahua also agreed to the points shared by Dr. Gupta, she added that in the professional field more and more interdisciplinary discussions are taken place but at the same time in basic sciences also is not anymore in the isolated silos. To this Prof. Dutta said that science and technology are two different things, there may be collision, commission and also inhibition. Social science is also a science, societal response scientifically. Science is less professionally in-depth rather technology is more professionally in-depth. But at the same time, there is no basis of professional sciences without basic sciences. Just like education transforms professionalism similarly scientific rules are transformed into technology.

3. Role and involvement of private sector in Indian higher education research scenario

PROF. DUTTA stated that it all starts with the capital that is involved in education by the private sectors. With investments private sectors are likely to be more involved in the scenario. **Dr. PANDEY** brought up the topic of privatization of the education system as a whole. Linking with the skill development, he said private sector definitely has a role to play in skill development through institutes like ITIs. **Dr. MAHUA** said that in future how private sector will deploy their role but considering today's scenario, it is definite that private sector very strongly influence the education and the students mindscape. **Dr. RAY** said that private sectors should do what they do the best and public sector should do what they do the best. However, he pointed out that in India, the youth is more inclined towards the private sector rather than the public sector.

4. Unique place of Indian research and researchers in the global scenario of research and innovation

PROF. DUTTA said that India, China and USA cannot be compared that easily. In India the opportunity cost is very low thus a lot of people are engaged in higher education. He further highlighted the role of contextualizing education. In India the current scenario is education has rather become a luxury and that is why one may see that American PhD programmes have maximum participation from India and China. Further praising the question he said that there is a need to ponder deep on this question. **DR. MAHUA** also agreed to importance and need to contextualize education and education systems in India. She said that India is investing a lot on resources and if the young minds are not able to utilize the resources, then the country will definitely be a looser. Research in India is rather theoretical and hypothetical and there is an increased need to bring-up certain experiences from ground. Adding to the discussion, **DR. RAY** said that the young minds need to know what coming up and he further highlighted the understanding the future education needs. **DR. PANDEY** joined the discussion by stating that although there is a need for India to have a whole new education system. He added that out of box thinking is extremely important; however how these innovations are used should be given special emphasis. Sometimes too much of innovations may lead to disasters; rather than doing well they do more harm.

5. Systemic obstacles in Indian research

Quoting George Barnard Shaw, **Dr. DUTTA** said that 'Money is the Honey of Humanity'. Money is needed and is important to but one should know how to spend that money. Here the question is that how to remove obstacles and improve research activities; in a fully capitalized society, the social acceptance of products as pointed out my some of the other speakers on the dais is difficult to understand. The whole point is that money is very important provided it is qualitative. With an interesting example, he said teaching and cheating comprise of the same letters and so businessmen should not change people's mind rather they should do business. **Dr. RAY** shared a very different angle to the question. He compared the Russians and the American mind set and stated about the open data, the technology, the freedom to information etc are more accepted and talked about by the Americans than the Russians. Thus they attract a lot of people and gain profit from that, giving away free and open data. In this regard, the India is a little conservative when it comes to data sharing, which he said may be one of the systemic obstacles. Supporting the comments from the other speakers, **Dr. MAHUA** added it is also the atmosphere the researchers are exposed to play a crucial role. She added that there has become a scarcity of platform or atmosphere where the researchers can openly participate in discussions.

6. Expectations of researchers from academic publishers

Dr. RAY said that Indian researchers are neglected by International publishers, it is the responsibility of the researchers but also the publishers. For example he highlighted that the standard of English does not match the international standards, so here the publishers can employ the full time staffs to develop on this aspect and raise the level. He mentioned about the Elsevier's new initiative called Mendeley, and said they if India could also host a similar portal where the Masters students and the PhD students can put forward ideas, concepts, call for papers, unfinished papers and get immediate feedbacks and such platforms may be very useful. To answer this question **Dr. PANDEY** said that if academic publishers can develop certificate courses on research methodologies and how to publish papers; such courses may be really useful for upcoming researchers. This question also had comments from the audience; **Dr. SURABHI** from VMMC said that Springer should sensitize young researchers towards the importance of publications and not only publishing the positive findings but at the same time the negative findings and also the importance of ethics in research. Another participant said that the publisher should bring in a balance in the composition of the review panel to avoid bias for any research editorial board. **Dr. ANIL K GUPTA** also pointed out that the availability of the systemic reviews and the students who are actually willing to take up good research is missing. **Ms. SWATI SINGH** another participant pointed out that the waiting time between submitting the research paper and the communication of the information of the acceptance or rejection of the paper is very long, this time taken by the journals to communicate the research fellows/ students should be reduced.

To this, **Dr. NAREN AGGARWAL** said that this is problem globally, millions of research scholars are facing this problem and the publishers are trying to shorten this time period of review process. Certain journals have their express channels depending upon the prestige of the journal. It is also not easy to find reviewers for the panels and reviewers also feel the pressure of completing reviews sometimes. **Dr. SUNIL** suggested that young reviewers should be engages and entrusted with the responsibility to reviews papers by young scholars. Another participant from the audience pointed out that for submitting any paper, the journals ask for suggested reviewers when so the scholars may

not be aware of them, filling such details increases the time further. **Dr. NAREN** said, it is primarily to develop a database. To this **Prof. DUTTA** said that the publishers should follow an approach and there should be some sought of certainty. The publishers should pull their strings but at the same time should not compromise with the quality of the research.

