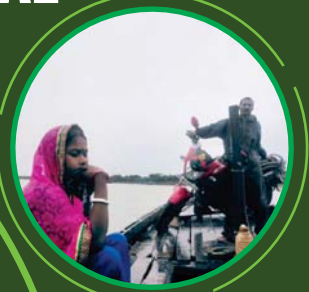




CLIMATE PROOFING DISASTER RELIEF AND RECOVERY TRAINING MANUAL



Resilient India - Disaster free India

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



CLIMATE PROOFING DISASTER RELIEF AND RECOVERY

TRAINING MANUAL

A training manual developed under Project CAP-RES supported by DST (Govt)

National Institute of Disaster Management

Ministry of Home Affairs, Government of India

Plot No. 15, Pocket 3, Block-B, Sector-29, Rohini, Delhi-110042

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Climate Proofing Disaster Relief and Recovery

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Authors :

Prof. Anil K. Gupta

Dr. Eilia Jafar

Ms. Shweta Bhardwaj

Ms. Nupur Tyagi

Mr. Vaibhav Mahajan

Ms. Riya Sethia

Dr. Uzma Parveen

Maj. Gen. Manoj Kumar Bindal, VSM

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Dr. Akhilesh Gupta
Senior Advisor & Head, PCPM

Department of Science and Technology (DST)
Government of India
Technology Bhavan, New Mehrauli Road,
New Delhi-110016



MESSAGE

The recent IPCC report has highlighted that the impacts of climate change is going to get more and more critical. Climate change has already led to enhanced frequency, intensity and spatial range of hydro-climatic disasters. Increasing disaster events adversely affect the people and their livelihood and expose the vulnerable sections of population as well as the environment to future disasters.

The natural disasters are often intensified by anthropogenic activities. These disasters degrade ecosystems, affecting people's livelihood and especially those who derive their livelihood from natural sources. At the same time, some sections of population such as women, children, elderly, and differently abled people are at higher risk during disasters. These challenges need special attention and preparedness well in advance.

In India, still emphasis is given to post-recovery measures. These post-disaster measures often neglect environment as more importance is given to shifting people to safer places and saving lives rather than safeguarding the environment. However, there is a need to emphasize more on preparing plan and policies so that the environment is least affected due to the post-disaster recovery and relief processes. This scenario demands for actions like climate proofing disaster and recovery and the training manual 'Climate Proofing Disaster, Relief and Recovery' highlights this crucial feature of post-disaster recovery.

I congratulate Prof. Anil Gupta and his team at NIDM for significant endeavors and promoting training and research through CAP-RES project, and helping out DST in this regard. The manual nicely covers the crucial aspects of post-disaster recoveries and relief and I am sure that this manual would be an important resource and asset for trainers, training institutes and concerned stakeholders.

(Akhilesh Gupta)



FOREWORD

Climate change has not only intensified the disasters but also the impacts of disaster. The rare and uncommon disasters have become very common. Rise in surface temperature has resulted in more droughts. At the same time, rising sea level has exposed coastal locations to various disasters. For instance, the high intensity cyclones which were rather rare are occurring almost every year in India. Similarly, the frequency and severity of forest fires, floods, droughts, heat-wave and cold wave has increased. A large section of population is getting affected by frequently occurring and re-occurring disasters.

The IPCC reports have indicated further intensification of extreme events along with enhanced frequency and a real extent. Hence, climate change adaptation and disaster risk reduction is crucial to achieve a sustainable future. The government strategy has also shifted to prevention and mitigation measures. Now, more care is taken to pre-disaster measures in order to reduce the ill effects of disasters. Increasing awareness among masses have become the main agenda.

During disasters, the focus remains on providing immediate relief to people and their mobilization to safer locations. In the meantime, environment and ecosystem services which are also affected during disasters, remain ignored undermining disaster recovery process in the long run. This proves to be catastrophic for future disasters.

This training manual on Climate Proofing Disaster Relief and Recovery, I firmly believe, is going to assist in preparedness measures following the unique approaches deliberated in carefully drafted five modules of the manual. The manual will assist in developing strategies for environmental concerns and suggest eco-friendly approaches in disaster management.

(Taj Hassan)

आपदा प्रबंधन महाविचार: पूरा भारत भागीदार

Dr. Karen Sudmeier-Rieux

Senior Advisor, Disaster Risk Reduction
Resilience to Disasters and Conflicts Global
Support Branch, Ecosystem Division,
United Nations Environment Programme

UNEP

11-14 Chemin des Anémones
Châtaine, Geneva, Switzerland



FOREWORD

Under the impact of climate change, the frequency and magnitude of disaster events have increased. According to Intergovernmental Panel on Climate Change (IPCC) predictions, the frequency and severity of such events will continue to increase. Developing countries such as India are more affected, not only because of high population density, but also because a large number of people live along exposed coastlines, rivers and depend on primary sources for their livelihoods.

Climate change and disasters also cause food and water scarcity and trigger displacement leading to worsening of living conditions. Agriculture and livestock suffer due to extreme weather events, threatening people's livelihoods.

The scale of climate change and disaster impact depends on the choices we make related to land use, food production, type of construction, where we construct and how we utilize our natural resources. These choices, hence, play a crucial role in making us more resilient or more prone to climatic changes and disasters.

The concept of Disaster Risk Reduction or DRR is based on keystone actions, namely prevention, preparedness and mitigation. The objective is to reduce exposure to hazards, lower vulnerability, use natural resources wisely and improve preparedness for adverse events. DRR is also a crucial part of sustainable development involving all parts of society, government, professional and private sectors.

The training manual on Climate Proofing Disaster Relief and Recovery developed by National Institute of Disaster Management (NIDM) under the project Climate Adaptive Planning for Resilience and Sustainable Development in Multi-Hazard Environment (CAP-RES), funded by Department of Science and Technology-Government of India (DST-Gol), jointly with Sphere India, aims to develop ecosystem-based approaches to manage disaster relief and recovery measures in such a way that the environment is not adversely affected. This manual highlights the necessity of incorporating green approaches for improving relief and recovery measures in post-disaster settings.



(Karen Sudmeier-Rieux)



Sphere India

National Coalition of Humanitarian Agencies in India

Vikrant Mahajan
CEO, Sphere India

Sphere India Secretariat
B-94, Sector 44, Noida
Uttar Pradesh-201303



FOREWORD

There is a growing recognition and awareness about the importance of addressing the environmental impacts of emergency response, which can be done by giving due consideration to Environmental protection and sustainability. When a disaster strikes, the immediate focus is on saving lives and environmental issues often take a backseat in response plans. Disaster response and relief can have various impacts on the surroundings and ecosystems. Mainstreaming climate change adaptation into the field of disaster relief and recovery is an emerging and urgent issue that needs to be accounted at various levels.

Disaster relief and response have a large scale impact on environment, which can also hinder recovery of the affected population. Climate change and environmental degradation can further result in escalating disasters and vulnerability. This training module offers guidance for climate proofing disaster management through various case studies and strategies highlighting opportunities for sustainability in response and recovery process along with various greening tools and techniques aimed towards achieving the same. The module also highlights various case studies depicting the impact of disaster recovery and relief work on the environment.

This training manual was drafted after numerous consultative meetings between the NIDM team and Sphere India secretariat. Extensive research and discussions have taken place between authors of the sub modules and inputs have been collected and collated from various case studies, research papers, publications and NIDM reports, throughout the process of drafting the modules.

Provision of in depth knowledge of climate proofing, its various terminologies and inter-relation of it with disaster and sustainability is also one of the prime focuses of this training module. Through this module we aim to enhance the knowledge management, efficiency and capacities of students, emergency responders, field practitioners and other stakeholders to improve the humanitarian actions.

(Vikrant Mahajan)

Prof. Anil K Gupta

Project Director: CAP-RES (DST)
Professor and Head - Environment,
Climate and Disaster Risk
Management Division

National Institute of Disaster Management

Ministry of Home Affairs, Government of India
Plot No. 15, Pocket-3, Block-B, Sector 29, Rohini, Delhi - 110 042



PREFACE

It gives me immense pleasure to present this training manual on 'Climate Proofing Disaster Relief and Recovery' developed in collaboration with Sphere India that focuses on a very crucial aspect of post-disaster recovery and relief towards mainstreaming sustainability and climate change concerns. I strongly believe that this manual on Climate Proofing Disaster Relief and Recovery will assist capacity building endeavors of key stakeholders on disaster preparedness measures inculcating the concepts of green growth and eco-friendly measures for disaster management.

The concept of Green Growth is embedded in ensuring sustainable environment along with economic growth. Green growth aims at ensuring clean water and air to support food production and human health. It is considered a useful tool for expanding economic growth through sustainable utilization of natural resources. Green growth policies are an integral part of structural reforms needed to foster strong, more sustainable and inclusive growth. At the same time, to ensure the same, eco-friendly measures for disaster management is crucial.

The manual covers very significant modules on i) Climate Proofing Disaster Management, ii) Disaster and Environmental Sustainability, iii) Sustainable Disaster Relief, iv) Sustainable Disaster Recovery, v) Green Relief and Recovery.

The project, Climate Adaptive Planning for Resilience and Sustainable Development in Multi-hazard Environment (CAP-RES), which is an umbrella project under ECDRM division, includes Green Growth and disaster risk reduction (DRR) as one of the major focus areas along with climate proofing disaster relief and recovery processes. Subsequently, it also aims at Science-Practice-Policy interface and to promote value addition. The project aims to address the gap areas in capacity building to curb the challenges of climate change.



(Anil K Gupta)

ACKNOWLEDGEMENT

The training manual on Climate Proofing Disaster Relief and Recovery under Climate Change has been supported by the Department of Science and Technology (DST), Government of India, through Climate Adaptive Planning for Resilience and Sustainability in Multi-Hazard Environment (CAP-RES), in collaboration with Sphere India. A special note of thanks to Dr. Akhilesh Gupta, Senior Advisor and Head, PCPM, DST, Govt. of India for entrusting NIDM with the opportunity to take up and work on the CAP-RES project.

I sincerely acknowledge Major General Manoj Kumar Bindal, VSM, Former Executive Director, NIDM for his constant support and encouragement for undertaking the study and ensuring the smooth functioning.

I, on behalf of the entire team, thank Mr. Vikrant Mahajan (Sphere India) for his encouragement and support. The preparation of this training manual has been expedited with the help of Dr. Eilia Jafar, Mr. Vaibhav Mahajan, Ms. Riya Sethia and Nupur Tyagi from Sphere India and Ms. Shweta Bhardwaj (Research Fellow) from CAP-RES team, NIDM. I owe their sincere efforts and contributions to this training manual.

Thanks are also due to the CAP-RES team Dr. Sweta Baidya, Ms. Pritha Acharya (Research Associate) and Dr. Uzma Parveen (Research Associate).

In addition, my sincere thanks to Sh. Surendra Thakur, Consultant (HR & Admin.) and of Mr. Santosh Kumar Tiwari (Librarian, NIDM) and the publication cell of NIDM for facilitating the printing and publication of this manual especially, Ms. Karanpreet Kaur Sodhi and Ms. Sonali.



Prof. Anil K Gupta
Project Director
CAP-RES Project

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CONTEXT

India has experienced a surge of extreme weather events recently, affecting both urban and rural areas. Loss of life and property, increasing food and water insecurities, disruption to ecosystem and biodiversity, social and psychological issues and economic losses (immediate and following) are the series of implications following any climate change-induced disaster, varying based on risk and vulnerability.

During disasters, the focus remains on providing immediate relief to people and their mobilization to safer locations. In the meantime, environment and ecosystem services which are also affected during disasters, remain ignored undermining disaster recovery process in the long run. This proves to be catastrophic for future disasters. Climate change and environmental degradation can further result in escalating disasters and vulnerability.

The manual specifically focuses on how can the disaster relief and recovery stages become climate resilient by integration of green approaches for improving environmental outcomes of disaster management strategies and intervention particularly in post-disaster settings. Multiple regulatory strategies and tools/techniques can be applied in enabling sustainable disaster relief and recovery operations.

Built in this context is the emerging and urgent need to mainstream climate proofing into the relief and recovery stages of disaster management cycle. Hence, this training manual is developed National Institute of Disaster Management (NIDM) under the project Climate Adaptive Planning for Resilience and Sustainable Development in Multi-Hazard Environment (CAP-RES), jointly with Sphere India. This training module offers guidance for climate proofing disaster management through various case studies and strategies highlighting opportunities for sustainability in response and recovery process along with various greening tools and techniques aimed towards achieving the same. The module also highlights various case studies depicting the impact of disaster recovery and relief work on the environment.

ABOUT THE TRAINING MANUAL

Training Design and Brief

The training manual on Climate Proofing Disaster Relief and Recovery developed by National Institute of Disaster Management (NIDM) under the project Climate Adaptive Planning for Resilience and Sustainable Development in Multi-Hazard Environment (CAP-RES), funded by Department of Science and Technology-Government of India (DST-Gol), jointly with Sphere India, aims to develop ecosystem-based approaches to manage disaster relief and recovery measures in such a way that the environment is not adversely affected. This manual highlights the necessity of incorporating green approaches for improving relief and recovery measures in post-disaster settings.

This training manual would be an important resource and asset for trainers, training institutes and concerned stakeholders to assist in preparedness measures following the unique approaches deliberated in carefully drafted five modules of the manual. The manual will assist in developing strategies for environmental concerns and suggest eco-friendly approaches in disaster management.

This training module was drafted after numerous consultative meetings between the NIDM team and Sphere India secretariat. Extensive research and discussions have taken place between authors of the sub modules and inputs have been collected and collated from various case studies, research papers, publications and NIDM reports, throughout the process of drafting the modules.

Provision of in-depth knowledge of climate proofing, its various terminologies and inter-relation of it with disaster and sustainability is also one of the prime focuses of this training module. Through this module we aim to enhance the knowledge management, efficiency and capacities of students, emergency responders, field practitioners and other stakeholders to improve the humanitarian actions.

Aim of the Training Manual

The aim of this training manual is to enhance the knowledge management, efficiency and capacities of students, emergency responders, field practitioners, government officials (district and local levels bodies) trainers, researchers, policy makers, and other stakeholders to improve the humanitarian actions in terms of crucial focus and implementation of climate proofing agenda in the stage of disaster recovery and reconstruction.

Training Objectives

At the end of the training the participants should be able to:

- To deliberate upon environment and disaster linkages and delineate strategic approaches for environmental concerns and role of climate proofing in disaster risk reduction
- To deliberate upon various international & national policy frameworks on Disaster Risk Reduction and analyze and identify gaps in various policy framework & entry-points for climate proofing disaster relief and recovery.

- To identify the impact of disaster relief activities and interventions have on the environment, including through its carbon footprint.
- To understand the challenges and key environmental issues across different areas of disaster relief and enumerate the needs and benefits of bringing sustainable solutions to disaster relief.
- To identify tools and strategically approached to address the cyclical linkages of disaster management and environmental management.
- To identify strategies to support climate Action and Environmental Sustainability in disaster relief and recovery.

Target Groups/Audience

The training manual has been developed keeping in mind the performance gaps and the knowledge needs of the following group of participants:

- Senior to middle level officials from the state and local level bodies from line departments and central ministries of government of India.
- Executives and professionals from other government agencies and boards as well as programmes and schemes in charges including public sector undertakings.
- Members and representatives of non-governmental and community organizations engaged in activities related to assessment, planning, implementation or monitoring of any aspect of disaster risk and management including disaster response, recovery, reconstruction and rehabilitation.
- Faculty members or professionals from training, education and research institutes and other master trainers related in the field of planning and development, environment, climate change and disaster management sector etc.
- Private Sector and industry officials involved in water supply, sanitation, environmental, health, waste management, power, industries, communication, risk management, etc.
- Local community workers and others including Non-Governmental Organisations (NGOs), Chief Security Officer (CSO), Resident Welfare Association (RWA), Panchayats, Volunteer Organization, Bilateral etc.
- First responders, target communities and emergency units deployed.

LEARNING UNITS

Structure of the Module

This training manual offers a training tool along with course guidelines enabling participants to develop an overview of course for sensitization aimed at highlighting environment and disaster linkages and need for integrating green approaches for improving environmental outcomes of disaster management strategies and intervention particularly in post-disaster settings. The manual also deliberates upon different international and national policies/guidelines/laws/standards on disaster risk reduction and sustainable development that can provide opportunities to achieve climate proofing of disaster relief and recovery operations. Further, the manual focuses on Tools and techniques that can support in enabling sustainable disaster relief and recovery operations and highlights cyclical linkages of disaster management and environmental management at both, pre-disaster and post-disaster phases.

The training manual consists of five modules and has been designed as a five-day course with interesting learning activities, case studies and tools to support the overall framework of the manual. The five modules are as below –



MODULE A	CLIMATE PROOFING DISASTER MANAGEMENT
	A.1 Environment and Disaster Linkages
	A.2 Green Growth and Climate Proofing: Concepts and Scope
	A.3 Greening Disaster Management
MODULE B	DISASTERS AND ENVIRONMENTAL SUSTAINABILITY: POLICY PATHWAYS AND ENTRY-POINTS
	B.1 International policy frameworks (on disaster relief and recovery)
	B.2 National policy frameworks (on disaster relief and recovery)
	B.3 SDGs and Green Disaster Relief and Recovery
MODULE C	SUSTAINABLE DISASTER RELIEF
	C.1 Shelter and Settlement
	C.2 Water Sanitation and Hygiene (WASH)
	C.3 Food, Nutrition and Livelihood
	C.4 Health
	C.5 Debris and Waste management
	C.6 Supply chain management
MODULE D	SUSTAINABLE DISASTER RECOVERY
	D.1 Infrastructure Reconstruction
	D.2 Livelihood Restoration
	D.3 Business Recovery
	D.4 Ecosystem Recovery
MODULE E	ENABLERS FOR GREEN RELIEF AND RECOVERY: TOOLS AND TECHNIQUES
	E.1 Post Disaster Needs Assessment (PDNA)
	E.2 Cost-Benefit Analysis (CBA)
	E.3 Ecological footprint
	E.4 Climate Finance

Modules	Learning Units	Duration	Training Method
Climate Proofing Disaster Management			
	A.1 Environment and Disaster Linkages	90 Minutes	Lecture, PowerPoint (PPT) Presentations, Case Studies, Audio/Visuals, Q&A, Group Discussions and Activities
	A.2 Green Growth and Climate Proofing: Concepts and Scope	90 Minutes	
	A.3 Greening Disaster Management	90 Minutes	
Disasters and Environmental Sustainability: Policy Pathways and Entry-Points			
	B.1 International policy frameworks (on disaster relief and recovery)	90 Minutes	Lecture, PowerPoint (PPT) Presentations, Case Studies, Audio/Visuals, Q&A, Group Discussions and Activities
	B.2 National policy frameworks (on disaster relief and recovery)	90 Minutes	
	B.3 SDGs and Green Disaster Relief and Recovery	60 Minutes	
Sustainable Disaster Relief			
	C.1 Shelter and Settlement	60 Minutes	Lecture, PowerPoint (PPT) Presentations, Case Studies, Audio/Visuals, Q&A, Group Discussions and Activities
	C.2 WASH		
	C.3 Food, Nutrition and Livelihood	90 Minutes	
	C.4 Health		
	C.5 Debris and Waste Management	90 Minutes	
	C.6 Supply Chain Management		

Sustainable Disaster Recovery			
	D.1 Infrastructure Reconstruction	120 Minutes	Lecture, PowerPoint (PPT) Presentations, Case Studies, Audio/Visuals, Q&A, Group Discussions and Activities
	D.2 Livelihood Restoration		
	D.3 Business Recovery	120 Minutes	
D.4 Ecosystem Recovery			
Enablers for Green Relief and Recovery: Tools and Techniques			
	E.1 PDNA	120 Minutes	Lecture, PowerPoint (PPT) Presentations, Case Studies, Audio/Visuals, Q&A, Group Discussions and Activities
	E.2 Cost-Benefit Analysis (CBA)		
	E.3 Ecological footprint	120 Minutes	
E.4 Climate Finance			

Selection of trainees

The participants selected for the training programme will be based on the following criteria:

Target level trainees	As specified under target group/ audience (Senior to middle level officials/professionals/agency representative)
Nature of the group	Heterogeneous (from various departments, agencies and academic institutions), with representation of women colleagues.
Qualification	At least graduation and preferably post-graduation, having written and spoken ability in English/Hindi. Computer knowledge is desirable.
Medium of Instructions	Mainly English with blend of Hindi/regional language

Pre-requisite for the Trainer/Course Faculty

Criteria for course trainers are:

Eligibility	Interdisciplinary expert with knowledge on disaster response and recovery, climate change impacts, resilience, disaster risk reduction, infrastructure, planning and governance, environment and developmental planning issues and have experience in conducting interactive training sessions.
Training Approach	Friendly and informal approach and have ability to involve heterogeneous group at a single platform
Challenges to be addressed by the trainer	Motivating the participants to bring them at similar level of knowledge and experience sharing
Strategies to overcome the challenges	Provide reading materials during registration (or preferably can be mailed in advance). Involve the participants through group exercise, video clippings and quiz sessions, etc.

Tips for using the Manual

To make learning easy and interesting and more participatory the following techniques can be used:

- Perception check questionnaire (Q&A)
- Lecture/PowerPoint presentation
- Case Study
- Group Exercises
- Discussion and Experience Sharing

Instruction for Trainers

1. Facilitate participants in understanding the concept of event tree analysis using PowerPoint slide. Emphasize on understanding the consequential impacts of different factors on society and environment after a disaster.
2. Divide the participants into small groups (5-6 people in each group) and assign each group the responsibility of developing an event tree on a particular disaster event, for example: forest fire, flood, drought, tsunami etc.
3. Each group should be facilitated by an instructor. Give time for discussion among the group members and development event tree of various potential impacts of any disaster events.
4. Collect flip cards and post them on a board.
5. Invite a member from each group to explain the respective event tree to other groups
6. Trainer should facilitate of potential environmental impacts identification and linkages for identified events/consequences.

MODULE A

Climate Proofing Disaster Management

Background

Climate change and disasters are closely linked, and there are uncontroversial evidences that climate change magnifies disaster risk in number of ways. Patterns of disaster risk as driven by climate change result from close association of climate change with different drivers of disaster risk including different hazards and vulnerabilities. The IPCC Assessment Report (2012) expressed high confidence that changing climate will lead to changes in intensity, duration, frequency, timing, and spatial extent of climatic and weather events, which in future could result in unprecedented extreme events. This is just one of the ways in which climate change drives disaster risk. Climate change also tends to influence the exposure and vulnerability of human and natural systems towards extreme events by impacting/altering their coping capacity and resilience. Climate change is likely to increase the vulnerabilities of communities towards natural hazards through degradation of ecosystems and its services which will in turn create challenges related to water, food and livelihood security¹.



Figure A-1: Environment and Disaster Linkages (Estrella & Saalismaa, 2010)

¹ Malcolm & Pitelka (2000). Climate change is likely to alter the compositions of ecosystems which in turn will influence their functioning. These changes will not just overwhelm the capacity of ecosystems to mitigate future extreme events but would also adversely impact the quality and quantity of various ecosystem good and services.

Challenges and Opportunities:

Environment and Disaster Linkages: Challenges

Environmental degradation is an important driver of disaster and climate risk. Healthy and functional ecosystems act as natural buffer towards natural hazards reducing the physical exposure and mitigating the impacts of hazards. In addition to this, ecosystems also provide essential goods and services required to upkeep the human well-being; thereby reducing socioeconomic vulnerability and strengthening resilience of communities towards disaster and climatic risk. On the other hand, disasters can also lead to environmental degradation and direct ecosystem losses or damages caused due to disasters exacerbate impacts of disaster. Furthermore, disasters through post-disaster emergency operations often leave an impact on environment. These operations primarily focus on providing immediate relief to save lives and reduce the impact of disasters. However, lack of attention given to environmental concerns during these operations often leads to depletion and degradation of natural resources. Environmental degradation caused due to disasters usually undermines recovery efforts and longer-term resilience against future disaster and climatic risk, leaving both, the communities as well as environment more vulnerable and exposed than before (Proact Network, 2008).

Opportunities for Sustainable Disaster Management

1. Disaster Risk Reduction and Climate Change Adaptation

Both disaster risk reduction and Climate Change Adaptation are imperative for sustainable development. Both these approaches aim at reducing vulnerabilities and enhancing resilience of communities. With growing experience across DRR and CCA, it is widely recognised that both these fields share much in common including goals, processes and benefits. However, management of risk associated with disasters and climate change have always worked in isolation from each other and lacked an integrated approach. Given the vast synergies between disaster risk management and climate adaptation in terms of practice, strategies, institutions and finances; integration of these two approaches can help in managing disaster and climatic risk while addressing sustainable development challenges (IPCC, 2012). However, to achieve this, there is a need to develop effective linkages between these two approaches at conceptual, strategic and operational levels (Islam et al., 2019).

2. Environmental Management

The interdependency between environment, changing disaster and climatic risk patterns, and human well-being makes environmental management central to disaster risk reduction and climate change adaptation. Environment management is critical yet one of the under-used tools for disaster risk reduction and climate change adaptation. Strategic management of environment can ensure long-term sustainability of ecosystems and delivery of essential ecosystem goods and services even in face of disasters or climate change. Ecosystem-based approaches are cost effective, flexible, no-regret approaches capable of reducing disaster and climatic risk while delivering multiple environmental, social and economic co-benefits. Lately, ecosystem-based approach has emerged as a promising strategy for addressing CCA and DRR concerns.

Box A.1 Definitions

Ecosystem-based disaster risk reduction (Eco-DRR)

Sustainable management, conservation and restoration of ecosystems for reducing disaster risk so as to achieve resilient and sustainable development (Estrella & Saalismaa, 2013)

Ecosystem-based adaptation (EbA)

The use of biodiversity and ecosystem services as a part of overall adaptation strategy towards climate change to reduce vulnerabilities and build resilience of communities

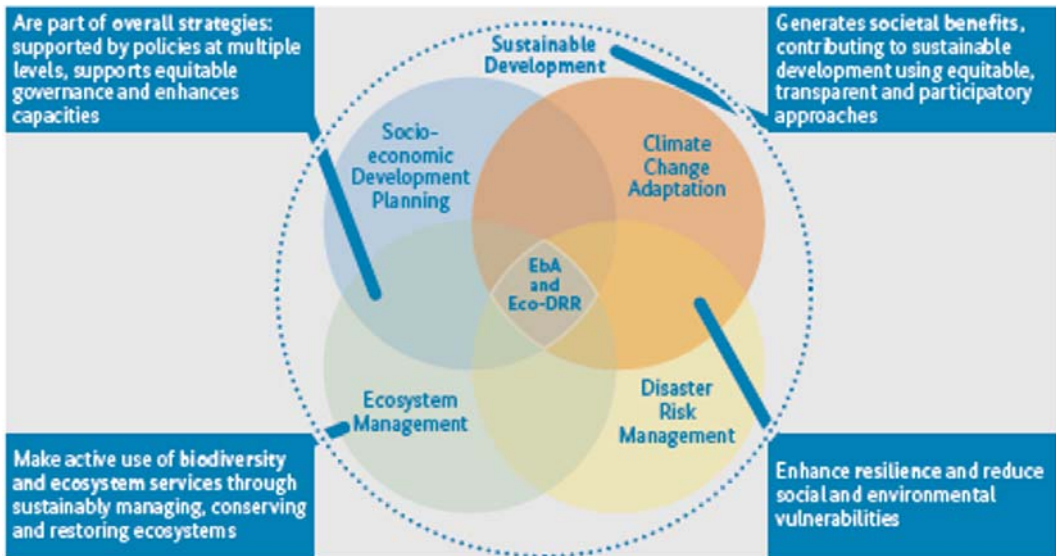


Figure A-2: Integration of Disaster Management, Climate Change Adaptation, Ecosystem Management and Socio-economic Development Planning through Eco-DRR/EbA for Sustainable Development (CBD, 2019)

3. Sustainability and Green Growth

Environment is central to economic activities and growth. Environment provides resources required for carrying out economic activities (production of goods and services) and also absorb and process unwanted by-products (waste). Therefore, ensuring sustainability of natural assets and environment is a key towards long-term economic sustainability (Everett et al., 2010). Green growth aims at fostering economic development while ensuring sustainability of natural assets on which human well-being relies. The concept of green growth draws its context from sustainable development and is considered as its subset. Green growth primarily emphasises on economic and environmental components of sustainable development. Green growth is a more focussed concept, providing operational framework to achieve sustainable progress at the interface between economy and environment; while taking full responsibility of social consequences arising as a result of greening economic growth.

4. Climate-proofing Approach

Climate proofing builds on the concept of green growth and aims reducing climate- related risk for promoting sustainable development. The overall goal

of climate proofing is to advance climate change mitigation and adaptation across strategic project activities. Climate proofing in context of disaster risk management provides an opportunity for integrating climate change adaptation and disaster risk reduction. Climate proofing disaster risk reduction encompasses achievement of disaster risk reduction goals while addressing inherently present and future climatic risk within disaster management cycle by promoting environmentally sustainable, economically viable and socially acceptable solutions and strategies. The idea is to achieve holistic risk reduction within disaster management ensuring sustainable development.

Training Module

This is an introductory training module on disaster management through integrated climate proofing approaches. It encompasses the concepts of sustainable development, green growth, and environmental sustainability towards strategic management of disaster risks. The module is developed as overview course for sensitization aimed at highlighting environment and disaster linkages and need for integrating green approaches for improving environmental outcomes of disaster management strategies and intervention particularly in post-disaster settings.

Following three learning units are delineated under this module:

- LU-A.1: Environment and Disaster Linkages
- LU-A.2: Climate Proofing: Concept and Scope
- LU-A.3: Greening Disaster Management

Training objective

- To deliberate upon environment and disaster linkages in the context of climate change and sustainable development
- To delineate strategic approaches for environmental concerns and role of climate proofing in disaster risk reduction
- To enumerate on the need and opportunities of green growth and eco-friendly approaches in disaster management cycle
- To state the convergence between environment management and disaster management

Guidance

- Sharing of expectations from both sides - from the faculty/trainers and the participants is important, to start from and finally define the learning scope to be fulfilled by end of the module delivery.
- Other expectations regarding basic rules for participants, trainers, etc., to be communicated at the beginning of the course.
- The module being the introductory course, should be taken up in discussion mode to encourage greater participation from trainee making the discussion more open and interactive between trainer and participants.
- Case examples/case study drawn from past disasters highlighting the environmental outcomes of disasters would help in enriching the discussion
- Documentaries or short films on Eco-DRR, EbA, green recovery, green relief, etc. would be useful.

Methodology

- Perception check questionnaire (or Q&A)
- Lecture/PowerPoint presentation
- Case study (preferably based on film)
- Group exercises
- Discussion & Experience sharing

Learning Unit A.1

Environment and Disaster Linkages

Background

Environment and disasters are closely linked to each other. Environmental safeguards can play a crucial role in effective management of disaster risk. However, environmental degradation is one of the key drivers of disaster risk; which contributes to disaster risk in multiple ways. Natural environment helps in mitigating and regulating natural hazards (flood, drought, landslides, etc.) and most often degraded environment leads to increase in frequency and intensity of these hazards. Also, natural environment provides number of essential ecosystem good and services necessary to support live, livelihood and human well-being (PEDRR, 2010). The goods and services provided by natural environment play a significant role in enhancing adaptive capacities and resilience of communities towards disaster risk. Environmental degradation alters quality and quantity of ecosystems and their services, thereby increasing vulnerability of natural and human systems towards disasters.

Table 1: Hazard Mitigation Function of Different Ecosystems

Ecosystems	Hazard Mitigation
Wetlands Vegetation on hillsides and Forest	Flood, storm surge Landslides, soil erosion, erratic rainfall, floods, avalanches, drought
Coastal ecosystems (Mangroves, barrier reefs, barrier islands, salt marshes and sand dunes)	Storm surge, tidal surges, tsunami, cyclones
Dryland	Droughts, desertification, wind erosion, fires, temperature increase
Urban ecosystems (forest, greenbelts)	Extreme heat, Temperature increase, Floods Erratic rainfall

Adapted from: CBD, 2019

Disasters can also adversely impact environment, ecosystems and its services, which can result in long-term impact on communities dependent on them. The two ways in which a disaster can impact environment include: (i) direct damage to

natural infrastructure and resources affecting the functioning of ecosystems and (ii) indirect damage caused due to lack of consideration given to environmental concerns during post-disaster phases (PEDRR, 2010).

Environmental Impacts of Disasters

Environment provides number of vital services for existence and well-being of human. Disasters can have far reaching impacts on environment and are considered as one of the drivers of environmental degradation. Significant losses can be caused to environment during the post disaster interventions and by disaster itself. Depletion in natural capital, loss of biodiversity, damaged ecosystems and their services are some of the direct impacts of caused by disasters on environment. It is important to understand and analyses the impact of disasters on environment, as damage to ecosystems or deterioration of natural resources affects environmental sustainability that can pose serious challenge in achieving sustainable development. Table 2 provides an overview of potential impacts that different disasters can have on environment.

Table 2: Potential Environmental Impact of Different Disasters

Disasters	Potential environmental impact
Forest Fire	• Loss of biodiversity (flora and fauna) and ecologically sensitive habitat • Air and water pollution
Landslides	• Damage to ecosystems • Ground water and surface water contamination
Drought	• Scarcity of water resources • Unsustainable resource consumption-Increased stress on surrounding ecosystem for basic goods and services • Loss of biodiversity, habitat
Flood, Storms, hurricanes, typhoons, cyclones, tsunami	• Soil erosion • Contamination of surface and ground water • Damage or loss of ecosystem (coral reefs or mangroves)
Chemical disaster-oil spill	• Contamination of air, water and land • Loss of biodiversity (flora and fauna)

Adapted from: DEWGA, 2008

Box A.1.1: Case Studies

The 2019-2020 Australian Bushfires

Over the year 2019-2020, Australia experienced one of the worst fire season on record across different parts of the country. More than 15,000 fires were reported which impacted almost 19 million hectares of area, with around 12.6 hectares contained primarily woodland and forest burning (This estimated are highly contested). More than 3 billion native vertebrates (mammals, reptiles, birds and frogs) were likely to have been present within the impacted areas. Air and Water pollution were also among invisible consequences of fires witnessed across the country (WWF, 2020).

Baghjan Oil Spill, Assam (2020)

On 27th May 2020, a blowout occurred in a gas well in a government operated oil site, which was followed by subsequent fire on 9th June 2020 which destroyed around 60-70 hectares of land area around the site. The site was in close vicinity of highly sensitive biodiversity hotspot which included the Dibru-Saikhowa National Park and the Maguri-Motapung wetlands. The leak of oil into surrounding landscapes lead to huge biodiversity loss in the area. The assessment of biodiversity and landscape indicated large-scale impact of oil spill on flora and fauna. Death of fishes (including dolphin), birds, insects (butterflies and odonates), herpetofauna and impacts on health of animal were observed due to well blowout and oil spill. Contamination of air, water and ground were also reported in surrounding areas of impact site. Vegetation in the surrounding areas were observed to be covered with condensed oil due to the leak which impacted the landscape, resulting in inhabitable aquatic and terrestrial environment and causing substantial decline in the biodiversity (WII, 2020).

Need for Sustainable Relief and Recovery

In post disaster setting, relief and recovery operations in the absence of appropriate planning can lead to environmental degradation, which can have a lasting impact on ecosystems and communities dependent on them. Post disaster operation primarily aims at saving lives and reducing risk after disaster; however to achieve so it is also important to ensure environmental sustainability of these operations. Environment which forms the basis of human life and well-being also needs to be restored and protected for the future after any disaster. But generally, in urgency to meet immediate relief and recovery needs very often the environmental impacts of post disaster operations are neglected. Environmental footprint of post disaster relief and

recovery operations not just have a potential to put communities at new risk; but can also be detrimental to long-term recovery prospects of affected communities. The most common reasons which often lead to environmental concerns being overlooked in post-disaster operations by various stakeholders include the following:

- Lack of awareness about environmental impacts of particular relief or recovery operation
- Belief that environment concerns are of secondary importance to the goals of post-disaster response and recovery, particularly in immediate post-disaster settings
- Addressing environmental concerns can be too costly or too time-consuming
- Lack of knowledge or skills to address environmental issues/concerns

Integration of environmental concerns into post disaster relief recovery helps in avoiding exacerbation of pre-existing vulnerabilities and emergence of new risk and vulnerabilities patterns; thereby reducing drivers of disasters and increasing resilience (UNOCHA & UNEP, 2014). Therefore, it is imperative to promote environmental issues as an integral part of disaster management continuum, particularly during post disaster phases. This would require systematic identification and integration of sector-specific environmental concerns in post-disaster settings through post disaster need assessments, strategic response planning, mobilisation of resources and implementation, monitoring and evaluations of humanitarian projects.

This session can be discussed in detail with the case examples of various disasters:

- **Indian Ocean Tsunami, 2004** resulted in extensive damage and loss to the environment, caused by the event itself and the post-disaster interventions taken up by the humanitarian response agencies.

<https://www.gdrc.org/uem/disasters/disenvi/tsunami.html>

<https://www.tandfonline.com/doi/pdf/10.3152/146155107X190622>

- **Nepal Earthquake, 2015** resulted in an estimated loss of 2.2% of forest cover in the affected areas, along with environmental impacts, including major landslides, sediment loading, debris accumulation, forest and biodiversity losses, changes in water supply and quality, hazardous materials contamination, and other impacts.

https://d2ouvy59p0dg6k.cloudfront.net/downloads/rea_2.pdf

Learning Objectives	Session(s) & Methodology
• To enumerate the disaster and environment interlinkages • To discuss the concepts of environmental management with reference to disaster risk reduction and sustainable development. • Deliberate on need for integrating environment concerns into post disaster response and relief.	• One session • PowerPoint presentation and Lecture • Group Exercise • Question-Answer Session • Discussions
Enabling Units	
• Environmental degradation and disasters- causes, effects and need for environmental sustainability for climate and disaster risk resilience.	
Guidance	Recommended Readings
• This session intends to provide understanding of disaster and its interlinkages environment. The concept of sustainability and environmental management from the perspective of disaster risk reduction should be discussed in brief. • The session as the first learning unit of the module should be taken up discussion mode so as to allow trainees to share their experiences and opinions on the issues/concepts discussed during the session • Presentation and lecture should use infographics and case examples for setting the context for the next learning units of this module. • This session may include a group exercise and engage participants to	• Gupta, A. K. and Nair, Sreeja S. (2012). Ecosystem Approach to Disaster Risk Reduction. New Delhi, India: National Institute of Disaster Management. • PEDRR. (2010). Demonstrating the Role of Ecosystem-based Management for Disaster Risk Reduction. Partnership for Environment and Disaster Risk Reduction. • Sudmeier-Rieux, K. and Ash, N. (2009). Environmental Guidance Note for Disaster Risk Reduction: Healthy Ecosystems for Human Security, Revised Edition. Gland, Switzerland: IUCN. • Sudmeier-Rieux, K. N., Nehren, U., Sandholz, S. and Doswald, N. (2019). Disasters and Ecosystems, Resilience in a Changing Climate - Source Book.

develop logical tree diagram for a particular disaster highlighting the possible impacts and consequences of the given disaster.