With this the session came to an end. **Prof. DUTTA** in the concluding remarks said that Research should not be imposed; it should only for the love of doing the research. It should be done with a purpose and affinity towards it.

• KEY RECOMMENDATIONS •

- Indian research and higher education landscape: current trends and future prospects.
  a. Discussants reflected that among scientific community there is a tussle between getting a job or a promotion v/s creating real-time research impact.
  b. They suggested that there should be more interaction among researchers and especially between students and young scientists to inculcate scientific temper and interest in research.
  c. Relevance of skill development and vocational training was highlighted.
  d. Bringing focus back to indigenous ways of learning and its integration into education system was also discussed.
- Status of professional v/s basic sciences education.
  a. All the discussants agreed that lines between professional and academic courses are increasingly getting blurred.
  b. It was agreed by all the discussants that both 'basic sciences' and 'technology' are important and have their own unique place.
  c. Chair concluded that courses and curriculum in higher education should be designed based on the needs and demands of the society.
- Role and involvement of private sector in Indian higher education research scenario.
  a. Discussants had consensus on the importance of private sector in catalysing implementation of education and research related goals.
  b. Chair expressed that both public and private sector have differentiated roles and they both must continue to work cohesively to bring out the best results.
- Unique place of Indian research and researchers in the global scenario of research and innovation.
  a. There was consensus on the idea that India needs to contextualise the structure and processes of higher education with respect to the global changes and local demands.
- Systemic obstacles in Indian research.
  a. Discussants and chair agreed that issues of spending the research funds judicially and having an open exchange of research ideas and outcomes are essential to overcome the systemic obstacles of the current research scenario.

- Expectations of researchers from academic publishers Discussants expressed following expectations:
  a. More involvement of publishers in development of manuscripts
  b. Develop platforms for young researchers to interact and share work with senior fellows so as to exchange scientific dialogue and get feedback
  c. Organise training sessions and certificate courses for young researchers to guide them on publication ethics and manuscript preparation etc.

Publications Released:

Valedictory Session: Concluding & Way Forward

Glimpses from the session

Session date and time:
27th September 2019, (04.00 to 05.00 pm)
Name of organizer:
CECR, NIDM
Name of Rapporteur:
- Dr. Sweta Baidya, Research Associate, CAP-RES, NIDM
Session Coordinator:
- Dr. Anil K Gupta, Head, ECDRM, NIDM
Session Speaker:
- Major General Manoj Kumar Bindal, Executive Director, NIDM - Dr. P P Shrivastav, Former Member - NE Council & Member Advisory Committee NDMA - Ms. Payden, Deputy Representative to India, WHO - Prof. Manipadma Dutta, Vice Chancellor, TERI School of Advance Studies (University) Delhi
Vote of Thanks:
- Dr. Sweta Baidya Das, Research Associate, CAP-RES, NIDM

PROF. ANIL K GUPTA, convener of the symposium invited the dignitaries of this session Major General Manoj Kumar Bindal, Dr. P P Shrivastav, Ms. Payden and Prof. Manipadma Dutta on the stage. He presented a brief summary of two days International Symposium on Disaster Resilience and Green Growth for Sustainable Development. While giving an account of the program, he told that more than 110 organizations from 19 states participated in the symposium. More than 180 delegates registered and participated in the various session of the program. Also experts from abroad joined this programme. He explained about the themes of the CAP-RES project which were discussed with luminaries during various sessions which provided holistic understanding of issues and ideas. This two day deliberation is not only a mere symposium but will provide a line of actions to go long way in developing the strategies and undertaking the compendium of case studies and towards a roadmap of integrating green growth in disaster risk management in order to achieve sustainable development goals which is the broader perspective. The important outcomes of this symposium would be published in a book series by Springer Nature that was launched during the inaugural session. After explaining the success of the symposium he requested the Executive Director, NIDM to put forth his remarks.

MAJOR GENERAL MANOJ KUMAR BINDAL, Executive Director, NIDM, told that the symposium was a multi sectorial discussion and during the symposium numbers of sub sectorial themes have been identified and each theme will have separate panel to further develop on. He proposed large workshops will be conducted for each theme and for that organizations will be identified who are dealing with that theme. NIDM will be inviting them for a brainstorming session and consultation workshop to come out with a document which is worthy of publishing in Springer. He also proposed to organize a workshop especially for the PhD students to bring out the important part of their thesis work and to include them in the team. He welcomed all organizations to join NIDM for any further research, studies, workshop or collaboration. He told that collaboration is the only way to do capacity building. He thanked all the speakers and participants, dignitaries and partners for participating in the two day workshop.

• KEY POINTS •

- Proposed large workshops will be conducted for each theme of the symposium with People dealing with those themes.
- NIDM will be inviting them for a brainstorming session and consultation workshop.
- Welcomed experts for further research and Collaboration.