- Geneva: UNEP and Cologne: TH Köln - University of Applied Sciences.
- UNEP. (2007). Environment and Disaster Risk: Emerging Perspectives. UNEP-UNISDR.
- DEWGA. (2008). Linking Disaster Risk Reduction, Environment Management and Development Practices and Practitioners in Asia Pacific Region: A review of opportunities for integration. Disasters Environment Working Group for Asia.
- UNOCHA & UNEP. (2014). Environment and Humanitarian Action: Increasing Effectiveness, Sustainability and Accountability. Geneva, Switzerland : UNEP/OCHA Environment Unit.
- WWF. (2020). Impacts of the unprecedented 2019-2020 bushfires on Australian animals. Ultimo NSW: WWF-Australia.
- WII. (2020). Impact of oil well blowout at Baghjan oil field, Assam and resulting oil spill, on surrounding landscape. Wildlife Institute of India.

Activity and Group Exercise

This group exercise is designed to identify potential impacts of disasters on environment through a Logical tree analysis. This activity will support in developing the understanding of the consequential impacts of different factors on society and environment after a disaster.

Activity: Causal risk assessment analysis	Time: 1 hour including discussions	Material: flip charts, sketch pens-bold marker, board pins
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Objectives

1. To identify potential consequences/impacts of disaster event on human, societal and environmental systems.
2. To develop an understanding of impacts that disasters can have on environment.

Background

Logical tree is a tool used to analyse different sources of risk for any event with respect their chronological or causal components. Logical trees are useful for analysing overall risk as well as assessment of risk as contributed by individual components. This group exercise aims to identify different potential consequences of initiating event (disaster) employing a logical tree approach. The exercise will follow inductive qualitative logical tree approach to identify various consequences of a particular disaster that will be purely based upon the risk perception of the participants.

The Logical (Disaster Consequence) tree analysis would represent logical sequence of occurrence of events resulting from an initiating event. The initial event is branched to subsequent potential event as the consequence of initial event in the first level. The consequences of each of these branches are detailed in second, third and further levels.

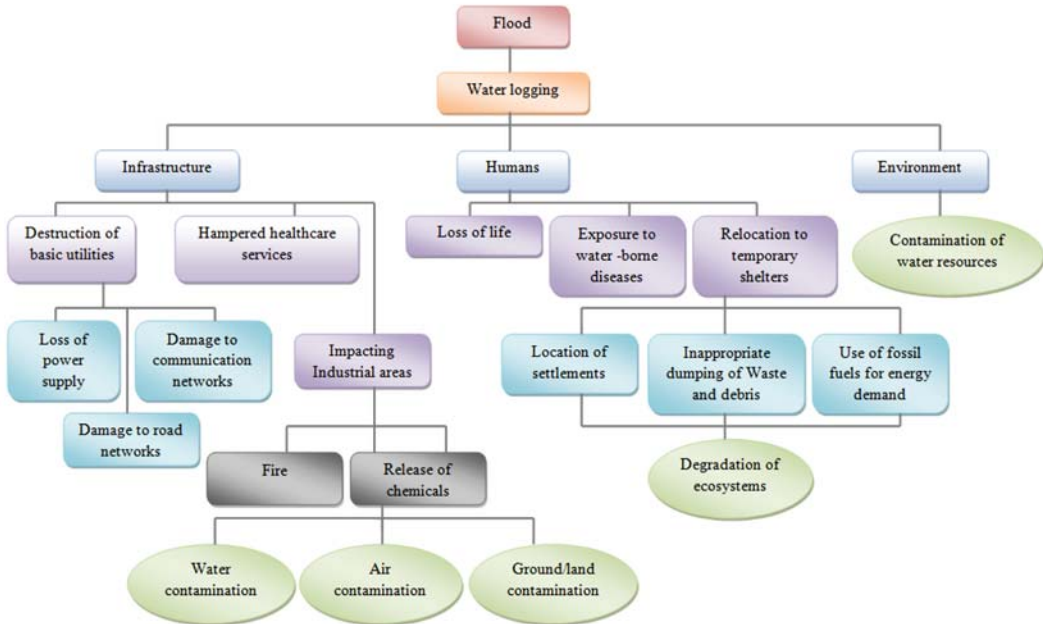


Figure A-3: An example of Logical (Disaster Consequences) Tree Analysis for Flood Disaster

Box. A.1 Risk Assessment Tool and Techniques

Risk analysis can help in estimating the probability or likelihood of an occurrence of event and in identifying vulnerabilities of a system. Some of the commonly used risk assessment tools and techniques include:

1. Preliminary hazard analysis
2. Accident consequence analysis
3. Failure mode, effect and criticality analysis
4. Logical trees- event trees, fault trees, and decision trees

Source: Ostrom & Wilhelmsen, 2012

Instructions for trainer

1. Facilitate participants in understanding the concept of event tree analysis using PowerPoint slide. Emphasize on understanding the consequential impacts of different factors on society and environment after a disaster.
2. Divide the participants into small groups (5-6 people in each group) and assign each group the responsibility of developing an event tree on a particular disaster event, for example: forest fire, flood, drought, tsunami etc.
3. Each group should be facilitated by an instructor. Give time for discussion among the group members and development of an event tree of various potential impacts of any disaster events.
4. Collect flip cards and post them on a board.
5. Invite a member from each group to explain the respective event tree to other groups.
6. Trainer should facilitate potential environmental impacts identification and linkages for identified events/consequences.

The participants should note down the potential environmental impacts identified during the exercise on a separate note sheet as it will help in understanding and setting the context for subsequent modules.

Learning Unit A.2

Green Growth and Climate Proofing: Concepts and Scope

Background

Sustainable development draws its essence from the Triple Bottom line concept which advocates maintaining the right balance between three pillars of sustainability - economic, social and environmental (Klarin, 2018). Economic sustainability aims at maintaining the social, natural and human capital necessary for income and living standard; social sustainability focuses on preserving social and cultural identity while prompting equality and inclusiveness; and environmental sustainability strives for maintaining the quality of environment necessary for carrying out economic development; it is the environmental sustainability on which quality of life of people and overall capacity of development directly depends. The concept of Sustainable development stems from combination of three distinct component viz. environment, development and society. Therefore, sustainable development advocates socio-economic development well within environmental limits i.e. development taking care of needs of present generation without comprising the ability of future generations to meet their needs (OCED, 2008).

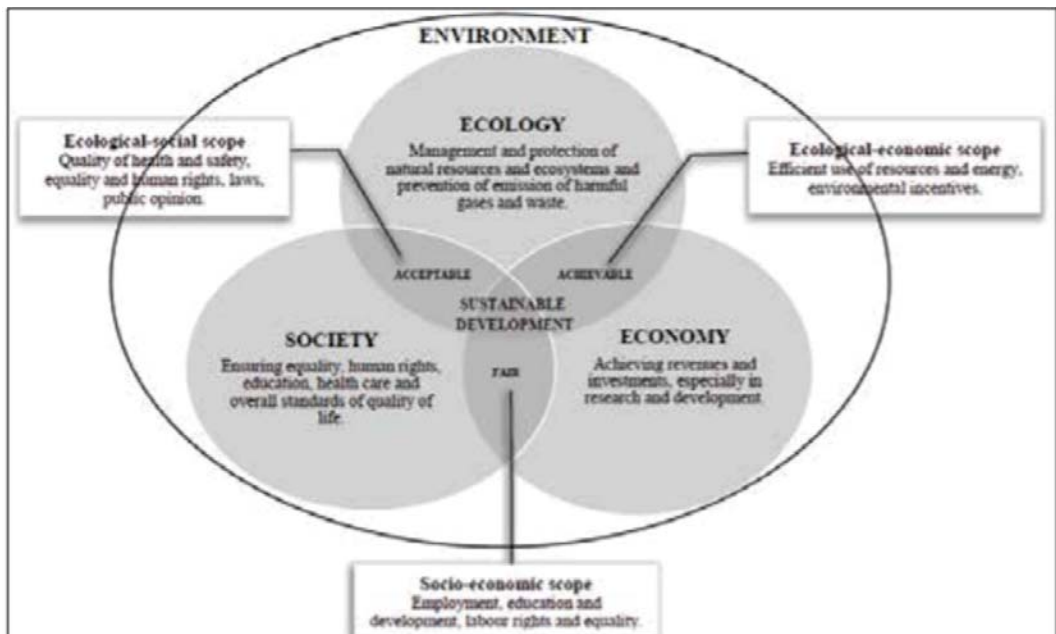


Figure A-4: Triple Bottom Line Concept of Sustainable Development (Klarin, 2018)

Green growth aims at fostering economic growth and development while ensuring sustainability of natural resources and environmental services on which the well-being of society relies. However, the concept of green growth does not provide replacement for sustainable development; rather should be considered as sub-set of it, offering practical and flexible approach to achieve measurable and concrete progress across economic and environmental pillars of sustainable development, while taking full accountability of social consequences of growth dynamics green economies (OECD, 2011). Green growth aims at enhancing ecological efficiency of economic development by promoting resource efficient, clean energy and carbon offsets technological innovations. Green growth very well recognises that unsustainable economic development would lead to scarcity of natural resources, contribute to climate change and exacerbate disaster vulnerabilities. Therefore, green growth approach tries to address the sustainability gap at the interface between economy and environment. Due to synergistic outcomes of green growth approach, it is capable of delivering multiple benefits including climate change adaptation and mitigation and disaster risk reduction while ensuring sustainable economic growth.

Climate change will impose both increased and new risk on natural and human systems. To address this, development at any level (national, local or sectoral) should be based on hazard management and climate change adaptation strategies, so as to ensure potential risks are reduced. Climate proofing is a risk-based approach towards climate change. Climate proofing aims at managing both current and future climate risk through long-lasting, environmentally sensitive, economically viable and socially acceptable solutions (ADB, 2005). Climate proofing facilitates mainstreaming of climate change adaptation across different going or new developmental policies, plans or projects at national, regional, sectoral or local levels. These solutions can be easily integrated into any of the stages of project cycles viz. planning, designing, construction, operations and decommissioning.

Box. A.2.1 Case Study

Disaster-resilient infrastructure through innovative financing in United States of America (USA)

The Property Assessed Clean Energy (PACE) Financing or PACE Loan is a means of financing energy efficiency upgrades, disaster-resilient improvements and retrofitting, water conservation measures and renewable energy installations in the USA, developed and run by the US Department of Energy.

This financing scheme has been used in the San Francisco Seismic Retrofitting Financing Program in collaboration with Alliance NRG/Counterpointe Sustainable Real Estate (CounterpointeSRE) to provide owners 100 % financing for seismic retrofitting of their property (ESIP, 2013). CounterpointeSRE Program provides terms up to 30 years, fixed interest rates, and no balloon payment. The program is designed to help real estate owners' free cash flow so they maximize investment in their future and the resilience of San Francisco.

Application in India: Need for innovative financing in disaster-resilient infrastructure

At present, the traditional sources of finance to cities from national government grants and existing budgets for city development is unlikely to sufficiently meet the incremental cost for disaster-resilient infrastructure and/or retrofitting (Prasad, et al., 2009). Therefore, specific financial instruments and incentives are needed, along with supporting policies and awareness generation, to reduce incremental cost and/or show future savings from disaster resilience.

A PACE financing-like scheme, customized and backed by creditworthy Special Purpose Vehicle (SPV) of Smart Cities Mission, could boost incentives for residential complexes, businesses and industries to incorporate disaster-resilient reconstruction, install decentralized utilities or retrofitting.

Source: Gupta et al., 2019

https://www.nidm.gov.in/PDF/pubs/GGGI&NIDM_Position%20Paper_FINAL.pdf

Learning Objectives	Session(s) & Methodology
• To discuss the concepts of sustainable development and green growth. • To deliberate on need and scope for integrating green approaches/ strategies for climate proofing development.	• One session • Power Point presentation and Lecture • Question-Answer Session • Discussions
Enabling Units	
• Sustainable development and green growth-concept, scope and approaches for operationalising climate proofed development.	
Guidance	Recommended Readings
• This session should cover description of the concept and scope of sustainable development in context of green growth and climate-proofing. The role of environmental management in facilitating green and climate proofing strategies should be highlighted in brief. • The facilitator shall have adequate knowledge on similarities and difference among the three concepts: sustainable development, green growth and climate proofing. • Presentation and lecture should use infographics and case examples for setting the context for the next learning units of this module.	• ADB. (2005). Pacific Studies Series: Climate Proofing- A Risk-based Approach to Adaptation. Asian Development Bank. • GIZ. (2010). Climate Proofing for Development: Adapting to Climate Change, Reducing Risk. Deutsche Gesellschaft für Technische Zusammenarbeit, (GTZ) GmbH. • Klarin, T. (2018). The Concept of Sustainable Development: From its Beginning to the Contemporary Issues. Zagreb International Review of Economics and Business, 67-94. • OECD. (2011). Towards Green Growth. OECD Publishing. • Strange, T. & Bayley A. (2008). Sustainable Development: Linking economy, society and environment. OECD.

Learning Unit A.3

Greening Disaster Management

Disaster management is a systematic process adopted to organise, plan and apply various measures so as to prepare, respond and recover from any disaster (UNISDR, 2017). A typical disaster management cycle comprises six elements across pre-disaster and post-disaster phases. Pre-disaster phase includes prevention, mitigation and preparedness, while the post-disaster phase includes response, rehabilitation, reconstruction and recovery.

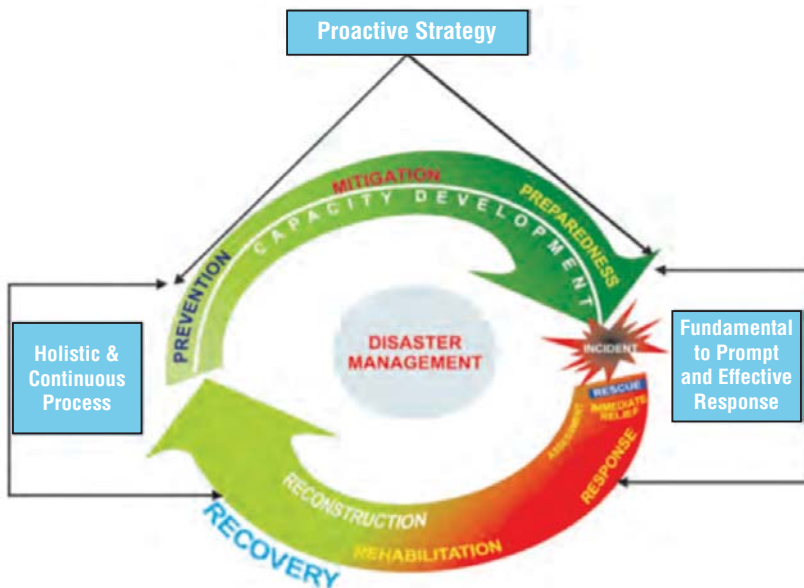


Figure A-5: Disaster Management Continuum (NDMP, 2009)

Interventions undertaken across any of the phases of disaster management cycle can have many different impacts on the environment and ecosystems. These impacts are dependent on the type, approach and scale of the intervention. It has been widely recognised that there lies an intrinsic and cyclic linkage between environmental management and disaster risk reduction. Ecosystem-based disaster management (Eco-DRR) which uses environmental management as a tool for reducing vulnerabilities and enhancing resilience of communities; thereby reducing disaster risk has been increasingly recognised globally. Eco-DRR approach promotes idea of sustainable management, conservation and restoration of ecosystems so as to reduce disaster risk and achieve resilient and sustainable

development. Eco-DRR approach is of critical importance particularly in context of pre-disaster phase (prevention, mitigation and preparedness stage) and later post disaster phase (reconstruction and recovery), where ecosystem-based solutions and practices can help providing the much need 'green' solutions for managing disaster risk.

Box A.4.1 Green Approaches to Disaster Management

Green approaches to disaster management emphasis on socially and environmentally sensitivity as well as economically viable strategies and activities for managing the present and future disaster risk. Planning sustainable disaster management strategies and activities can effectively help in addressing the key issues, challenges and gaps across different phases of disaster management (TNA Document, NIDM).

Post-disaster, during response phase focus is on catering the immediate needs of the affected population, providing immediate support to protect lives and reduce further damages and losses; whereas during recovery phase focus is on taking care of rehabilitation and reconstruction activities; restoring basic services. Disasters also provide unique window of opportunities to build-back-better to increase resilience of communities by integrating disaster risk reduction measures into restoration and recovery of physical infrastructures, economies and societal, environmental systems. Taking into account the environment considerations during disaster relief and recovery operations can help in effectively capturing this window to build-back-better. Systematic identification and integration of environmental concerns across different sectors is needed to ensure sustainable disaster response and recovery. Ill-planned activities during different sectoral operations often leads to detrimental impacts on environment. Table 3 enlists some of the key sectors of interventions during different post-disaster phases which have potential impact on environment.

Table 3: Key Sectors across Different Post-disaster Phases

Post-Disaster Phases	Key Sectors with potential impact on environment
Rescue and Relief	• Water, Sanitation and Hygiene • Health • Food, Nutrition and Livelihood • Shelter and Settlements • Debris Management • Supply Chain Management
Reconstruction and Rehabilitation	• Infrastructure Reconstruction • Livelihood Restoration • Business Recovery

Learning Objectives	Session(s) & Methodology
• To describe different phases of disaster management and their potential impacts on environment. • To enumerate different approaches for addressing environmental concerns in disaster risk reduction • To deliberate upon key environmental challenges and gap associated with different disaster response and recovery sectors.	• One session • PowerPoint presentation and Lecture • Activity and Group Exercise • Question-Answer Session • Discussions
Enabling Units	
• Integrated approach for managing disaster risk- causes, effects and need for environmentally sustainable green approaches for climate and disaster risk resilience.	
Guidance Recommended Readings	
• This session intends to state the need for green approach for managing disaster risk and highlight the possible areas of interventions across different phases of disaster	

management cycle. The concept of Ecosystem-based Disaster Risk Reduction should be discussed in brief.

- The module may include group exercise or discussion to encourage trainees to share experiences from their respective departments and sectors with respect to the issues/concepts discussed during the session.
- Case examples from different sectors of disaster response and recovery in context of environmental sustainability may be used in discussion to enrich the session.
- Session may include small exercise on mapping stakeholders for planning and implementation of green disaster management strategies.
- UNEP & CNRD. (2014). The Ecosystem-based Disaster Risk Reduction: Case Study and Exercise Source Book. United Nations Environment Programme and Center for Natural Resources and Development.
- GRRT. (2010). Green Recovery And Reconstruction: Training Toolkit For Humanitarian Aid. World Wildlife Fund, Inc. and American Red Cross.
- IRFC. (2018). Snapshot: Green Response . International Federation of Red Cross and Red Crescent Societies (IFRC).
- Sudmeier-Rieux, K. (2013). Ecosystem approach to Disaster Risk Reduction. European and Mediterranean Major Hazards Agreement (EUR-OPA) .
- Sudmeier-Rieux, K. N. (2019). Disasters and Ecosystems, Resilience in a Changing Climate - Source Book. Geneva: UNEP and Cologne: TH Köln - University of Applied Sciences.
- UNISDR. (2017). Build Back Better in recovery, rehabilitation and reconstruction: Consultative version. United Nations Office for Disaster Risk Reduction.
- UNOCHA & UNEP (2014). Environment and Humanitarian Action: Increasing Effectiveness, Sustainability and Accountability. Geneva, Switzerland : UNEP/OCHA Environment Unit.

MODULE B

Disasters and Environmental Sustainability: Policy Pathways and Entry-Points

Background

Policies are set of actions containing goal(s) and means to achieve them. Policies may contain policy instruments provide the linkage between policy formulation and its implementation. Policy instruments are the means for achieving policy goals. Policy instruments are broadly classified into three categories:

- Regulatory instruments (orders, prohibitions, licenses, permits, regulations, etc.)
- Financial instruments (incentives, grants, subsidies, taxes, user charges, etc.) and
- Communicative instruments

The inherent linkages among disasters, climate change and environment make environmental and climate change governance tools critical part of overall disaster risk reduction governance framework. Therefore, it becomes important to link legal frameworks on disaster risk management with the cross-cutting themes of environment and climate change.

International Policy Scenario for Disaster Management

IDNDR (1990-1999)

Over the time, the field disaster risk reduction has significantly broadened globally. In this respect, the year 1990 was a landmark year for the field of disaster risk reduction, when the first and the foremost international policy framework –the International Decade for Natural Disaster Reduction (IDNDR, 1990-1999) came into existence. United Nation General Assembly recognising the importance of reducing the impacts of ‘natural disasters’ on communities particularly in developing countries and to foster international cooperation in the field of natural disaster reduction designated the 1990s as IDNDR.

Yokohama Strategy and Plan for Action for Safer World (1994)

The first world conference on Natural Disaster Reduction was held at Yokohama, Japan, in the year 1994. The conference served as a substantive platform for the mid-term review of IDNDR during which a new strategy for the second half of the

decade was reflected and adopted in the form of ‘Yokohama Strategy and Plan of Action for Safer World: Guidelines for Natural Disaster Prevention, Preparedness and Mitigation’. Some of key characteristics of this new international policy framework include (United Nations, 1999):

- Shift in approach for disaster reduction from emergency preparedness to reduction of vulnerabilities and risk.
- Greater emphasis on social sciences in areas of research, policy development and implementation.
- Focussed on public policy for disaster reduction.
- Prioritized development of regional and sub-regional approaches.
- Emphasised on concrete application of science and technology and involvement of local communities to reduce disasters and their impacts.

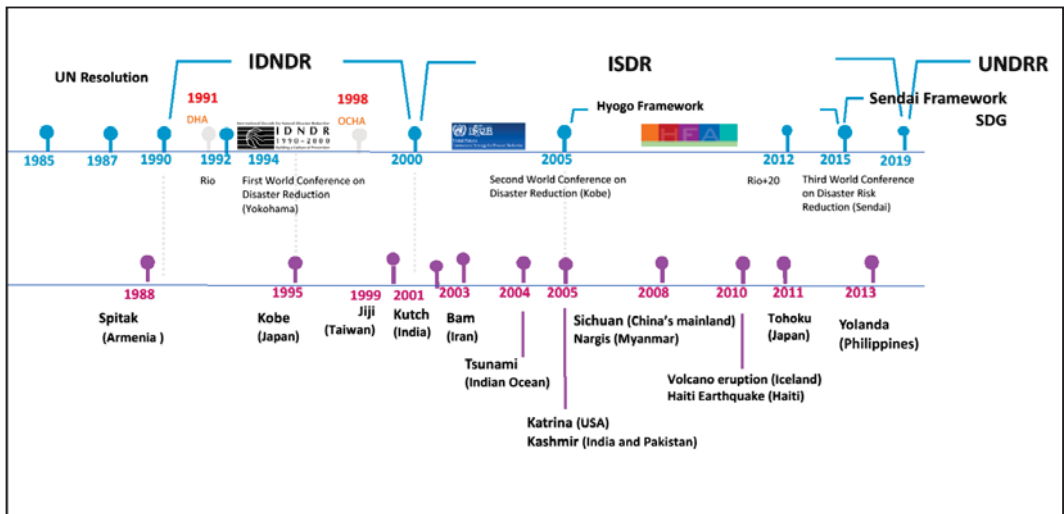


Figure B-1: Evolution of the Disaster Risk Reduction (DRR) field and selected major disasters, 1985–2019. DHA—Department of Humanitarian Affairs; OCHA—Office for the Coordination of Humanitarian Affairs (Source: Shaw, 2020)

The Hyogo Framework for Action (2005-2015)

In the year 2000, at the second world conference on Disaster Reduction held at Kobe, Hyogo, Japan, the Hyogo Framework for Action (HFA, 2005-2015) was adopted. HFA is considered as one of the most significant international documents on Disaster Risk Reduction, which put forth the concept of Disaster Risk reduction putting a stronger focus on disaster preparedness and prevention. HFA put forth five priorities for actions and guiding principles offering practical means for achieving disaster risk reduction and resilience.



Figure B-2: Hyogo Framework for Action's Five Priorities for Action

In the year 2015, at the third world conference on disaster risk reduction, Sendai, Japan, the Hyogo framework for Action was succeeded by more ambitious Sendai framework for Disaster Risk Reduction (discussed in the Learning Unit B.1).

National Policy Scenario for Disaster Risk Reduction

National Disaster Management Act (2005)

National Disaster Management Act, 2005 brought the paradigm shift in India's disaster management approach from relief centric, now emphasised was made on adopting an integrated and holistic proactive approach addressing prevention, mitigation and preparedness along with relief and response. Past disaster experiences highlighted the need for a holistic approach for disaster management. Country needed a comprehensive legal, institutional and financial arrangements

and the National Disaster Management Act played a pivotal role in establishing one such comprehensive disaster management framework in the country. Based on one of the most crucial recommendation of HPC to address the limitations and gaps of disaster management approach of that time, National Disaster Management Act was enacted in 2005, providing the much needed legal framework for disaster management in the country at state and national level. The act mandates the establishment of three tier institutional system for holistic management of disasters at national, state and district level. The act lays down a comprehensive institutional framework clearly defining structures, roles and responsibilities of different agencies. National Disaster Management Authority (NDMA) was designated as an apex central agency among the other three central entities at the centre – National Executive Committee (NEC), National Institute of Disaster Management (NIDM) and National Disaster Relief Force (NDRF). Apart from a comprehensive institutional framework, the Act also provided financial provision for managing disasters. Act envisaged constitution of two types of funds – disaster response fund and disaster mitigation fund at national, state and district levels. Act also mandates the preparation of disaster plan at national and sub-national levels (state and district) by the respective disaster management agencies.

National Policy on Disaster Management (2009)

In 2009, National Disaster Management Policy was notified; prepared in accordance with National Disaster Management Act, 2005. The policy laid emphasis on establishing holistic and integrated approach through community based disaster management, developing capacities of the institutions as well as stakeholders, bringing in multi-sectoral synergy and cooperation among regional, national and international agencies. The DM policy envisaged promotion of culture of planning and preparedness; ensuring participation of different stakeholders for disaster mitigation and preparedness (community, local institutions- panchayati raj bodies, NGOs, CSR and others); establishment of proper institutional mechanism/chain of command; standard operating procedures and disaster management plan at all levels; development of disaster management codes/manuals, ensuring safe construction practices; building capacity of communities, institutions, artisans etc. and creating knowledge network through research and documentation. The policy reinforced the existing disaster management act by laying down an integrated policy covering all aspect of disaster management, emphasizing on priority areas where interventions are needed and drawing down different mechanisms required for operationalizing these interventions in effective manner.

Training Module

This training module is designed to provide an overview of various international and national disaster risk reduction policy frameworks and understand the provisions for disaster relief and recovery. The module also deliberates upon different international and national policies/guidelines/laws/standards on disaster risk reduction and sustainable development that can provide opportunities to achieve climate proofing of disaster relief and recovery operations.

Three learning units are delineated under this module are:

LU B.1: International policy frameworks (on disaster relief and recovery)

LU B.2: National policy frameworks (on disaster relief and recovery)

LU B.3: SGDs and Green disaster relief and recovery

Training objective

- To deliberate upon various international & national policy frameworks on Disaster Risk Reduction.
- To state the synergies between environment, climate change and disaster management policies.
- To analyse and identify gaps in various policy framework & entry-points for climate proofing disaster relief and recovery.

Guidance

- In this module, Trainer will take discussion on different policy framework on disaster risk reduction and sensitize participants about various policy tools addressing mode to encourage greater participation from trainee making the discussion more open and interactive between trainer and participants.
- Participants will be informed about cross-linkages among disaster risk reduction policies with environmental and climate change.

Methodology

- Lecture
- PowerPoint presentation
- Question- answer sessions
- Case study
- Group exercises
- Discussion

Learning Unit B.1

International Policy Frameworks (on Disaster Relief and Recovery)

In recent decades, number of international policy frameworks has been developed for disaster risk reduction. In context of climate proofing disaster relief and recovery, it is important to assess how these policy frameworks address disaster relief and recovery across environment and climate change dimensions.

Sendai Framework for Disaster Risk Reduction

The Sendai Framework for Disaster Risk Reduction (SFDRR), 2015-2030, was adopted at third UN World Conference in Sendai, Japan. SFDRR draws guidance and builds on the gaps, assessment and lessons drawn from its predecessor i.e. the Hyogo framework for action instruments (2005-2015). SFDRR provides action-oriented framework for reducing disaster risk and enhancing disaster resilience by setting out four priorities for action and seven global targets. SFDRR advocates for effective management of disaster risk rather than just the management of disasters.

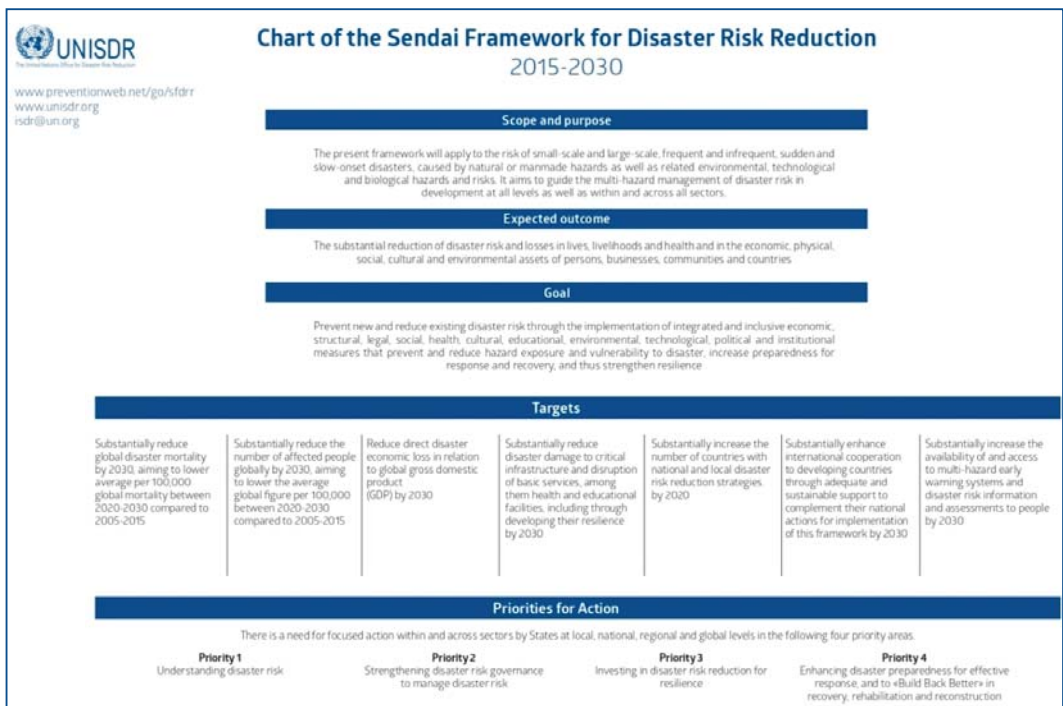


Figure B-3: Sendai Framework for Disaster Risk Reduction

- SFDRR through 'Priority 4' emphasises on enhancing disaster preparedness for ensuring effective disaster response and building back better during recovery, rehabilitation and reconstruction.
- SFDRR highlights the needs for strengthening disaster preparedness to ensure capacities for effective disaster response and recovery are well in place at all the levels (SFDRR, 2015).
- SFDRR also advocates for utilising post disaster recovery, rehabilitation and reconstruction phases as an opportunity to 'build-back-better' and promoting disaster resilient development through integration of disaster risk reduction into post disaster developmental activities.
- The frameworks also identifies climate change as a driver of disaster risk and therefore calls for planning and preparedness anticipating climate change scenarios and their potential impact on disaster risk across all the sectors, facilitating participation of relevant institutions and stakeholders.
- SFDRR also emphasis on strengthening sustainable management and utilisation of ecosystems and implementing integrated natural resource management and disaster risk reduction approaches.

International Disaster Relief Laws

'Guidelines for the domestic facilitation and regulation of international disaster relief and initial recovery assistance' commonly known as International Disaster Relief Laws (IDRL) were developed by International Federation of Red Cross and Red Crescent Societies (IFRC) which were unanimously adopted by states and national societies in the year 2007 at the 30th International Conference of Red Cross and Red Crescent. The guidelines provide set of recommendations to governments intended to help them in strengthening their disaster laws and plans related to international assistance during emergencies. These guidelines have been anchored in various international norms and standard including United Nation Assembly Resolutions, Sphere Minimum Standards in Disaster Response, Hyogo Framework for Action (2005-2015) etc.

- IDRL guidelines under the core responsibilities of assisting actors specifies the disaster relief and recovery assistance should be carried out so as to 'minimise negative impacts on economy, local community, environment and development objectives'.

- Also, the guidelines specify that it remains the responsibility of assisting states or assisting humanitarian organisations to ‘remove or dispose unwanted or unused relief/initial recovery goods, particularly if they may pose potential threat to human health and safety or the environment’.

Sphere Minimum Standards

The Sphere project or ‘Sphere’ was initiated in the year 1997 by a group of humanitarian organisations and the international Red Cross and Red Crescent Movement. Sphere identified set of principles and minimum standards that must be achieved during humanitarian response.

- These standards have been framed based on the Humanitarian Charter and the Core Humanitarian Standards. Sphere Minimum Standards focus on four technical areas of humanitarian response which include: Water supply, sanitation and hygiene promotion (WASH), Food security and nutrition, shelter and settlement, and Health.
- While setting out sector-specific key actions, key indicator and guidance for achieving minimum standards during humanitarian response, sphere minimum standards also address number of cross-cutting issues related to gender, children, person with disabilities, environment, etc.
- The minimum standards emphasise on the need to prevent degradation and over-exploitation of environmental resources in order to reduce disaster risk and vulnerabilities and secure life-supporting functions of environment. The minimum standards seek to foster environmental sustainability in humanitarian response and introduce mechanisms promoting adaptability of natural ecosystems for self-recovery.
- The sphere minimum standards also try to address climate change and its impacts by considering and accommodating new patterns of risk, hazards and vulnerabilities drawn from future climatic scenarios.



Figure B-4: Core Humanitarian Standards (Sphere, 2018)

Table 4: Thematic Areas Covered in International Policy Framework

Policy framework / guidelines	Disaster relief and recovery	Environment sustainability during disaster relief and recovery	Climate Change
SFDRR	✓	✗	✓
IDRL	✓	✓	✗
Sphere standards	✓	✓	✓

Learning Objectives	Session(s) & Methodology
- To enumerate international policy frameworks related to disasters - Deliberate on key gap in policy frameworks and entry points for promoting green disaster relief and recovery.	- One session - PowerPoint presentation and Lecture - Question-Answer Session - Discussions
Enabling Units	
Understanding policy framework for disaster risk reduction and humanitarian response.	
Guidance	Recommended Readings
- This session intends to deliberate upon various international policy frameworks including guidelines, standards, etc. related to disaster risk reduction addressing disaster relief and recovery issues and concerns in particular. - The facilitator should have in-depth knowledge and understanding of various international policy mechanism related to disaster risk reduction	- Burton, I., O.P. Dube, D. Campbell-Lendrum, I. Davis, R.J.T. Klein, J. Linnerooth-Bayer, A. Sanghi, and F. Toth. (2012). Managing the risks: international level and integration across scales. In: A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change (IPCC). Cambridge, UK, and New York, NY, USA: Cambridge University Press. - IFRC. (2017). Introduction to the Guidelines for the domestic facilitation and regulation of international disaster relief and initial recovery assistance.

International Federation of Red Cross and Red Crescent Societies (IFRC).

- SFDRR. (2015). Sendai Framework for Disaster Risk Reduction (2015-2030). United Nations Office for Disaster Risk Reduction.
- Sphere Association. (2018). The Sphere Handbook: Humanitarian Charter and Minimum Standards in Humanitarian Response, fourth edition. Geneva, Switzerland.

Learning Unit B.2

National Policy Frameworks (on Disaster Relief and Recovery)

“Policy, legal and institutional arrangements form the foundation for any society’s approach to disaster management” - R. Britton

International policy frameworks provide guidance for action at national and sub-national levels. National and sub-national strategies complementing international framework provides mechanisms translating international priorities and goals in realities. National and sub-national strategies also provide opportunities for empowering and including all stakeholders and concerns into the process ensuring more effective reduction of disaster risk. SFDRR through a dedicated target emphasis on development of national and local disaster risk reduction strategies and plans taking account of country specific disaster risk concerns, vulnerabilities and capacities.

For illustration on role of national policy frameworks in enabling a green disaster relief and response, we are discussing a case example of India, deliberating on some of key national policy tools on disaster risk reduction.

National Disaster Management Act (2005)

National Disaster Management Act was passed in the year 2005 and is known to be the foundational legislation in the country. National disaster management act of India (2005) provides a detailed plan of action to drawing its implementing and executing a disaster management plan. The act laid down a comprehensive institutional and financial framework for managing disasters. The act distinctly defined institutional and financial structures, role and responsibilities of different agencies at national and sub-national level. The act mentioned about post disaster activities including evacuation, rescue and relief and rehabilitation and reconstruction. The act mainly focused on designating the responsibilities to national or sub-national authorities for management of these activities in case of any emergency. Sub-national authorities have the primary responsibility of managing post-disaster phases with support from national authorities as and when needed.

National Disaster Management Act entrusted National authority with the responsibility of recommending guidelines for minimum standards of relief at national level in case of emergency which should include (Gol, 2005):

1. Minimum requirements to be made available in relation to shelter, water, food, sanitation and medical cover
2. Special provisions to be made for widows and orphans
3. Ex gratia assistance on account of loss of life, damage to houses and restoration of means of livelihood
4. Other such relief as may be necessary

Similarly, State authority is entrusted with the responsibility of laying down the detailed guidelines for minimum standards of relief at state level, provided these standards of relief in no cases should be less than guidelines of minimum standard formulated by the national authority in this regard.