DR. P P SRIVASTAV, Former Member - NE Council & Member Advisory Committee NDMA,explained that Nature is creating such situations that our disaster vulnerability is increasing in all directions. He thanked the scientists as they have given fantastic scientific skill to forecast climatic events with special emphasis to the phenomenal work done by the Indian Meteorological Society. There is enough scientific knowledge now and with the help of that effective work has been done to save people from difficult disaster situations and yet there is a need to do more things for disaster management. He further added that disaster management ideas should not be mere Government guidelines but people themselves haves to take ownership of these problems and approach the community. Each citizen must be aware of the vulnerabilities towards all the disasters and effects of environmental changes. He told that people must opt for the traditional knowledge which is used by Indian rural practioners and communities in the hinterland who are difficult to contact and convince but their wisdom is still there with them. If modern scientific knowledge combines with the traditional wisdom, then it will definitely be accepted. He explained the importance of Panchtatwa or five basic elements. He further explained that any scientific knowledge will gain success in Indian community only if the traditional wisdom is blended with it. Knowledge about the regional vulnerabilities has to be developed and knowledge about how to counteract those should be given equal preference. Mock drills are important to achieve them. Lately schools and communities have started have to be organized such initiatives for different disasters. He further said that disaster management has to be demand driven and not supply driven. Moreover, he said that NIDM is a storehouse of knowledge and

skills regarding disaster management and they are sharing that knowledge. But there is a need to create and increase this demand. The knowledge of disaster mitigation has to be given from primary school to university level. Most meritorious act among all other acts is saving a life and it needs to be taught through disaster management through stories to reach the heart of the people and only this can bring us success. Lastly, he said that consultations should be done with modern architects to make disaster proof buildings. To end his speech, he congratulated NIDM for organizing such wonderful event.

• KEY POINTS •
• Thanked Scientists for giving skill of weather forecasting.
• We Need to merge the Scientific Knowledge with Traditional wisdom.
• Capacity Building is important to achieve sustainability.

MS. PAYDEN, WHO Deputy representative to India, congratulated NIDM and Dr. Anil Gupta for organizing such a brilliant and important workshop. She told that WHO is proud to be one of the partners supporting NIDM for organizing this workshop. WHO in collaboration with NIDM is working on human health to prepare a tool kit for climate resilient health care facilities. WHO at global level is supporting its 192 member states in developing capacity, research especially on the impact of climate change, awareness and also developing pool of experts in addressing the climate change at country level. In terms of disaster resilience and preparedness, while developing the action plans there is a need to consider all the risks related natural, manmade and climate disaster so that it will be more integrated and cost efficient and its efficiency as a whole in implementation will improve. It is always preferred to have a national action plan which will provide a strategic direction and vision for the country to develop climate resilience and preparedness. But it is equally important to translate it into action and tap into the local wisdom and developed a practical action plan. This will also increase the demand from communities. She further added that WHO is supporting for health vulnerability. India being a big country needs to have regional cooperation among the states as hazards like air pollution knows no boundaries. This regional cooperation will give an idea of the best practices and sharing the platform will also help in addressing different issues of environment and health. She further mentioned that it is high time to build the capacity to cope with the future disasters by reducing the greenhouse gas. Recently the Indian Prime Minister Mr. Narendra Modi shared the need to do rigorous work in climate change and these words of the prime minister should be taken as motivation for reducing greenhouse gas emission and go for Green Economy as it is the citizens who are the political will in India. People must use renewable energy leaving the dirty energy behind. Things should not be left on govt. but people can participate in this and save resources like light, water etc. in their daily lives. People must ensure their responsibilities towards reducing the greenhouse gas as ultimately it is them who have responsibility in reducing the carbon foot print which will help them in saving the Earth in long turn.

• KEY POINTS •

- WHO in collaboration with NIDM is preparing a tool kit for climate resilient health care facilities.
- All types of risks should be incorporated in action plans.
- Need to Translate the National Action Plan in regional languages.

PROF. MANIPADMA DUTTA, Vice Chancellor, TERI School of Advance Studies (University), said that the greatest problem in the Globe today is the trust deficit. People are digging their own graves by increasing the number of dams. Dams should be dumped but people worship dams. Plastic removal is the biggest topic discussed these days but it might be costly for general people. He further added that systems need to be process driven in order to bring the sustainable development. The wealth of the world is not well distributed and for sustainable development there is a need to generate ample amount of fund. Faith should be directed towards the right cause. Good load of thought has to be given to proper wealth distribution to save the Earth from disaster; the motto should be to carry the heritage and not to delink from past. Caring and living for others only will lead the path for a disaster free future. At the end, he thanked everyone for their patience and presence.

• KEY POINTS •

- The greatest problem in the Globe today is the trust deficit.
- Dams should be dumped as it increases the flood risk.
- For sustainable development, we need to generate ample amount of fund.

• KEY RECOMMENDATIONS OF THE SYMPOSIUM •

- Need to perform risk assessment and prepare for the worst-case scenarios. Disaster resilience should be inculcated in an infrastructure project from the planning phase itself.
- To find ways to integrate old and new constructions from a safety perspective along and address multi-hazard ecosystem challenges.
- We cannot solely rely on technology to guide us; Human intelligence is needed to anticipate problems and adapt projects according to individual needs of the projects.
- There is a need for district level contingency plans to help farmers.
- We need Green, low emission technology and raise the productivity of factors of production while accounting for fixed land area.

- We must study the effects of various species on the ecosystem during recovery from disasters to make quicker recovery during disasters.
- There is a need for sector-specific, location-specific green growth strategies in each stage of the disaster management cycle.
- In Indian context, early warning systems, resilient infrastructure and industrial hubs, and smart/ green urban spaces should be the key focus areas for green development.
- Green growth requires innovative financial and policy instruments integrated with the resource-efficiency and circular economy principles.
- Green growth strategies can become critical tools in disaster mitigation and adaptation ensuring low-carbon development.
- Potential policy vehicles that can be used for mainstreaming green growth-based Disaster Risk Reduction in India include State Action Plan for Climate Change, City and Industry development plans, land use planning, disaster management plans and other national and state development plans.
- Intense capacity building and stakeholder consultations in the field of green growth and disaster management can help in developing DRR strategies which are easily implementable, socially inclusive and cost-effective.
- Landscape risk assessment should be done to develop local adaptation strategies.
- Wetlands are an important buffer against such water mediated disasters; thus extremely important to utilize solutions of NbS to reduce disaster risks.
- Need to mobilize and implement integrated and community based approaches.
- Emphasis has to be given to develop technologies for anticipation or accurate prediction of disasters as prevention is better than cure.
- Social frameworks and access to infrastructure and resources affect communities and their vulnerability.
- A more thoughtful approach has to be applied while making laws and rules.
- Legal frameworks are robust, but the implementation is lacking.
- A substantial amount of work has to be done in the policy front.
- Despite good intentions and proper framing, the guidelines often lack legal teeth.
- Proper guidelines for eco-restoration are needed.
- Green technology means using renewable resources; green tech is eco-friendly, promotes sustainable use of resources and conserves resources too.
- The advantages of green, clean technologies include decrease of cost of clean up after disasters, disaster risk, vulnerability and impact reduction, reduction in greenhouse gas emissions, changes in waste generation pattern for better economic growth.
- To look at how peri-urban communities innovate technologically and institutionally to adapt to the combined effects of urbanization and climate change and use that as a basis for capacity building programmes or DRR strategies.

- Challenge the assumption that there is a governance vacuum (non-statutory governance is more pronounced).
- To build social capital by promoting civic engagement.
- Strengthening city strategies, DRR plans of the cities giving due considerations to peri-urban areas and their buffer zone functions need to be done.
- To promote peri-urban farming, in particular vegetables and commercial agriculture that incentivizes agricultural use of the land.
- To protect and stimulate urban agriculture and forestry, wetland management.
- Using city runoff, waste water for irrigation purposes in these areas and for managing forestry are important.
- Addressing the urgent need of data and deeper insights on peri-urban economy, services levels, people, infrastructure.
- Economic policies for peri-urban areas that cater to both rural and urban linkages and concentrate on redistribution of wealth, ensuring environmental-spatial justice is needed.
- Urban centers are engines for economic growth, focus on peri-urban can significantly growth rates.
- Developing engagement model between municipal and peri-urban should be strengthening through integrated planning, and service delivery.
- State and local governments need to ensure adequate public financing for resilience planning for both urban and peri-urban.
- Division between urban and peri-urban should end now, Uttarakhand, for example, is taking steps to merge peri-urban areas with urban local bodies.
- There is need to develop futuristic scenarios to better understand the repercussion of the natural disasters.
- There is a need to encourage the usage of Model Simulations/Model based projections in climate change adaptation.
- There is a need to develop contingency plans against the increasing daily rainfall, rain frequency as well as the quantity of the rain.
- Different climate scenarios to be considered in developing different contingency plans.
- Integration of climate adaptation, disaster resilience and SDGs into one framework at state and sub-state level is critical for sustainable inclusive development.
- New business models should be developed based on the agriculture.
- The mobilisation of finances through banks and NABARD institutes needs to be better understood.
- Effective use of technology, communication and local actions by addressing knowledge and capacity gaps through systematically designed programmes to be encouraged.
- Understanding of the causes of landslides before attempting to stabilize it by building a retaining wall.

- WEF nexus needs to be integrated in developmental plans, policy and decision making to promote synergies among different sectors.
- Reassessment of availability of water, which is the basis of management of surface water.
- Nature and communities dependent of forest and forest products should be kept away from external biotic interference.
- Validation of data with the ground level reality and the community perception.
- India needs to work on climate proofing health facilities, starting from Primary Health Centres to super specialised hospitals.
- Public must be educated about climate change and its impact. This will help them prepare for disasters and take precautions.
- States should build comprehensive action plan for health. Smallest governing unit should have their own plan as well. Health should be kept at centre for all planning exercises.
- Health workforce should be sensitized about climate change and how it will impact human health.
- Scientific and medical researchers should focus on health impacts of climate change, environmental degradation, and local environmental factors. There is need for India specific data and studies liking such issues to public health.
- Indian research and higher education landscape: current trends and future prospects
  - Discussants reflected that among scientific community there is a tussle between getting a job or a promotion v/s creating real-time research impact
  - They suggested that there should be more interaction among researchers and especially between students and young scientists to inculcate scientific temper and interest in research
  - Relevance of skill development and vocational training was highlighted
  - Bringing focus back to indigenous ways of learning and its integration into education system was also discussed
- Status of professional v/s basic sciences education
  - All the discussants agreed that lines between professional and academic courses are increasingly getting blurred
  - It was agreed by all the discussants that both 'basic sciences' and 'technology' are important and have their own unique place
  - Chair concluded that courses and curriculum in higher education should be designed based on the needs and demands of the society
- Role and involvement of private sector in Indian higher education research scenario
  - Discussants had consensus on the importance of private sector in catalysing implementation of education and research related goals
  - Chair expressed that both public and private sector have differentiated roles and they both must continue to work cohesively to bring out the best results