The concerns and issues related to environment and climate change across disaster management discourses remain missing in the act, the act somewhere failed to address these concerns.

National Disaster Management Plan (2019)

National disaster management plan prepared in accordance with national Disaster Management Act 2005 and the national policy on disaster management (2009), provides an operational framework for managing disasters covering all aspects of disaster management cycle. The plan clearly defines scope, role and responsibilities of all the relevant stakeholders (government agencies, private sector organisations, local communities etc.). The revised national plan which put forth a holistic framework for disaster risk reduction is based on five main pillars which include:

1. National legal mandates- the Disaster Management Act 2005 and the National policy on Disaster Management 2009
2. International agreements to which India is signatory- Sendai framework for Disaster Risk Reduction (SFDRR), Sustainable development goals (SDGs) and conferences of parties (COP21) Paris Agreement on Climate Change
3. Prime minister's 10 point agenda for DRR
4. Social inclusion as ubiquitous and cross-cutting principle
5. Mainstreaming of DRR as integral feature

The plan provides a blueprint of disaster management cycle for all types of hazards and also takes account of viz. climate change, environmental degradation, development with risk zones, urbanisation, increasing population and

industrialisation, aggravating the impacts and frequencies of these hazards. For each of hazard, the plan provides an integrated planning framework for each of the hazards, grouped into six thematic areas- understanding risk, inter-agency coordination, investing in DRR- structural and non-structural measures, capacity development and climate change risk management detailing out strategies for disaster prevention, mitigation, response and recovery. The plan also includes chapters on cross-themes related to DRR such as coherence and mutual reinforcement of three post-2015 global framework, social inclusion and mainstreaming.

The key reflections from selected selections/chapters of the plan are discussed below: (the idea is to understand how the national plan addresses the issues related to environment and disaster relief and recovery while looking out for opportunities for mainstreaming the climate proof strategies across the post-disaster response and recovery operations).

Environment and Wildlife Conservation

Considering environmental management as an integral part of disaster risk reduction, the plan emphasised on developing integrated framework addressing disaster risk reduction and strengthening environmental resilience. The plan mentions about the five assertion used to define interlinkages between environment and disaster risk reduction (an UNISDR working group analysis) which include:

- Natural hazards being physical processes can be directly affected by social processes
- Healthy ecosystem provides natural defence
- Degraded ecosystems lead to reduced community resilience
- Disasters can have secondary environmental impacts
- Environmental management magnifies risk and becomes a hazard

The plan offers insights into two key areas of environmental management for disaster risk reduction viz. environmental monitoring & assessment and protected area management & ecosystem rehabilitation. The plan also reflected on biodiversity conservation and wildlife action plan in context of climate change and disaster risk reduction.

Climate Change:

Climate change risk is addressed as one of the key thematic areas for disaster risk reduction in the plan. The plan advocated that planning and investing in DRR can play an important role in building community resilience towards climate change. The plan broadly touched following broad aspects related to climate change:

- Climate and human-induced climate change
- IPCC assessment report
- India and climate change
- Temperature
- Impact on Indian monsoon
- Storms and cyclones
- Sea-level rise
- Coastal inundation due to sea level rise
- Integrating DRR and climate change adaptation

Response:

The primary goal of disaster response is to save lives, protect property, environment and to meet the basic needs of human as well as other living beings after disasters (GoI, 2019). The plan mentions catering the immediate and short-term needs of affected population as an overarching concern of disaster response. The major disaster response tasks as delineated under the plan include the following:

- Communication
- Cultural heritage sites, their precincts and museums-protection and preservation
- Data collection and management
- Disposal of animal carcass
- Drinking water/dewatering pumps/sanitation facilities
- Early warning, maps, satellite inputs, information dissemination
- Evacuation of people and animals
- Fodder for livestock in scarcity-hit areas
- Food and essential supplies
- Fuel
- Housing and temporary shelters
- Management of the dead people
- Media relations
- Medical care
- Power
- Public health
- Rehabilitation and ensuring safety of livestock and other animals, veterinary care
- Relief employment
- Relief logistics and supply chain management
- Search and rescue of people and animals
- Transportation

Recovery and Building Back Better

The scope of disaster recovery as described under the plan is based upon the UNISDR definition which define recovery as “improving and restoring livelihood, health and economic, physical, cultural, social and environmental assets, activities and systems of communities affected by disasters, aligning the process with principles of build back better and sustainable development so as to reduce or avoid future disaster risk”. The reconstruction and recovery approach under the plan is guided by National policy on Disaster Management 2009. The Table 5 states the key aspects of disaster recovery and reconstruction processes as addressed by the plan.

Table 5: Key aspects of Disaster Recovery and Reconstruction addressed in National Disaster Management Plan 2019

Process	Key aspects
Recovery process	• Physical Recovery (restoration and reconstruction of community infrastructure, critical infrastructure, heritage and cultural buildings, private houses) • Economic Recovery (livelihood, productive activities and markets activities) • Social Recovery (social and psychological wellbeing of person, families, community)
Reconstruction process	• Reconstruction of public infrastructures and social services • Re-establishment of adequate housing • Restoration of jobs/ livelihood • Restoration of the economic base of the disaster areas

Sectoral approach to Disaster Risk Reduction:

One of the main objectives of national disaster management policy is to mainstream Disaster Risk Reduction into development planning process. The relationship between development and disaster risk, provides the core rationale for mainstreaming DRR into developmental planning and practice. Development can be a major driver of disaster risk, wherein disaster risk, vulnerabilities and exposure are constructed through development patterns, pathways and practices.

Mainstreaming of DRR into developmental processes must be driven from within the developmental sectors so as to ensure that sectoral vulnerabilities are well assessed and risk management is institutionalised into policy planning, project cycles and practices. Mainstreaming DRR is a complex process and is highly context specific, however the key is to keep risk management at the centre of development processes rather looking at it as an add-on. Mainstreaming being a dynamic process can be operationalised through different entry points and pathways. However, policies and laws are often considered most common entry tools for mainstreaming DRR at national and subnational level. Table 6 enlist some of the national policies/schemes/programmes across key strategic sector that act as potential entry points for integrating disaster risk reduction.

**Table 6: National Policies/Schemes/Programmes for
Potential entry points for Integrating DRR**

Sector	Policies/schemes/programmes
Infrastructure	- Atal Mission for Rejuvenation of Urban Transformation (2015-2022) - Pradhan Mantri Gram Sadak Yojana (PMGSY) (2000 -Ongoing) - Smart Cities Mission (2015-2023)
Health and Sanitation	- National Rural Health Mission (NRHM) (2005-2012) - Integrated Child Development Services (1975-Ongoing) - Atmanirbhar Swastha Bharat Mission (Launched in 2021) - Swachh Bharat Mission (2014-2025)

Livelihood	• Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) (2005-Ongoing) • National Rural Livelihood Project (NRLP) (June 2011-Ongoing)
Education	• Mid-Day Meal (2001-Ongoing) • Sarva Shiksha Abhiyan (2001-Ongoing)
Agriculture	• Pardhan Mantri Krishi Sinchayee Yojana (2015-Ongoing) • Pardhan Mantri Fasal Bima Yojana (2016-Ongoing) • Soil Health Card Scheme (2015-Ongoing)

Source: Bhardwaj & Gupta 2021

Learning Objectives	Methodology
• To deliberate upon national policy frameworks related to disasters • Discuss key opportunities and entry points for promoting green disaster relief and recovery.	• One session • Power point presentation and Lecture • Question-Answer Session • Discussions
Enabling Units	
• Review of national disaster management framework and scoping of green disaster relief and recovery.	
Guidance	Recommended Readings
• The module knowledge sharing sessions on various national policy frameworks related to disaster management. • The facilitator should have in-depth knowledge and understanding of various national policy mechanism related to disaster risk reduction • The session must cover various opportunities and entry-points within national policy framework to address the	• Gol. (2005). National Disaster Management Act. Government of India. • Gol. (2019). National Disaster Management Plan. National Disaster Management Authority, Ministry of Home Affairs, Government of India. • Gol. (2009). National Policy on Disaster Management. National Disaster Management Authority, Ministry of Home Affairs, Government of India.

issues related to sustainable disaster response and recovery.

- Session may include a brief exercise mapping various entry-points/opportunities for mainstreaming green relief and recovery across different national disaster management guidelines (flood, drought, cyclone, landslides etc.)
- UNDRR. (2019). Global Assessment Report on Disaster Risk Reduction. Geneva, Switzerland: United Nations Office for Disaster Risk Reduction (UNDRR).

Learning Unit B.3

SDGs and Green Disaster Relief and Recovery

In the year 2015, 'Transforming Our World: The 2030 Agenda for Sustainable Development' was unanimously adopted by UN members as part of the UN's post-2015 development agenda. The 2030 agenda helped in defining overarching international vision related to sustainable development with the aim, the agenda 2030 laid down set of 17 Sustainable Development Goals (SDGs). These goals envisage eradicating poverty in all forms and dimensions to help the world embark a collective journey towards sustainable development. SDGs put forth a universal framework setting out diverging policy objectives on economic, social and environmental dimensions to ensure more inclusive and sustainable development for all. These goals very well recognise ending poverty, deprivation and inequality within societies would require committed efforts towards addressing the key developmental challenges related to education, health, food security, nutrition, climate change etc. Therefore, SDGs encompasses all the key developmental sectors including, health, sanitation, education, infrastructure, and environment.

SDGs' contribution to Sendai Framework for Disaster Risk Reduction:

The central core of both the agreements- Sustainable development Goals and the Sendai Framework is to promote idea of sustainable, inclusive and equitable development. There are several SDGs that recognise and advance disaster risk reduction directly or indirectly. The concept of resilience is common in both these agreements, wherein improving capacities remains an important aspects across these agreements. SDGs, as they thrive to address the systemic challenges within developmental trajectory simultaneously reduce or mitigate various elements of disaster risk (hazards and vulnerabilities). The strong convergence between the two agreements provides unprecedented opportunities for resilience building, risk reduction, and sustainable and inclusive development.

As disasters undermine development and can affect wide spectrum of SDGs. The implementation of the Agenda 2030 can help in mainstreaming disaster risk reduction and climate change adaptation across all sectors of development. There are number of goals and targets that link disaster risk reductions and development. There are well defined interlinkages between the goals and targets of SDGs and the targets of Sendai Framework for Disaster Risk Reduction. Table 7, analyses SDGs through lens of disaster risk reduction and SFDRR in particular and identifies SDGs

and targets goals addressing advancing disaster risk reduction across different development sectors. Figure B.5 describes the linkages between seven targets of SFDRR and SDGs targets.

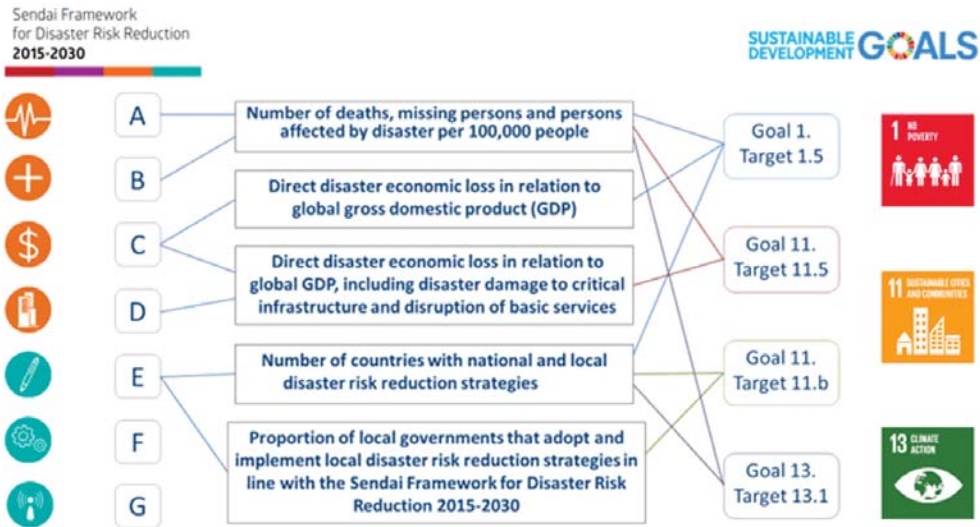


Figure B.5: Linkages between seven targets of SFDRR and SDGs targets.

How the Sendai Framework contributes to the Sustainable Development Goals

SDG

HOW DOES THE SENDAI FRAMEWORK CONTRIBUTE TO THIS?



The Sendai Framework calls for the design and implementation of safety-net mechanisms to strengthen resilience of the poor to the impact of disasters. Disaster risk reduction and risk-informed development are tools to break the cycle of exposure to hazards and entrenched poverty. Credible links with Sendai Framework implementation will contribute to achieving the Sustainable Development Goal of eradicating poverty.



Reducing the risk of disasters is a prerequisite for eliminating hunger, and protects livelihoods and productive assets essential for food security. Integrated disaster risk and food security assessments, early warning mechanisms, and innovative financing tools can curb agricultural and economic losses caused by natural hazards.



The Sendai Framework calls on Member States to enhance the resilience of national health systems by integrating disaster risk management into primary, secondary and tertiary health care, and by promoting and enhancing training capacities in the field of disaster medicine. The substantial reduction of disaster damage to critical infrastructure and disruption of basic services is essential to ensure healthy lives and promote well-being.



Increasing public education and risk awareness, and reducing disaster risk to educational facilities, will support the Sustainable Development Goal of inclusive and equitable quality education by reducing the disaster losses to educational facilities and disruption of educational services.



The Sendai Framework calls for women to publicly lead and promote gender-sensitive, equitable and accessible disaster risk reduction policies, plans and programmes, and for adequate capacity-building measures to empower women for preparedness as well as to build their capacity to secure alternate means of livelihood in post-disaster situations.



Training of community health practitioners in disaster risk reduction approaches, and ensuring compliance with existing health and safety standards with an adequate focus on disaster risk management, will build resilient health systems. The Sendai Framework advocates for resilient water infrastructure to remain effective and operational during and after disasters in order to provide life-saving and essential services and limit the spread of disease.



The Sendai Framework calls for sustainable use and management of ecosystems and integrated environmental and natural resource management approaches that incorporate disaster risk reduction. Trans-boundary cooperation on ecosystem-based approaches to shared natural resources builds resilience and can reduce disaster risk, while contributing to achieving the Sustainable Development Goal of affordable and clean energy.



The Sendai Framework calls for substantial reduction of disaster economic loss in relation to global GDP by 2030. Public and private investment in disaster risk prevention and reduction through structural (e.g. infrastructure) and non-structural (e.g. legislation/disaster preparedness plans) measures can enhance the economic resilience of people, and drive innovation, economic growth, and job creation.



Building and re-building better from the start through proper design, construction, and retrofitting to withstand hazards will contribute to achieving the Sustainable Development Goal on industry, innovation and infrastructure. The Sendai Framework also promotes investments in innovation and technology development in disaster risk management research.

Figure B-6: SFDRR contribution's to SDG

Source: UNISDR, 2016

Table 7: Targets on Disaster Risk Resilience in the Sustainable Development Goals

Sustainable Development Goals	Targets on Disaster Risk Reduction
Goal 1: Ending poverty in all its forms everywhere	Target 1.5: By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters
Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture	Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality

Goal 3: Ensure healthy lives and promote well-being for all at all ages	Target 3d: Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks
Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	Target 4a: Build and upgrade education facilities that are child, disability and gender sensitive and provide safe, non-violent, inclusive and effective learning environments for all
Goal 6. Ensure availability and sustainable management of water and sanitation for all	Goal 6.6 By 2020 protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation	Target 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all
Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable	Target 11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations Target 11. b: by 2020, increase by x% the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, develop and implement in line with the forthcoming Hyogo-framework holistic disaster risk

	Target 11.c: Support least developed countries, including through financial and technical assistance, for sustainable and resilient buildings utilising local materials
Goal 13: Take urgent action to combat climate change and its impacts	Target 13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries Target 13.2: Integrate climate change measures into national policies, strategies and planning Target 13.3: Improve education, awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning
Goal 14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development	Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts including by strengthening their resilience, and take action for their restoration, to achieve healthy and productive oceans
Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	Target 15.3: By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world

Sources: UNESCAP 2017 & UNISDR 2014

Learning Objectives	Session(s) & Methodology
• To deliberate on coherence and synergy between the SDGs and Sendai Framework • To understand interlinkages between sustainable development and disaster risk management	• One session • PowerPoint presentation and Lecture • Question-Answer Session • Discussions
Enabling Units	
• Sustainable Development Goals (SDGs) and Sendai Framework for Disaster Risk Reduction (SFDRR): Opportunities for Green Response & Recovery	
Guidance	Recommended Readings
• The session intends to deliberate upon various frameworks including guidelines, standards, etc. related to disaster risk reduction addressing disaster relief and recovery issues and concerns in particular. • Facilitators shall have adequate knowledge of various Sustainable Development Goals (SDGs) and SFDRR targets.	• Handmer, J., Stevance, AS., Rickards, L., & Nalau J. (2019). Policy Brief: Achieving Risk Reduction across Sendai, Paris and The SDGs. International Science Council. • SDGs. (2015). Transforming Our World: The 2030 Agenda For Sustainable Development. United Nations. • UNESCAP. (2017). Disaster Risk Reduction and Resilience in the 2030 Agenda for Sustainable Development. Bangkok: Economic and Social Commission for Asia and the Pacific, Economic and Social Council, United Nations. • UNISDR. (2014). Disaster Risk Reduction in Sustainable Development Outcome Documents. Report of the Open Working Group of the General Assembly on Sustainable Development Goals (A/68/970). UNISDR. • UNISDR. (2016). Implementing the Sendai Framework to achieve the Sustainable Development Goals. The United Nations office for Disaster Reduction.

MODULE C

Sustainable Disaster Relief

Background

A disaster management cycle (Figure C-1) illustrates the processes by which the concerned authorities plan to reduce the impact of any disaster and their reaction to the disasters. The post-disaster phase in the Disaster Management cycle focuses on Response and recovery, which includes immediate search and rescue, relief, rehabilitation and reconstruction.



Figure C-1: Disaster Management Cycle

Source : NIDM

Throughout the relief period, the main focus is to bestow the basic needs of the affected population. More precisely, disaster relief is the organised response to produce help to those who need it. Relief activities need swift reaction and it conjointly includes services like transportation, provision of food, clothing, medicines and other medical services, providing water supply, temporary and transitional shelters, repairs to essential services and other help.

Environmental Impact of Disaster Relief

When environmental and natural disasters strike, the initial step is to save lives. Environmental issues typically arise long after the immediate chaos, once

unsustainable relief and recovery practices have already been implemented (Strong, 2014). Emergency responses and relief can have various impacts on the surroundings and ecosystems. The impact depends on the types of interventions undertaken and the approaches used, as well as the scale and broader context of the response, inclusive of the fragility/ strength of the surroundings and ecosystems (IFRC, 2018).

These factors lead to environmental degradation and destruction, which may hinder the recovery of affected and vulnerable populations who rely upon natural resources for their livelihoods, with negative and long-run impacts on their lives, and on ecological systems in a broader perspective.

Most pressing is the proven fact that climate change and environmental degradation is resulting in escalating disasters and vulnerability. For the humanitarian sector and other relief actors, mandated with saving lives and reducing suffering, examining and mitigating their footprint and impact on the surroundings ought to be an explicit priority (Inspire association, Group URD, 2020).



Figure C-2: Areas of Disaster Relief (The sectors listed are illustrative not exhaustive and may vary depending on the geographical area and type of disaster)

There is a need for compliance with environmental policy and regulatory frameworks for all post-disaster interventions. Some of the international frameworks and tools that address environmental concerns like environmental degradation, pollution and over-exploitation and encourage sustainable development and recovery are:

- **The Sphere Handbook**
- **Code of Conduct for The International Red Cross and Red Crescent Movement and NGOs in Disaster Relief**
- **Sendai Framework for Disaster Risk Reduction**

Environmental problems arising from disaster response and relief activities can be cross-sector, as is the case for logistics, the supply chain and waste management, or they can be sector-specific (Shelter, WASH, Health, etc.). Several key problems linked to some of the key sectors throughout disaster relief operations and interventions are delineated below:

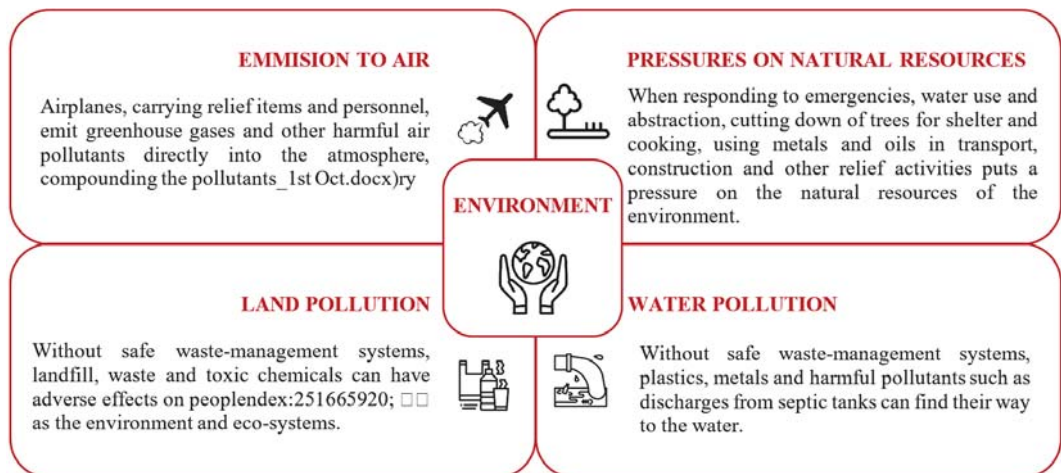


Figure C-3: Environmental Impact of Disaster Relief (Source: IFRC)

Source: IFRC

SECTOR	KEY ENVIRONMENTAL ISSUES IN DISASTER RELIEF
Water, Sanitation & Hygiene 	• Groundwater aquifers being over-pumped • Decommissioning of wells and inappropriate rehabilitation • Sewage disposals leading to water contamination • Solid wastes getting improperly disposed
Food Security 	• Dumping of food packages • The increased need for fuelwood/water collection for cooking due to the selection of food that may require long cooking time or large quantities of water may lead to environmental degradation and possible security risks
Health 	• Improper management of healthcare waste expired medicines or chemicals used in health protection (e.g., Water disinfection) • Soil and water contamination, ashes from incineration and the transmission of diseases from infected bandages or body tissues
Shelter, Non-Food Items (NFI) 	• Shelter construction materials being unsustainable or expensive • Inappropriate shelter design and selection of the site for a specific need, community or culture, leading to misuse or non-use • Deforestation and soil erosion due to unsustainable use of timber in shelter construction
Camp Coordination & Management 	• Land compacting and degradation, erosion and biodiversity loss • Unsustainable supply of natural resources (e.g., Timber, fuelwood sand, stones or gravel) • Improper decommissioning of camps and pit toilets

Logistics 	• Construction, packaging waste, fuel, waste oil and tires getting inadequately disposed • Procurement of goods produced through unsustainable practices
Early Recovery & Disaster Waste Management 	• Natural resources are used in an unsustainable manner for reconstruction and livelihoods • Improper land use and urban planning • Inappropriate building designs or choices of reconstruction materials • Unequal access to natural resources and changes in tenure • Deforestation due to the use of fired bricks • Disaster wastes getting improperly managed
Education 	• Missed opportunities to foster environmental stewardship as an integral part of education and training activities
Protection 	• Environmental degradation, sexual and gender-based violence can occur during fuelwood collection for domestic energy

Source: ProAct Network, Groupe URD (2014)

Challenges

To drive change, there is a need for some insight into the challenges that give rise to environmental problems. Some of the key challenges that lead to unsustainability during disaster relief interventions are listed below:

- **Understanding the Issue:** Post disaster responders and practitioners are typically unaware of what “environment” exactly means and what kind of impacts they ought to be considering as they design projects and interventions. This ends up in a scarcity of thought of environmental problems before an emergency, both among agencies already present and with knowledge of the situation as well as coordinating bodies.
- **Understanding the Concept of Environmental Mainstreaming:** Despite its cross-sectoral connection, there exists a lack of vision on how environments ought to be self-addressed across programmes. For some, putting up a solar panel is enough to justify that environmental consideration has been established into an operation. This ends up in scattered, stand-alone environmental projects that serve solely to distract from the larger need. There is little recognition of the environment as a life-saving priority, despite clearly recognising that people’s immediate survival once a disaster goes is based upon accessibility of natural resources like water, wild foods, and wood for cooking, heating and shelter construction.
- **Mainstreaming Environment in Post Disaster Needs Assessment:** Environmental considerations are often neglected in PDNA, so the recovery strategy do not address restoration of environment and natural resources damaged due to a disaster, and give due consideration to environmental impact of the recovery and restoration.
- **Lack of Institutional Commitment:** There is a lack of accountability and seemingly no intention to redress the situation i.e. environmental challenges—at all levels government agencies, humanitarian organisations and other stakeholders. There is also poor coordination at and between all levels, even among humanitarian responders.
- **Lack of Expertise:** Those who plan and screen interventions at the proposal level often lack environmental experience and proceed with interventions with probable negative environmental impacts, without verification or suggestions for a stronger response. Following a sharp onset emergency, it’s usually troublesome to access required resources on time, especially technical help.

- **Humanitarian Funding:** The duration and level of humanitarian funding is also considered as being one of the challenges in considering environmental problems in humanitarian relief and response operations. Also, donors typically don't have any resources to invest in green solutions. Hence, there is a chronic lack of funding for environmental initiatives in any respect at all stages of the programme cycle.
- **Lack of Practical Solutions:** Even in cases where field practitioners and other stakeholders can correctly identify environmental impacts, they lack practical ideas for cost-effective responses.
- **Lack of Metrics:** Another challenge is the lack of metrics by which environmental impacts of relief operations can be compared and evaluated.
- **Competing Pressures:** Practitioners are also subjected to varied competitor pressures, significantly throughout the proposal development and therefore the integration of cross-cutting problems don't receive similar attention as core relief efforts.
- **No Mandate in Humanitarian Organisations:** Most of the agencies don't necessarily have the mandate to enforce the principle of environmental mainstreaming.

Though mainstreaming environmental issues in the response and relief phase of acute emergencies is considered challenging, but these challenges may be overcome if addressed at the preparedness stage.

Need of Sustainable Disaster Relief

Environmental protection and sustainability need to be considered in emergency responses because of the growing recognition and awareness of the importance of addressing the environmental impacts of emergency response. The increasing gravity of environmental challenges, considering the climate-related ones, including the dependency of affected individuals on natural resources, incorporate a "collective responsibility" of all actors to cut back the environmental impacts of their actions, i.e. their environmental footprint.

IFRC: Why adopt a Green Response approach?



Because a community is more than the sum of its people and a degraded environment will ultimately hinder the survival and recovery prospects for the people affected by disasters, possibly increase the risk for future disasters and disrupt sustainable development.



Because as humanitarians, the Red Cross Red Crescent Movement is bound by the principle of 'do no harm'. We are accountable, first and foremost towards beneficiaries and implementing partners, but also donors. Actions taken by humanitarian actors affect the communities we seek to support, as well as the global environment.



Because it is Value for Money. Environmental considerations often lead to efficiency gains more generally and it doesn't necessarily cost more to be Green, often more cost-effective in the long-term.



Because 80% of disaster relief operational costs consists of logistical efforts, a life-saving service with a huge environmental cost. The Nepal 2015 Earthquake IFRC operation's emissions from its logistics and most relief items was 11,906 ton CO₂, the equivalent of planting 1,867 hectares of mangrove forest.



Because national legal frameworks increasingly incorporate elements linked to more sustainable natural resource management and climate change action which could hinder response if not addressed beforehand.



Because adopting a rights-based approach to environmental protection, supporting DRR/CCA laws, policies and practices at national and local level and supporting the strengthening of community resilience will reduce need for response operations, thus reducing its cost and its environmental impact.

Figure C-4: Why adopt a Green Response Approach

Source: IFRC, 2018

If environmental considerations don't seem to be thought about in the response and relief phase then there can be serious impacts on the effectiveness of humanitarian programmes and the well-being of affected communities. Policies for humanitarian assistance are largely focused on the protection of affected victims of disasters and also the provision of basic services like health, food, shelter and education. Only a few such policies – or associated practices – consider the environment and the resources it provides, while also taking heed of the negative consequences, especially on livelihoods and protection, when environmental impact is not considered. As a consequence, serious environmental degradation and destruction have repeatedly occurred, accompanying several negative and semi-permanent impacts on affected and vulnerable populations. It may also become a significant impediment to recovery.

One of the necessary, however least appreciated links is that once environmental problems are integrated into emergency response, then vulnerability, disaster risk and conflict may be reduced. This combination is key as it can:

- reduce the environmental drivers of conflict and competition over scarce and limited natural resources;
- enhance capacity to avoid and/or reduce disaster impacts through environmental management;
- enable physical, economic and human rehabilitation to be safer and more sustainable;
- increase resilience and reduce the risk of at least certain disasters; and
- link humanitarian assistance to immediate livelihood needs.

The systematic integration of environmental issues throughout response operations makes recovery activities more effective, contributes positively to sustainable development, and lays a foundation for conflict resolution and peacebuilding. Environmental considerations additionally mitigate the impact of climate change and support climate change adaptation (Sphere, 2018).

Green Response:

Box C.1 Outcomes of Green Response

The long-term outcomes that Green Response aims are three-folded:

The first one is to incorporate environmental considerations into each step of the humanitarian response cycle, including response preparedness, and to ensure that all interventions carry a green minimum standard or commitment target.

The second one is to identify, consider and mitigate the environmental impacts that result from emergency response.

And the third and final one is to equip the movement to advance environmental considerations through its policy, networks, partnerships and practices and to influence others to mitigate the adverse effects on the environment that result from emergency response operations.

Source: IFRC, 2018

Environmental sustainability in the Humanitarian sector:

Figure C-5 describes the sustainability approach focusing on strengthening climate and environmental sustainability in the Humanitarian sector, these approaches and other tools for sustainable relief and recovery are further explained in Module E- Enablers for Green Relief and Recovery.

At universal level:

Assessing and limiting the foremost vital climate and environmental impacts, calculating, reporting on and reducing emissions, and exacting higher quality and device practices along the supply chain.

At local level:

Incorporating climate and environmental knowledge and concerns in every step of the project cycle.
Coaching and awareness for communities on environmentally friendly practices.
Planning and implementing multi-sectoral recovery operations that embrace the principles of build back higher and integrate risk reduction, climate action and environmental protection.

Figure C-5: Recommendations for Green Response & Recovery

Source: IFRC, 2018

Training Module
This is the third module of the manual which focuses on sustainability aspect of disaster relief activities. It also discusses the environmental impact of disaster relief and the emerging challenges along with cross-sector and sector specific issues. It also highlights the need of developing sustainable solutions and gives recommendations for the same. The module has 6 learning units: LU-C.1: Shelter and Settlement LU-C.2: WASH LU-C.3: Food, Nutrition and Livelihood LU-C.4: Health LU-C.5: Debris and Waste Management LU-C.6: Supply Chain Management
Training objective
To identify the impact of disaster relief activities and interventions have on the environment, including through its carbon footprint.

- To understand the challenges and key environmental issues across different areas of disaster relief.
- To enumerate the needs and benefits of bringing sustainable solutions to disaster relief.
- To identify strategies to support climate Action and Environmental Sustainability in Disaster Relief.

Guidance

- This session should cover the unsustainability challenges in disaster relief along with opportunities to mainstream environmental sustainability, illustrated with appropriate case studies.
- The trainer should encourage the participants to actively involve and share their experiences of dealing with such kind of experiences on field.
- Examples and case studies for mainstreaming environmental sustainability in disaster relief operations should be discussed.
- Discussion on the role of participants/trainees in disaster relief and response and its relevance to sustainable development would be useful to break the ice in the diverse group.
- Sharing expectations from both sides - from participants as well as from the faculty/trainers and course director/coordination team is important, to start from and finally define the learning scope to be fulfilled by end of the module delivery.

Methodology

- Lecture/PowerPoint presentation
- Case study (preferably based on film)
- Group exercises
- Discussion & Experience sharing

Learning Unit C.1

Shelter and Settlement

Background

The world's population is increasing dramatically, with the quickest growth recorded in resource-poor countries. The challenge of providing adequate homes for the extra millions is staggering. Disasters add pressing shelter necessities to the already huge and chronic shortage of housing within the developing world as extreme weather events, water level rise, and political disputes drive lots to go leave or lose their homes.

Destructive climate-related events take a toll, especially in a vulnerable area, where individuals are probably already living in unsafe structures and hazardous locations, with zero savings, insurance or secure incomes. Disaster relief shelters, therefore, play an important role in large-scale disasters and are a crucial part of disaster response and recovery. Disaster Relief shelters are designed to give private and secure places for individuals who have left or lost their usual accommodations as a result of some kind of disaster. They do not solely provide immediate and short-run shelter for the affected population and victims of a disaster, they additionally facilitate them to pass through the trauma of a disaster and to begin the process of rehabilitation.

Challenges and Key Environmental Issues

Some of the key environmental issues linked to shelter and settlement during disaster relief and response are described below:

- Inappropriate shelter design for a specific need, site, community or culture, leading to misuse or non-use.
- Unsustainable supply of shelter construction materials and excessive use of timber in shelter construction.
- Unsustainable reliance upon active power supplies.
- Deforestation, soil erosion, soil degradation, contaminated groundwater through over-extraction, and/or improper disposal of grey and Blackwater.
- Inadequate disposal of construction and packaging waste.
- Insecurity of land tenure leads to non-promotion of long-term environmental stewardship.
- Global impact due to CO₂ emissions because of international transportation of wood and other Non-Food Items (NFI) items in shelter programmes.

- Loss of natural habitats such as forest, grassland or wetland; if the relief camps/shelters are set up in an environmentally sensitive site, or in or near a protected area, it may have a bigger environmental impact.

Opportunities for Sustainability in Shelter and Settlement

- During the preparation phase, sustainable building materials should be selected in vulnerable areas.
- Stay updated with the latest humanitarian solution innovations.
- Develop programs that are community inclusive and include various service-oriented strategies.
- Develop easy-to-use tools to assess the sustainability of programs.

Box C.1.1 Case Study

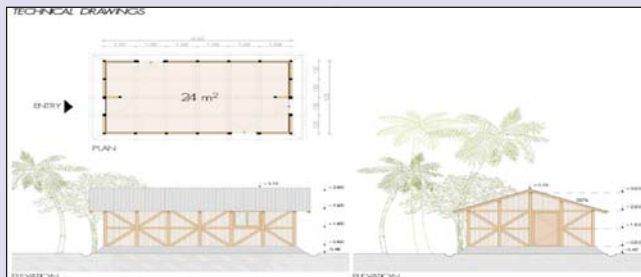
Bistanguan village, Chapagaun, Kathmandu, Nepal | 2015

In 2015, after the catastrophic earthquake in Nepal, Maria da Paz invited Joao Boto Caeiro from Root Studio to design and build a model house in Nepal. Using native and accessible materials, they designed two prototype houses out of bamboo and partitions, via a collaboration between locals and volunteers that came to the region.

The prototypes address the requirement for housing that's able to be engineered quickly to provide independence and immediate shelter, while also introducing basic building techniques using bamboo and bricks. In doing so, they can produce a collection of tools for future construction that the community can create themselves.

The structure comprises a four-column base created out of brick that supports a bamboo truss supporting the roof. The bamboo structure is roofed with rows of reed and then with metal sheets.

The bricks used, each for the column and the floor lining is the salvaged remains of the destructed buildings within the specified area. The bamboo is domestically sourced and immunised on the spot.



Source: Archdaily, 2017

Learning Objectives	Session(s) & Methodology
- To develop an understanding of Shelter and settlement in context to Disaster relief and management. - To identify the key environmental issues in the sector. - To identify strategic interventions or entry points for sustainable shelter solutions.	- One session - PowerPoint presentation and Lecture - Question-Answer Session - Discussions
Enabling Units	
Understanding carbon footprint of Shelters during relief and response settings and identifying opportunities for integrating environmental sustainability.	
Guidance	Recommended Readings
- This learning unit should cover the unsustainability challenges in disaster relief along with opportunities to mainstream environmental sustainability, illustrated with appropriate case studies. - The trainer should encourage the participants to actively involve and share their experiences of dealing with such kinds of experiences on the field. - Examples and case studies for mainstreaming environmental sustainability in disaster relief operations should be discussed and the participants should be encouraged to identify more case examples.	- Equipo Editorial. "Easily Reproducible Disaster Relief Constructions in Bamboo" [Prototipos de vivienda en bambú para-Nepal, por OOtStudio] 17 Apr 2017. ArchDaily. (Trans. Valletta, Matthew) Accessed 30 Mar 2021. <https://www.archdaily.com/867958/easily-reproduced-disaster-relief-constructions-in-bamboo> ISSN 0719-8884 - Bashawri, Abdulrahman & Garrity, Stephen & Moodley, Krisen. (2014). An overview of the Design of Disaster Relief Shelters. Procedia Economics and Finance. 18. 10.1016/S2212-5671(14)01019-3. - Kuittinen, Matti & Winter, Stefan. (2015). Carbon Footprint of Transitional Shelters. International Journal of Disaster Risk Science. 6. 10.1007/s13753-015-0067-0. - IFRC. (2018). https://www.sheltercluster.org/sites/default/files/docs/greening_supply_chain_nfi_workshop_180516_greening.pdf. Retrieved from https://www.sheltercluster.org/.

	• IFRC. (n.d.). What we do in shelter. https://www.ifrc.org/en/what-we-do/ disaster-management/ responding/ services-for-the-disaster-affected/ shelter-and-settlement/what-we-do-in-shelter/. • Sphere Association. (2018). The Sphere Handbook: Humanitarian Charter and Minimum Standards in Humanitarian Response. Geneva, Switzerland. Retrieved from www.spherestandards.org/handbook
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Learning Unit C.2

Water, Sanitation and Hygiene (WASH)

Background

In all emergencies following natural or man-made disasters, access to safe water supply and sanitation is of crucial importance for the health of the affected population. Population affected by disasters often reside in overcrowded relief camps they may get infected by serious diseases as a result of lacking sanitation or unsanitary conditions.

Water, Sanitation, and Hygiene (WASH) interventions are required in nearly all emergency contexts. From natural disasters to conflict zones and disease outbreaks, emergency WASH interventions aim to cut back the chance of diseases by providing safe water, reducing open excreting and promoting hygiene practices.