- Unique place of Indian research and researchers in the global scenario of research and innovation.

  There was consensus on the idea that India needs to contextualise the structure and processes of higher education with respect to the global changes and local demands

- Systemic obstacles in Indian research

  Discussants and chair agreed that issues of spending the research funds judicially and having an open exchange of research ideas and outcomes are essential to overcome the systemic obstacles of the current research scenario

- Expectations of researchers from academic publishers Discussants expressed following expectations:
  - More involvement of publishers in development of manuscripts
  - Develop platforms for young researchers to interact and share work with senior fellows so as to exchange scientific dialogue and get feedback
- Organise training sessions and certificate courses for young researchers to guide them on publication ethics and manuscript preparation etc.

Annexure

Annexe I: Programme Agenda

DAY 1: 26 September, 2019	
08.00-09.15	Registration of Delegates
09.30-10.30	INAUGURAL CEREMONY
	• **Introduction: Dr. Anil K Gupta, Head ECDRM**
	• **Welcome: Major General Manoj Kumar Bindal, Executive Director, NIDM**
	• **Address by: Dr. Akhilesh Gupta, Advisor & Head-SPLICE & Climate Change Programm, DST-GoI & Former UGC Secretary**
	---------- Release of Publications ----------
	• **Address by: Mr. Mohammad-El-Khawad, Programme Director NRM, GIZ Germany, India Office**
	• **Address by: Dr. Hendrik Jan Bekedam, WHO Representative to India**
	• **Address by: Prof. V K Sharma, Vice Chairman, Sikkim SDMA**
	• **Address by Guest of Honour: Prof. D P Singh, Chairman, University Grants Commission (UGC)**
	• Vote of Thanks & Group Photo
10.30-11.00	High Tea
11.00-12.00	HIGH LEVEL PLENARYW SESSION
	Chairpersons:
	Prof. Sudhir Jain, Director, Indian Institute of Technology, Gandhinagar
	Prof. Mahesh Verma, Vice Chancellor, Guru Gobind Singh Indraprastha University, Delhi
	Coordinator: Dr. Akhilesh Gupta, Advisor & Head – SPLICE & Climate Change Programme, DST - Govt. of India & Former Secretary UGC
	Distinguished Speakers
	• Dr. R K Bhandari, Former Director - CSIR-CBRI, Member of Advisory Committee, NDMA • Dr. Anil Kumar Singh, Secretary, NAAS, New Delhi (Former VC, VRS Agriculture University Gwalior & DDG-NRM, ICAR) • Prof. S P Singh (FNA), Former Vice Chancellor, Kumaun University, Nainital & ICFRE Chair Professor
12.00-13.30	Cluster Session 1: Green Growth and DRR

	Organizer: Global Green Growth Institute (GGGI), Seoul, South Korea.
	Chairpersons:
	Dr. Alok Sikka, Country Representative, International water Management Institute (IWMI), CGIAR
	Mr. Emani Kumar,
	Coordinator: Mr. Shantanu P. Gotmore, Country Director-India, Global Green Growth Institute (GGGI), Seoul, South Korea.

	Presentations Key Discussants	Key Discussants
	• Mr. Nishant Bhardwaj, Dy. Director and Head of Energy and Policy Division GGGI, Seoul, SouthKorea	• Prof. A L Ramanathan, Dean, School of Environmental Sciences, JNU, Delhi
	• Mr. Mehul Jain, Climate Change Specialist, The World Bank	• Dr. Neeraj Sinha, Advisor NITI Aayog, Govt. of India, New Delhi
	• Mr. N. Raghu Babu, Sr. Advisor, GIZ Germany, India Office	• Prof. P C Tiwari, Head, Dept. of Geography, Kumaun University Nainital
	• Dr. Neera Shreshtha, Sr. Specialist - Water & Adaptation, ICIMOD, Kathmandu, Nepal	• Prof. Santosh Kumar, Head Inclusive DRR Division, NIDM
	• Dr. Sunil K Choudhary, Executive Engineer, Govt. of Bihar, Patna	

13.30-14.30	**Lunch**
14.30-16.00	**Cluster Session 2a: Ecosystems for Disaster Risk Reduction**
	Organizers: IUCN-CEM South Asia, IUCN India, UNEP India, NIDM New Delhi
	Chairpersons:
	Prof. S P Singh FNA, Former Vice Chancellor, Kumaun University, Nainital
	Mr. Vivek Saxena, Country Representative, International Union for Conservation of Nature (IUCN)-India
	Coordinator: Mr. Vivek Saxena, Country Representative, International Union for Conservation of Nature (IUCN)-India