In several cases, pit toilets are often built in a rush post disasters, even in areas that could also be situated in flood-prone areas or areas where the groundwater table is high and the soil isn't appropriate for the given population density. These challenges need suitable planning, design, construction and management of appropriate and sustainable sanitation solutions in emergency and reconstruction situations.

Challenges and Key Environmental Issues

Some of the key environmental issues linked to WASH during disaster relief and response are described below:

- CO₂ emissions linked with water trucking (e.g. transport of water) and pumping (e.g. using generators).
- Generation of plastic packaging waste linked to Hygiene Kit distributions.
- Ground and surface water contamination linked to sanitation activities (ex: where latrines are inappropriately located too close to a water point, or inappropriate sludge management).
- Groundwater contamination and salinization linked with the construction of boreholes (risk of cross-aquifer contamination and contamination of the aquifer from surface water pollution from borehole construction).
- Water table depletion linked with unregulated pumping (water trucking), defective infrastructure, and inappropriate analysis of the aquifer or lack of coordination between WASH actors pumping from the same aquifer.
- Water outtakes sometimes also exceed the replenishment of water sources.

Opportunities for Sustainability in WASH

- WASH solutions should be diversified based on sustainability for the community and the environment.
- Information should be collated on existing successful environmental initiatives in WASH projects and good practices must be shared to increase awareness.
- The sustainability of ground and surface water supplies must be ensured by conducting assessments, implementing water conservation measures and planning for the appropriate disposal of liquid waste.
- The physical resilience of water and sanitation services to disasters must be ensured as an effective strategy to reduce disaster impact.
- Best water resource management practices should be utilized to avoid pollution and over-extraction of water resources.
- WASH interventions must be designed to reduce or avoid conflict among water users.
- Sustainable use of natural resources and source materials should be promoted for WASH infrastructure.
- Wherever possible greenhouse gas emissions should be reduced for humanitarian relief activities, such as water trucking.

Box C.2.1 Case Study

Flood-resistant reuse-oriented waterless sanitation in Bihar, India

The village Burmi Tola has issues typical of the many communities in rural Bihar like water shortage for most of the year, however during flash-floods in monsoon the region may be inundated for up to a few months. The residents earlier practised open excreting, that means the floodwaters carried excretory product and pathogens into homes and farms. Throughout floods, the entire village had to use a small raised area to defecate. This SEI Project in partnership with WASH Institute, India helped willing villagers to put in urine-diverting dry bathrooms on raised concrete plinths. These weren't solely flood- and drought-resistant, however conjointly gave farmers the opportunity of reusing treated waste as safe, free fertilizers and soil conditioners.



Raised, waterproofed substructures were built with project support (top). Households added their own superstructures (bottom).

Source: Andersson, (2014). Flood-resistant Ecological Sanitation Takes off in a Rural Community. SEI fact sheet, Part of Package on Bihar project.

Learning Objectives	Session(s) & Methodology
• To develop an understanding of WASH in context to Disaster relief and management. • To identify the key environmental issues in the sector. • To identify strategic interventions or entry points for sustainable WASH solutions.	• One session • PowerPoint presentation and Lecture • Question-Answer Session • Discussions
Enabling Units	
• Environmental impact of WASH interventions recommendations for sustainable solutions.	
Guidance	Recommended Readings
• This learning unit should cover the unsustainability challenges in disaster relief along with opportunities to mainstream environmental sustainability, illustrated with appropriate case studies. • The trainer should encourage the participants to actively involve and share their experiences of dealing with such kinds of experiences on the field. • Examples and case studies for mainstreaming environmental sustainability in disaster relief operations should be discussed and the participants should be encouraged to identify more case examples.	• Sanitation in Emergencies Overview. (2021). Retrieved from Sustainable Sanitation and Water Management Toolbox: https://sswm.info/water-nutrient-cycle/wastewater-treatment/hardwares/sanitation-emergencies/sanitation-in-emergencies-overview • Sphere Association. (2018). The Sphere Handbook: Humanitarian Charter and Minimum Standards in Humanitarian Response. Geneva, Switzerland. Retrieved from www.spherestandards.org/handbook • Day, S. J. & Forster, Tim. (2018). Water, Sanitation and Hygiene in Post-Emergency Contexts: A study on establishing sustainable service delivery models. Oxfam. • SuSanA Background Paper: Opportunities for sustainable sanitation in climate action. (2019). Retrieved from Sustainable Sanitation Alliance:

	https://www.susana.org/_resources/documents/default/3-3678-7-1566223290.pdf • Andersson, K. (2014). Flood-resistant ecological sanitation takes off in a rural community. SEI fact sheet, part of the package on the Bihar project. Retrieved from SEI https://www.sei.org/publications/flood-resistant-ecological-sanitation-takes-off-in-a-rural-community/
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Learning Unit C.3

Food, Nutrition and Livelihood

Background

The consequences followed by natural disasters like damage to food systems and destruction of livelihood-related infrastructure can threaten the food security of the affected individuals. Food might become troublesome to get in an emergency or following a disaster. Crops can also get destroyed within the fields, animals can sink, food supply lines might get discontinuous, and individuals might be forced to escape to areas wherever there is no access to food. Moreover, the safety of whatever food is there is also affected, leading to a bigger risk of epidemics due to foodborne diseases.

Food insecurity threat doesn't solely apply to the damage of food reserves and food systems, but also harm to the means of living and livelihood assets of individuals. The results of natural disasters, namely, earthquakes, floods, and drought, have the potential to last for a protracted time. Damage to infrastructures badly affects individuals' sources of livelihoods like land and agricultural inputs, livestock, and roads undermine people's food security.

Challenges and Key Environmental Issues

Some of the Key Environmental Issues linked to Food, Nutrition and Livelihoods during disaster relief and response are described below:

- Generation of waste linked with food packaging (most often plastic and/or not recyclable).
- CO₂ emissions linked with transportation of food.
- Over-exploitation of natural resources linked to programmes aimed at income-generating activities.
- Deforestation linked to types of dry food distributed to beneficiaries that require significant amounts of fuel for cooking.
- Deforestation, CO₂ emissions and soil contamination linked to the distribution of unsustainably produced food items.

Opportunities for Sustainability in Food, Nutrition and Livelihoods

- Systematic consideration of energy-efficient solutions in food assistance programmes: Energy is undoubtedly the lost link in most of the food help

operations. The shortage of systematic thought of energy economical solutions by humanitarian actors usually results in an overreliance on wood for energy supply, resulting in native deforestation and consequently soil erosion. In relief and aid programs there is a need to select food items that need less energy to cook, significantly in countries with high pressure on wood.

- Promotion of locally purchased food: One important way to scale back the GHG emissions of food-related relief and aid is to push locally-purchased food to avoid shipping food and native buying should be promoted whenever it's possible.
- Promotion of sustainably produced food: The drive for greater cost efficiency can lead to authorities buying the cheapest produce, which often does not coincide with environmental sustainability.

Learning Objectives	Session(s) & Methodology
• To develop an understanding of Food, Nutrition and Livelihoods in context to Disaster relief and management. • To identify the key environmental issues in the sector. • To identify strategic interventions or entry points for sustainable FNS solutions.	• One session • PowerPoint presentation and Lecture • Question-Answer Session • Discussions
Enabling Units	
• Identifying challenges and opportunities for a sustainable approach in post-disaster Food and Nutrition relief.	
Guidance	Recommended Readings
• This learning unit should cover the unsustainability challenges in disaster relief along with opportunities to mainstream environmental sustainability, illustrated with appropriate case studies. • The trainer should encourage the participants to actively involve and share their experiences of dealing with such kinds of experiences on the field.	• Sphere Association. (2018). The Sphere Handbook: Humanitarian Charter and Minimum Standards in Humanitarian Response. Geneva, Switzerland. Retrieved from www.spherestandards.org/handbook • Inspire Consortium, Groupe URD. (2020). Environmental Footprint of Humanitarian Assistance-Scoping Review.

• Examples and case studies for mainstreaming environmental sustainability in disaster relief operations should be discussed and the participants should be encouraged to identify more case examples.	• Ainehvand, S., Raeissi, P., Ravaghi, H., & Maleki, M. (2019). Natural disasters and challenges toward achieving food security response in Iran. Journal of education and health promotion, 8, 51. https://doi.org/ 10.4103/jehp_256_18 • ADPC. 2015. Disaster Recovery Toolkit, Tsunami Global Lessons Learned Project. Retrieved from www.adpc.net/tgllp/drt
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Learning Unit C.4

Health

Background

Different consequences of disasters have been put forward by various researchers. Disasters can cause death of numerous individuals, high prices over time, great economic and political impacts, social and psychological disorders, destruction of infrastructure, damage to the residential houses, loss of properties, and customarily the disruption of social life in societies. Among these, the factors which damage people's health and lives are very important. Following a disaster, a significant number of individuals will require medical interventions and proper healthcare facilities as disasters impact the physical health of survivors with injuries, aggravating chronic diseases and decreasing access to health services. The chances of an outbreak are also usually more in emergencies.

In addition to increased morbidity, mortality and disability, emergencies could lead to severe disruptions of the health system. They interfere with health service delivery by damaging and destructing the health facilities, interrupting the health programmes, leading to the loss of health workers, and overburdening of medical services. A single emergency can set back development gains in public health and different sectors by decades.

Challenges and Key Environmental Issues

Some of the key environmental issues linked to the Health sector during disaster relief and response are described below:

- Clinical waste generated by hospitals, healthcare facilities and mobile clinics.
- The disposal and dumping of medical wastes are some of the major problems in terms of environmental degradation, resulting in soil, water and air contamination, that ultimately cause harm to individuals and also the ecosystems to which they belong.
- In several healthcare clinics, all medical and non-medical wastes are usually mixed and burned in open pits or in dangerous incinerators that don't meet desired standards. This leads to carbon dioxide and other toxins being discharged into the air, causing issues at each local as well as the global level (Fullerton, 2017).

- Likewise, effluent from hospitals and clinics can also cause an environmental hazard if not treated or disposed of properly, and again, several clinics don't have the required systems in situ.
- Another impact is the ecological damage caused by the widespread use of insecticides and spraying used in vector control. Despite its widespread use, a study (Bowman et al., 2016) raises concerns regarding the efficacy of spraying to reduce the incidence of dengue fever.

Opportunities for Sustainability in Health Sector

- To manage clinical waste, creating better use of pre-existing hospital safety assessment tools, complying with standards, ought to be created a priority.
- Developing strategies and SOPs for biohazard and medical waste disposal in camp/post-disaster emergency settings.
- Developing pre-disaster recovery plans cooperatively and comprehensively for the health sector might give a strategic model to focus the efforts of multiple stakeholders while considering environmental concerns.
- With increasingly fragile ecosystems and environmental degradation happening at an alarming rate and to address the concerns about efficacy and environmental impact of vector control, it's important that vector management solely be used wherever it's completely necessary and with smart proof of its effectiveness.

Box C.4.1 Case Study

The growing challenge of biomedical waste disposal in India

The COVID-19 outbreak has left its impact on the health, social, economic and environmental sector too. The vaccine has brought a ray of hope, but the absence of a strategy for disposing of COVID-19-related biomedical waste continues to be a threat.

Data released by the Central Pollution Control Board (CPCB) has shown that between June and December 2020, biomedical waste generated due to COVID-19 was 33,000 tonnes. The CPCB submitted a report before the National Green Tribunal in July stating that India generates 101 metric tonnes (MT) per day of COVID-19-related biomedical waste, in addition to 609 MT biomedical waste generated daily through other means.

Cities that witnessed a higher number of COVID-19 cases are currently facing a problem of used/contaminated personal protection equipment (PPE), masks, gloves, shoe covers, etc. either thrown in the open or dumped with household wastes. Despite proscribing PPE kits for medical professionals, several non-medical persons used them and disposed of them with regular garbage. They are currently posing an immense risk to the ecosystem.

Though the hospitals and COVID-19 care centres have protocols when it comes to waste segregation, the unscientific disposal of COVID-19 biomedical waste by corporations and private contractors remains worrisome.

There is no mechanism for tracking vehicles that carry biomedical waste, and no way to check if such waste is stored properly before incineration. Protective equipment's such as goggles, shoe covers are made up of plastic which is a threat to the environment in the long term. At the household level, COVID-19-related waste generated by those under quarantine is not separated whereas disposed of. Such contaminated waste is mixed with other household waste while garbage is collected (Ganapatye, 2021).



Figure C-6: Biomedical Waste in India

Source: Zee News

Learning Objectives	Session(s) & Methodology
• To develop an understanding of Health in context to Disaster relief and management. • To identify the key environmental issues in the sector. • To identify strategic interventions or entry points for sustainable Health solutions.	• One session • PowerPoint presentation and Lecture • Question-Answer Session • Discussions
Enabling Units • Understanding environmental issues linked to the Health sector in relief settings and identifying a subsequent approach for sustainable solutions.	
Guidance	Recommended Readings
• This learning unit should cover the unsustainability challenges in disaster relief along with opportunities to mainstream environmental sustainability, illustrated with appropriate case studies. • The trainer should encourage the participants to actively involve and share their experiences of dealing with such kinds of experiences on the field. • Examples and case studies for mainstreaming environmental sustainability in disaster relief operations should be discussed and the participants should be encouraged to identify more case examples.	• Ganapatye, S. (2021). COVID-19 The growing challenge of biomedical waste disposal. Retrieved from www.moneycontrol.com. • Singh, S. G. (2021, May). COVID-19 will place India's biomedical waste management under terrible strain. Down to Earth. Retrieved from https://www.downtoearth.org.in/news/waste/covid-19-will-place-india-s-biomedical-waste-management-under-terrible-strain-77714 • World Health Organization. 2019. Health Emergency and Disaster Risk Management Framework. Geneva.

Learning Unit C.5

Debris and Waste Management

Background

Disasters and conflicts usually generate massive quantities of waste which often hinders humanitarian access, cause environmental contamination and human health impacts. It also tends to overload the existing or standard waste management systems further and often hinder reconstruction efforts. In combination with a deficient level of preparedness among local governments and humanitarian actors on a way to handle the usually unforeseen waste and debris, these challenges are often also seen even long after the crisis has ended. Additionally, to the waste caused by the particular hazard or conflict, the humanitarian operations responding to a disaster conjointly tends to produce substantial amounts of waste, that if improperly handled can exaggerate the challenges.

Debris created in a disaster additionally poses significant challenges to relief and recovery operations and rapid return to normal. Disaster debris must be removed from roads, homes and public facilities before survivors begin the rebuilding of normal lives. Yet, in the haste to recover, disaster debris is disposed off improperly which can cause future hardships for the disaster-affected population.

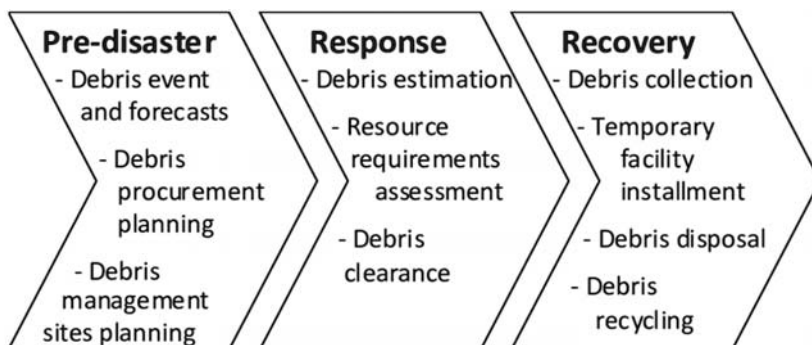


Figure C-7: Flow of Debris Management Operations throughout the Disaster Timeline

Challenges and Key Environmental Issues

Some of the key environmental issues linked to debris and waste management during disaster relief and response are described below:

- Uncollected building rubble from damaged buildings hindering access and constraining rehabilitation & reconstruction activities.

- Dumping in inappropriate areas and/or the proliferation of scattered dumpsites could cause potential human health and injury risks from dumpsites that are too close to the settlements, particularly from hazardous materials. Destruction of valuable land.
- Improper disposal of the waste has an impact on drinking water supplies and causes damage to valuable fisheries. Additional costs if waste must be moved later.
- Increase in disease vectors (flies, mosquitoes, rats, etc.). Risk of waste piles collapsing, fires and injuries and cuts from sharp materials, including used syringes.
- Uncontrolled dumping of healthcare waste from hospitals and clinics imposes serious health risks to the native populations including the spread of disease and infection, for instance from used syringes, along with odour issues.
- Asbestos sheet exposure in collapsed structures or re-use of asbestos for reconstruction creates health risks associated with inhalation.

Opportunities for Sustainability in Debris and Waste Management

- Pre-incident debris management planning ought to be done because it saves valuable time and resources; permits most efficient, effective, and environmentally responsible waste management decision-making throughout a disaster; encourages stakeholders to work together before a disaster occurs; boosts the community's resiliency and enhances the community's adaptation to the debris-related impacts of climate change.
- Pre-disaster planning additionally provides a chance to involve waste collectors from the start of the operation to make debris and waste management a high priority in response operations.
- Appropriate pre-disaster planning can support in creating performance measures and monitoring systems for waste management programs.
- Investing as much as possible in educating the community about types of waste and handling of waste. Strive to create a waste management culture starting from the household.

Box C.5.1 Case Study

Post-disaster Debris Management and Recycling in Italy

On the earth that struck a zone between Umbria and Marche, Italy, 70,252 buildings were damaged. More than 1580 demolitions were issued in the worst affected municipalities as these buildings were deemed unfit for reconstruction. The total amount of waste generated from the earthquake was estimated at 903,000 cubic meters, which included debris from demolished buildings and waste from reconstructed buildings. About 20-25% of the volume of the full building that was demolished was recovered as usable debris.

Post the collection, quantification and separation of debris, the following three years lead to the production of 189,362 cubic meters/year of recycled aggregates among which 55% was sold. The recovery rate of materials like inert materials and iron was ranging from 96%-98%. The collection and reuse of debris supported many entrepreneurial activities dedicated to recycling.

Such efforts were possible because of overarching policy directives, like the Regional Directive on Removal of debris, demolition of buildings and materials recovery 1998, which directed roles of authorities and targets for demolition and reuse. In addition to this directive, it was mandated by the region that municipalities must reuse at least 50% of the materials recycled from earthquake debris in the reconstruction of public and/or private civil works. The basis for such decisions was a far-reaching policy passed by the regional government in 1987 called the plan for waste management, which focused on the recovery of “mixed waste resulting from demolition”. The aggregates generated were typically used for road filling, railway ballast and armour stones for flood control.

Application in India: Using debris in reconstruction to promote disaster resilience, circular economy and resource efficiency.