	Presentations	Key Discussants
	• Mr. Dushyant Mohil, Country Programme Manager, Wetland International	• Mr. R B Lal, Additional Director, MoEF & CC
	• Dr. P K Joshi, Professor, SES, JNU, Delhi & Chairperson SCDR	• Prof. S. Mahapatra, Dept. of Geography, Institute of Science, Delhi

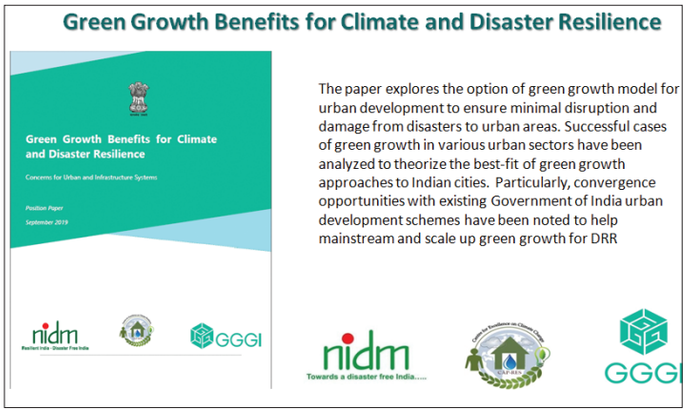
	• Mr. Sanjay Upadhyay, Lawyer, Supreme Court, & Expert Enviro Legal Defense, New Delhi	
	• Dr. U N Rai, Retd. Senior Principal Scientist, CSIR-NBRI, Lucknow	
16.00-16.15	**Tea**	
16.15-17.30	**Cluster Session 2b: Peri Urban Ecosystems for Urban Resilience**	
	Organizer: ICLEI/CDKN & Gorakhpur Environmental Action Group (GEAG)	
	Chairpersons:	
	Prof. V K Sharma, Vice Chairman, Sikkim State Disaster Management Authority, Former Senior Professor IIPA	
	Coordinator: Mr. Emani Kumar, Deputy Secretary General ICLEI & Executive Director, ICLEI South Asia	
	Presentations	**Key Discussants**
	• Dr. Shiraz Wajih, President, Gorakhpur Environmental Action Group (GEAG)	• Prof Rana Pratap Singh, Chairman, State EIA Committee, Govt. of UP
	• Mr. Manu Prakash, Chief Executive Officer, TARU Leading Edge	• Mr. Sajan John, Head Marine Conservation Project, Wildlife Trust of India
	• Prof. Vishal Narain, Management Development Institute (MDI)	• Ms. Nivedita Mani, Programme Manager, Delhi Office - GEAG
	• Dr. Divya Sharma, Lead – Urban Resilience, Oxford Policy Management	
	• Dr. Anandita Sengupta, Faculty, Adamas University, West Bengal	
DAY 2: 27 September, 2019		
09.30-11.15	**Cluster Session 3: Climate Risk, Adaptation & Sustainability Mainstreaming**	
	Organizers: German Technical Cooperation (GIZ) Germany - India Office	
	Chairpersons:	
	Dr. Sharad Jain, Director, National Institute of Hydrology, Roorkee	
	Prof. R B Singh, Vice President, International Geographical Union	
	Dr. Alka Bhargava, Additional Secretary, Dept. of Agriculture Corporation and Farmers Welfare	
	Dr. K Alagusundaram, Deputy General (NRM), ICAR	
	Coordinator: Dr. G. Ravindra Chary, Director, ICAR-CRIDA Hyderabad	

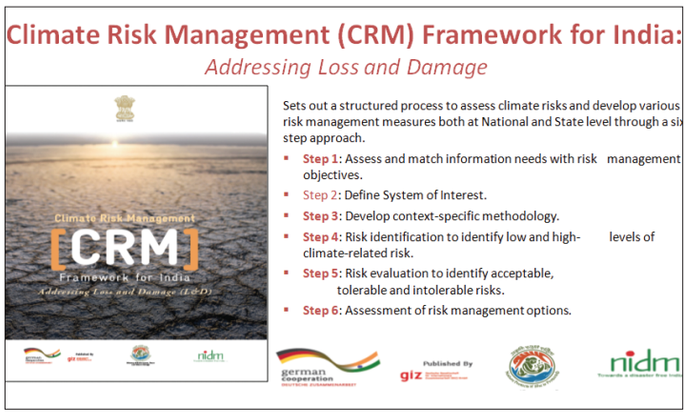
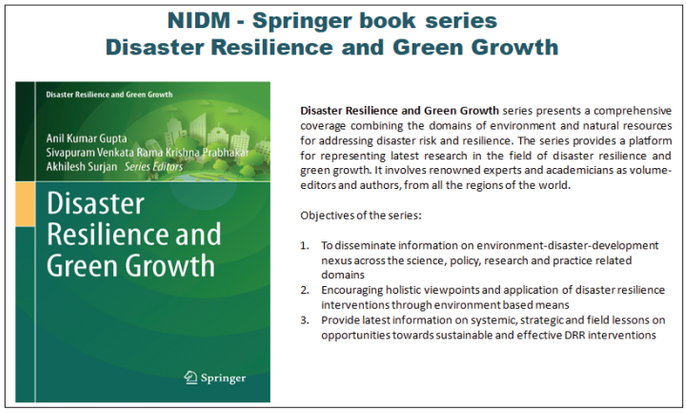
	Presentations	Key Discussants
	• Dr. Chandra Sekhar Bahinipati, Faculty, IIT Thirupathi	• Mr. Deepak Chamola, Technical Advisor, GIZ
	• Dr. Kirtiman Awasthi, Senior Policy Advisor, GIZ India	• Prof. V K Sehgal, Principal Scientist and Professor, Dept. of Agricultural Physics, IARI, ICAR, New Delhi
	• Dr. Vikram Gupta, Principal Scientist, Wadia Institute of Himalayan Geology, Dehradun	• Dr. Unnikrishnan D Nair, Programme Lead, GGGI
	• Dr. G. Ravindra Chary, Director, ICAR-CRIDA Hyderabad	• Dr. SP Thakur, DG Odisha SDMA
	• Ms. Swati Singh, TERI SAS	• Dr. K J Ramesh, Former DG IMD
		• Dr. G. Rajeshwar Rao, Director ICFRE
11.15-11.30	**Tea**	
11.30-13.15	**Cluster Session 4: Resilient Health**	
	Organizers: World Health Organization (WHO), UNICEF India & National Centre for Disease Control (NCDC)	
	Chairpersons:	
	Dr. Sujeet Singh, Director, National Centre for Disease Control (NCDC), Ministry of Health & Family Welfare **Mr. Sarbjit Singh Sahota**, Emergency Specialist, DDR Section, UNICEF, India	
	Coordinator: National Professional Officer (Environment & Public Health), WHO	
	Presentations	**Key Discussants**
	• Prof. Jugal Kishore, Director, Professor, V M Medical College and Safdarjung Hospital, New Delhi	• Dr. K J Anandha Kumar, Principal Scientist, Ministry of Jalshakti (Water Resources)
	• Dr. Shikha Vardhan, Assistant Director, NDCD, Ministry of Health & Family Welfare	• Dr. Indrani Chandrashekharan, Former Advisor, Planning Commission & MoEF, GoI
	• Ms. Somya Bhatt, Technical Advisor, GIZ Germany (India Office)	• Prof. Amita Singh, Centre for Legal Studies & Former Chairperson, SCDR, JNU
	• Prof. N C Gupta, Dean, School of Environment Management, GGS Indraprastha University, Delhi	

13.15-14.15	**Lunch**	
14.15-16.45	**Cluster Session 5: Higher Education & Research Promotion Strategies**	
	Organizer: CECR –NIDM, Springer Nature (Global Publishing)	
	Chairpersons:	
	Prof. Manipadma Dutta, Vice Chancellor, TERI School of Advance Studies (University) Delhi	
	Coordinator: Dr. N K Aggarwal, Editorial Director Medical & Environ. Group, Springer Nature Publishing	
	Presentations	**Key Discussants**
	• Dr. Suneel Pandey, Director The Energy & Resources Institute	• Ms. Aakanskha Tyagi, Editor, Springer Nature Publishing
	• Dr. Ray Taylor, ALLFED	• Prof. Mahua Mukherjee, Head, CDM, IIT Roorkee
	* Launch of Global Book Series - DRGG	
16.00-17.00	**Valedictory Session - Concluding & Way forward**	
	• Summary of the Session • **Dr. Anil K Gupta, Programme Director, CAP-RES NIDM** • **Major General Manoj Kumar Bindal, Executive Director, NIDM** • **Dr. P P Shrivastav, Former Member - NE Council & Member Advisory Committee NDMA** • **Ms. Payden, Deputy Representative to India, WHO** • **Prof. Manipadma Dutta, Vice Chancellor, TERI School of Advance Studies (University) Delhi** • Vote of Thanks: Sweta Baidya Das, CAP-RES	
17.00	**High Tea & Group Photo**	

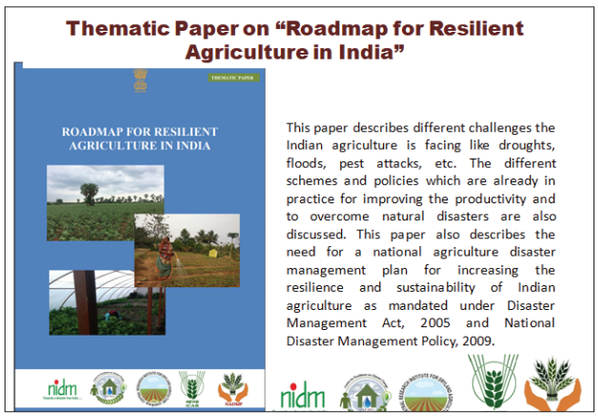
Annex II: List of Released Publications

Release of publication in Day 1

Reducing Drought Risk to improve Land-Water Resilience: mainstreaming EcoDRR Pathways and Tools	
Green Growth Benefits for Climate and Disaster Resilience	
Developing Disaster-Risk Resilience in Cities: Training module for Urban local bodies, including contexts of Climate Risk and Children's Resilience	

Climate Risk Management (CRM) Framework for India: Addressing Loss and Damages	
NIDM-Springer Book Series: Disaster Resilience and Green Growth	

Release of publication in Day 2

Thematic Paper on Roadmap for Resilient Agriculture in India	

National Programme on Climate Change and Health Sector Resilience	
Sectoral Consultative Workshop on National Agriculture Disaster Management Plan (NADMP)	

Annex-III Complete List of Participants

S.NO.	NAME	DESIGNATION & ORGANISATION
		INAUGURAL SESSION
1.	D. P Singh	Chairman, UGC
2.	Hendrik Jan Bekedam	WHO Representative to India
3.	Manoj Kumar Bindal	Executive Director, NIDM
4.	Mohammad-El-Khawad	Programme Director NRM, GIZ Germany
		CHAIRPERSON & COORDINATOR
5.	Akhilesh Gupta	Advisor & Head, DST, GOI
6.	Alok Sikka	Country Representative WMI, CGIAR
7.	Emani Kumar	Deputy Secretary General ICLEI & Executive Director, ICLEI, South Asia
8.	K. Alagusundaram	Deputy Director General (NRM), Indian Council of Agriculture Research
9.	K. J. Ramesh	Former Director General, IMD
10.	Mahesh Verma	Vice Chancellor, GGSIP University, Delhi
11.	Manjeet S Saluja	National Professional Officer (Environment & Public Health), WHO
12.	R B Singh	Vice President, International Geographical Union
13.	S. P Singh	FNA, Former Vice Chancellor, Kumaun university, Nainital
14.	Shantanu P Gotmare	Country Director, GGGI, India, Seoul, South Korea
15.	Sharad Jain	Director, National Institute of Hydrology, Roorkee
16.	Sujeet Singh	Director, National Centre for Disease Control (NCDC), Ministry of Health & Family Welfare
17.	V K Sharma	Vice Chairman, Sikkim State Disaster Management Authority, Former Senior Professor IIPA
18.	Vivek Saxena	Country Representative, International Union for Conservation of Nature (IUCN)-India

SPEAKERS/PRESENTERS		
19.	Anandita Sengupta	Faculty, Adamas University, West Bengal
20.	Anil Kumar Singh	Secretary, NAAS, New Delhi (Former VC, VRS Agriculture University Gwalior & DDG-NRM, ICAR)
21.	Chandra Sekhar Bahinipati	Faculty, IIT Thirupathi
22.	Divya Sharma	Senior Consultant and Portfolio Leader, Urban Planning and Policy, Oxford Policy Management
23.	Johnny Ruangmei	OSD, Nagaland SDMA, Kohima
24.	Jugal Kishore	Director, Professor, V M Medical College and Safdarjung Hospital, New Delhi
25.	Kirtiman Awasthi	Senior Policy Advisor, GIZ India
26.	M S Nathawat	Director, Institute of Science, Indira Gandhi National Open University
27.	Manu Prakash	Chief Executive Officer, TARU Leading Edge
28.	Mehul Jain	Climate change specialist, The World Bank
29.	N C Gupta	Dean, School of Environment Management, GGS Indraprastha University, Delhi
30.	N. Raghu Babu	Sr. Advisor, GIZ Germany, India office
31.	Neera Shrestha Pradhan	Sr. Specialist, Water & Adaptation, ICIMOD, Kathmandu, Nepal
32.	Nishant Bhardwaj	Sr. Specialist, Water & Adaptation ICIMOD, Kathmandu, Nepal
33.	P K Joshi	Professor, SES, JNU, Delhi & Chairperson SCDR
34.	R K Bhandari	Former Director - CSIR-CBRI, Member of Advisory Committee, NDMA
35.	Ritesh Kumar	Director, Wetland International
36.	S Bhaskar	Additional Director General, NRM, ICAR, New Delhi
37.	S P Singh	(FNA) Former Vice Chancellor, Kumaun University, Nainital & ICFRE Chair Professor
38.	Sanjay Upadhyay	Lawyer, Supreme Court, & Expert Enviro Legal Defense, New Delhi
39.	Shiraz Wajih	President, Gorakhpur Environmental Action Group (GEAG)
40.	Somya Bhatt	Technical Advisor, GIZ Germany (India Office)
41.	Suneel Pandey	Director The Energy & Resources Institute

42.	Sunil K Choudhary	Executive Engineer, Govt. of Bihar, Patna
43.	Swati Singh	TERI SAS
44.	U N Rai	Retd. Senior Principal Scientist, CSIR-NBRI, Lucknow
45.	Vikram Gupta	Principal Scientist, Wadia Institute of Himalayan Geology, Dehradun
46.	Vishal Narain	Professor, Public Policy and Governance, Management Development Institute (MDI)
47.	Ray Taylor	Co-founder, ALLFED
48.	Gurmeet Singh	Former Adv. PCS, MOES
49.	Deepak Chamola	GIZ Delhi
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