Source: Gupta et al., 2019

https://www.nidm.gov.in/PDF/pubs/GGGI&NIDM_Position%20Paper_FINAL.pdf

Learning Objectives	Session(s) & Methodology
• To develop an understanding of Waste management in context to Disaster relief and management. • To identify the key environmental issues in the sector. • To identify strategic interventions or entry points for sustainable debris and waste management solutions.	• One session • PowerPoint presentation and Lecture • Question-Answer Session • Discussions
Enabling Units • Developing a comprehensive understanding of challenges linked to post-disaster waste management and identifying opportunities for sustainable solutions.	
Guidance	Recommended Readings
• This learning unit should cover the unsustainability challenges in disaster relief along with opportunities to mainstream environmental sustainability, illustrated with appropriate case studies. • The trainer should encourage the participants to actively involve and share their experiences of dealing with such kinds of experiences on the field. • Examples and case studies for mainstreaming environmental sustainability in disaster relief operations should be discussed and the participants should be encouraged to identify more case examples.	• Debris & Waste. (2021). Retrieved from Connecting Environment and Humanitarian Action (EHA): https://ehaconnect.org/themes/debris-waste/ • CARE International & ProAct Network. (n.d.). Emergency Shelter Cluster- Quick Guide Post-Disaster Debris Management. • (2019). Planning for Natural Disaster Debris. The United States Environmental Protection Agency (EPA). • Amato, A., Gabrielli, F., Spinozzi, F., Magi Galluzzi, L., Balducci, S., & Beolchini, F. (2019). Strategies of disaster waste management after an earthquake: A sustainability assessment. Resources, Conservation and Recycling. • Gupta, A.K., Gotmare, S., Nair, U., Babu, S., 2019. Green Growth Benefits for Climate and Disaster Resilience: Concerns for Urban and Infrastructure Systems. Position Paper, NIDM and GGGI, P 17.

Learning Unit C.6

Supply Chain Management

Background

In general, the emergence of a disaster causes significant requirements in terms of disaster response. This, in turn, necessitates planning, establishing and stabilizing adequate supply chains. This type of response is essential for making certain or, rather, re-establishing continuity of supply of basic wants to the affected population at the proper place as quickly as attainable.

Logistics/supply chain activities are considered as one of the biggest challenge in disaster relief operations. Disaster response supply chains are usually characterised by zero lead times, extremely unpredictable demand patterns, improper logistics and infrastructure facilities, unreliable information, and also the presence of alternate supply chains operating in parallel. Moreover, such supply chains typically are created from vast numbers of actors to provide disaster response efforts, having completely different motives, roles, mandates and work ways as well as origins, history, geographical, cultural and political backgrounds.

Challenges and Key Environmental Issues

- Many of the environmental and carbon impacts of the humanitarian sector are often linked to the logistical operations concerned with reaching those suffering from disasters with essential relief items.
- Negative impacts include carbon emissions linked to the transport of products and personnel, the manufacturing of disaster relief items and also the waste generated through their packaging, with a number of these impacts somewhat hidden, occurring long before a response and long after (e.g., suppliers' impacts, impacts from crop production).
- To address the needs of the affected population, relief items are mobilised immediately without due consideration to the environmental footprint of humanitarian aid.
- While logistics and the supply chain (procurement, transport, storage and delivery of humanitarian supplies) presents multiple and crucial entry points for greening, it often takes a backseat due to lack of institutional mandates or expertise.

Opportunities for Sustainability in Supply Chain Management

- **Preparedness:** Anticipating likely impact of disasters and having early warning systems, pre-positioned stock, infrastructure and expertise in place, to respond quickly and effectively (IFRC, 2018).
- **Localisation:** Shift towards local delivery and promote bigger reliance on local skills, expertise and supporting local production and markets.
- **Pooled resources:** By using pooling practices, duplication may be avoided and last-mile logistics - usually the most carbon (and financially) intensive – optimised
- **Procurement/life-cycle approach:** Ensuring essential household items provided as emergency aid are of appropriate quality is important step in reducing the environmental footprint of relief programmes, both at the local and global levels.
- **Packaging and waste management:** Disaster response leaves behind tons of plastic and packaging waste in areas that do not necessarily have the local waste management systems to deal with it. Having appropriate planning in place can reduce the waste from packaging.
- **The circular economy:** This concept helps orient approaches towards sustainably, meeting people's desires while at the same time aiming to relieve pressure on natural resources and ecosystems.
- **Carbon footprint of organisations:** One way to cut back carbon footprint is by offsetting it - carbon offsetting is the method of buying carbon credits equivalent to the carbon emitted of an organization.
- **Flight and fleet:** Adopting creative solutions to reduce carbon emissions of aviation and fleet.
- **Environmental Management Systems:** As greening logistics processes and the supply chain is such a comprehensive and cross-cutting means of addressing the environmental footprint of humanitarian operations, it's helpful to place in situ mechanisms that supports this approach. (Logistics Cluster, n.d.)
- **Support the development of a logistics standard:** Inspire Consortium is also conducting the study to facilitate a worldwide consultation method to analyse the utility of common principles and guidance to support smart practices in logistics.

Box C.6.1 Case Study

Greening IFRC supply chains

This project aims to map the current level of greenhouse emission (GHG) emissions generated by humanitarian relief operations of the IFRC, the potential for their reduction and to implement GHG reduction activities to lower the environmental impact of the emergency operations.

Existing relevant standards were identified, tools and best practices for managing the environmental impacts of humanitarian relief provide chains were analysed and compared with IFRC's current practices. The results and gaps were highlighted to inform recommendations for changes, along with required improvements.

What were the essential steps taken along the process to bring about this change?

Step 1	Scoping of the study, methodology and approach: Define the main relief items to be explored and the IFRC emergency supply chain designed.
Step 2	GHG analysis: Study of the greenhouse gas emissions of the main relief items used in disaster response and their impact along the supply chain from start to end in the three operations.
Step 3	Recommendation and reduction roadmap: GHG emission hotspots identified in the supply chain as well as main potential source of emission reduction in the life cycle of relief items.

Source: Greening IFRC supply chains; mapping our GHG emissions. (2017).
 Retrieved from IFRC: DRR in Action Case Study. Retrieved from https://media.ifrc.org/ifrc/wp-content/uploads/2018/08/CaseStudy_Greening-IFRC-Supply-chains.pdf

Learning Objectives	Session(s) & Methodology
• To develop an understanding of Supply chain management in context to Disaster relief and management. • To identify the key environmental issues in the sector. • To identify strategic interventions or entry points for the sustainable supply chain management.	• One session • PowerPoint presentation and Lecture • Question-Answer Session • Discussions
Enabling Units • Analysing post-disaster supply chain management for identifying challenges to the environment and ecosystems and proposing appropriate recommendations for sustainable supply chain management.	
Guidance	Recommended Readings
• This learning unit should cover the unsustainability challenges in disaster relief along with opportunities to mainstream environmental sustainability, illustrated with appropriate case studies. • The trainer should encourage the participants to actively involve and share their experiences of dealing with such kinds of experiences on the field. • Examples and case studies for mainstreaming environmental sustainability in disaster relief operations should be discussed and the participants should be encouraged to identify more case examples.	• Greening IFRC supply chains; mapping our GHG emissions. (2017). Retrieved from IFRC: DRR in Action Case Study: https://media.ifrc.org/ifrc/wp-content/uploads/2018/08/CaseStudy_Greening-IFRC-Supply-chains.pdf • Tandler, Sandra & Eßig, Michael. (2010). Disaster Response Supply Chain Management (SCM): Integration of Humanitarian and Defence Logistics by Means of SCM. • Inspire Consortium, Group e URD. (2020). Environmental Footprint of Humanitarian Assistance-Scoping Review.

MODULE D

Sustainable Disaster Recovery

Background

Countries deal with the negative impacts of an unprecedented amount of natural and manmade disasters, which causes extensive damage to communities and infrastructure. Natural disasters such as earthquakes, cyclones, and flooding cause destructive damage to the built environment. Reconstruction projects take years to repair the damage, and even longer to deliver improved resilience. Therefore, the objective of this training module is to investigate opportunities for improving sustainability in disaster recovery. Following a disaster, authorities need to perform numerous tasks very quickly, and many of these are to be performed simultaneously. It is therefore critical to plan for disaster recovery along with disaster response. The community cares about how quickly houses can be rebuilt, how soon the roads can be repaired, and when vital infrastructure will be replaced. Post-disaster reconstruction projects are therefore subject to compressed timeframes within an environment of close public scrutiny. Disaster reconstruction relies heavily on government grants, insurance companies, and donations to fund rebuilding projects. Due to various constraints (time, resources, financial) and political pressures, engineering and asset management aspects are often ignored when emergent disaster recovery projects are implemented. This kind of ignorance, in addition to irregularities in road asset recovery projects, results in negative internal and external effects for the community, economy, and environment.

Civil infrastructures are being devastated with increasing frequency by natural disasters. Responding to such events, and in anticipation of more regular and intense climate-change-induced events in the future, it's essential to review how post-disaster infrastructure recovery projects can best be planned and delivered. There is awareness that rebuilding such infrastructure requires sustainable strategies that address economic, environmental, and social dimensions. A comprehensive sustainability assessment framework for pre-and post-disaster situations can minimise negative impacts on communities, the economy, and the environment. Analysing such implications of disruptions to transport networks and associated services is an important part of the recovery and rehabilitation process following natural disasters.

Disaster and immediate post-disaster response are increasingly becoming an important area of study. Situational entrepreneurial endeavours proved to have a positive influence on regional development and country competitiveness.

Recovery from a disaster is thus primarily about :



- **Shifting focus from saving lives to restoring livelihoods**

When the recovery process begins, the aim is to build back better. This means rebuilding infrastructure and making it more resilient, in order to avoid the pre-disaster status quo. Restoring health, education and social protection systems, as well as livelihoods is also essential. This last component is essential to reactivate the economic, social and sustainable development of the affected groups, and can be accelerated by involving the private sector, academia and civil society.



Figure D-1: Rebuilding Houses and Livelihoods in Post-earthquake Nepal

Source: World Bank, 2018

- **Effectively preventing the recurrence of crisis situations**

When facing a crisis an active contingency planning process is what enables individuals, teams, organizations and communities to establish working relationships that can make a critical difference. Contingency planning is a process of developing strategies, arrangements and procedures to address the humanitarian needs of those adversely affected by potential crises.

- **Harnessing conditions for future development**

Disasters have tragic consequences, and people with the least resources at hand to rebuild their lives are often the worst affected. The traditional response to disasters is to provide immediate relief, without considering how the process of rebuilding lives and communities can be a positive opportunity for change. This opportunity can be facilitated in two ways: first, by having a clear understanding of how disaster survivors are not victims but agents for change; and second, by providing the tools and techniques to facilitate the change process. Therefore it's important to learn and harness the existing situations so as to have a sustainable solution that would lead to future development.



Figure D-2: Post Tsunami Community Members and Volunteers Working for Temporary Housing.

Source: Archer & Boonyabancha, 2011

- **Building on national capacities**

Capacity building is a process that equips officials, stakeholders and the community to perform their functions in a better manner during a crisis/disaster. In the process of capacity building, we must include elements of human resource development, i.e., individual training, organizational development such as improving the functioning of groups and organizations and institutional development.

- **Empowering communities**

The community is at the frontier of any kind of natural hazard and disaster. Empowering the community by internalizing the tools and methods of disaster risk reduction is a good way to deal with future potential risks. Community empowerment is a type of capacity development where its members decide on the goals and strategies for disaster risk management, contribute some, if not all, of the resources needed, and monitor their performance.

- **Determining/ addressing root causes and vulnerabilities**

Natural hazards can trigger an event to become a disaster, there are other factors that determine whether an extreme event will lead to a disaster and causes extreme impacts. Therefore, enhanced knowledge is needed on vulnerability as well as on those factors and causes that actually lead to vulnerability and unsafe conditions. Detecting and understanding root causes of disasters will help agencies to avoid rebuilding vulnerability and high risk conditions. Hence, we have to broaden the focus from the analysis of symptoms of disasters and visible fragile conditions towards the identification of root causes.

Environmental Impact of Disaster Recovery

Relief and recovery efforts affect the environment in a way that threatens human life, health, livelihood, and security. Failure to consider these risks weakens the recovery process and cause more damage to life, displacement, aid dependency and also increase vulnerability. To meet the recovery needs of affected areas, natural resources are required. Unsustainable use of these resources can create new risks. Sending humanitarian aid by air (which is costly) contributes to air pollution, scattering of hazardous chemical waste in the environment, using trees to provide fuel for survivors (to meet their basic needs such as cooking and staying warm) are

some of the harmful effects. In some cases, disposal of the remaining aids damages the environment and even some relief items which are outdated and eliminating contributes to pollution.

To protect the environment in times of recovery, environmentally friendly resources and solutions should be implemented. Available safe resources should be used to supply assistance for the survivors and the relief teams. For this purpose, an initial assessment of the quality, quantity and process of replacement of resources should be conducted. At the same time, educating the community about the importance of natural resources and optimized usage is necessary. A solution such as the use of renewable and clean energy sources such as solar energy, using low consumption stoves, better cooking methods, and quickly-made foods etc. shall be taught and made aware to affected communities. To manage waste resulting from relief and recovery operations, it is necessary to use products with the least amount of packaging, especially containers that can be reused or recycled. Products should be obtained from local or national markets so that the travelled distances and the amount of released carbon are minimized and usage of recycled material should be preferred, even required items should be obtained from local suppliers to support them directly or indirectly.

Challenges

- To ensure that the recovery response is demand-driven.
- To frame reconstruction in a sustainable development approach, thus avoiding the tyranny of rush.
- To avoid the danger of rebuilding previous vulnerabilities or creating new risks.
- Placing the recovery and reconstruction process in the development framework, combining long-term approaches with strategic, short- and medium-term interventions.
- To avoid ad-hoc recovery institutions turning into parallel government structures that overlap functions and mandates and bypass accountability and control mechanisms.
- Building national capacities as an intrinsic part of the recovery and reconstruction process.
- Formulating recovery and reconstruction programmes based on consensus and stakeholder participation.

- To reach the most vulnerable population, which can be best ensured by a long-term, participatory approach.

Need of Sustainable Disaster Recovery

When disaster recovery is carried out without consideration to the environment, the process of recovery leaves short-term benefits. Sustainable recovery is a mandate to allow the building of a resilient recovery approach. Sustainable disaster recovery works on the principle of “Build Back Better” where unlike earlier environment and ecosystem are considered equally important while planning recovery measures and strategies. Also, when disaster recovery eliminates the component of sustainability, nature appears to be a rival. Communities often fail to return to their pre-disaster condition, or worse, actions may increase their exposure to hazards, worsen economic conditions, damage natural systems, or exacerbate racial and ethnic tensions. Using Nature-based solutions to recover and adapt to natural disasters help communities in working with nature, instead of against it. Nature acts as a buffer against disastrous events, reduces the impacts and enhances resilience. Hence, the recovery process from a disaster should be sustainable and with due consideration to the ecosystem.

Training Module

This is an introductory training module on disaster risk management through integrated climate-proofing approaches. It encompasses the concepts of sustainable development, green growth, and environmental sustainability towards strategic management of disaster risks. The module is developed as an overview course for sensitization aimed at highlighting environment and disaster linkages and the need for integrating sustainable disaster recovery for improving environmental outcomes of disaster management strategies and intervention, particularly in post-disaster settings.

Four learning units are delineated under this module are:

LU-A.1: Infrastructure reconstruction

LU-A.2: Livelihood restoration

LU-A.3: Business recovery

LU-A.4: Ecosystem Recovery

Training objective

- To deliberate upon environment and disasters linkages in the context of reconstruction and sustainable development.
- To delineate strategic approaches for environmental concerns and sustainable disasters recovery.
- To enumerate the need and opportunities of sustainable approaches in the disaster management cycle.

Guidance

- Sharing of expectations from both sides - from the faculty/trainers and the participants is important, to start from and finally define the learning scope to be fulfilled by end of the module delivery.
- Other expectations regarding basic rules for participants, trainers, etc., to be communicated at the beginning of the course.
- The module is the introductory course that should be taken up in discussion mode to encourage greater participation from trainees making the discussion more open and interactive between trainer and participants.
- Case examples/ case studies drawn from past disasters highlighting the environmental outcomes of disasters would help in enriching the discussion.
- Documentaries or short films on Eco-DRR, EbA green recovery, green relief etc. would be useful.

Methodology

- Perception check questionnaire (or Q&A)
- Lecture/PowerPoint presentation
- Case study (preferably based on the film)
- Group exercises
- Discussion & Experience sharing

Learning Unit D.1

Infrastructure Reconstruction

Background

Reconstruction of infrastructure aim to restore the functioning of the existing structures and services or upgrade them to meet the needs. Construction on the other hand entails developing new infrastructure which was needed previously but was not provided or may be required as a result of the need generated by a newly settled population in the vicinity. To implement reconstruction programmes, a holistic and comprehensive approach to planning is required of which few are mentioned below.

- (i) Creating a framework for sustainable recovery.
- (ii) Reconstruction to be taken as an integral part of pre-disaster planning.
- (iii) Recognising the leading role of governments and addressing their need.
- (iv) Reconstruction must deliver enhanced disaster resilience.
- (v) Prioritising the interdependencies of infrastructure and enhanced protection of critical infrastructure.
- (vi) Delivering climate change adaptation and enhancing environmental system recovery.
- (vii) To recognise disasters as development opportunities.
- (viii) Assistance to be support for local communities and the private sector, not as are placement.
- (ix) Exploring a fresh approach to funding and financing reconstruction and recovery.

Challenges and Key Environmental Issues

LAND	• Reduction in % of carbon sinks, natural barriers to harsh wind & weather - due to deforestation. • Negative impact on natural soil structure, increased soil erosion and contamination - due to use of heavy machinery, land clearance and toxic material release respectively while infrastructure development. • Increased run off, reduction in water absorption and storage from land - due to hard landscaping. • Visual Barrier to the locals - due to infrastucture like telecommunication pylons or wind turbines. • Air, water and land pollution - due to use and transportation of heavy metals and organic pollutants.
ECOLOGY	• Destruction of natural habitat, biodiversity and impact on species population dynamics - due to change in land uses. • Environmental Degradation on-site and off-site - during construction, operation or decommissioning of an infrastructure project. • Reduced ability of natural environment, its habitat and species to adapt to climate change.
HYDROLOGY	• Additive demand of water supply creating water stress in the area - due to construction activities. • Contamination and alteration in properties of surface and ground water - during construction, operation or decommissioning of an infrastructure project. • Accidental leakages, spills and discharge of contaminating pollutants affect the water resources.
WASTE DISPOSAL	• Waste generation and mismanagement due to construction related activities. • CO2 release in activities like waste transfer, recycling, and disposal causing damage to the environment and threatning the health of the disaster victims and workers in the affected area.

Source: INTOSAI, <https://www.digar.ee/arhiiv/en/download/119591>

Opportunities for Sustainability in Infrastructure Reconstruction

Sustainable Reconstruction - Reconstruction activities that are guided in their planning design and implementation of the goal of sustainability. It states the notion that societies can plan and organise their economic political and social activities in a manner that will meet their needs and express their greatest potential in the present while preserving ecosystems biodiversity and natural resources for future generations.

A sustainable reconstruction undertaking should cover the following-

- **Technical sustainability**- The requisite skills can be introduced and passed on to others and the necessary tools are accessible to the affected population.
- **Institutional sustainability**- A structure to bring together the different stakeholders without for example needing to call on outside expertise on each occasion.

- Social sustainability- The overall process and product fits within and satisfies the needs of the society.
- Environmental sustainability -The chosen approach should avoid depleting natural resources and contaminating the environment.
- Economic sustainability - Money or service exchange can be accessed to pay for the work that needs to be done.

Reconstruction programmes generally involve a complex set of activities, including interactions amongst key players such as government agencies, local authorities and communities. Risk can be defined as a potential negative impact on an asset or project and/or some characteristic value that may arise from present or future events. Risk management is important because it ensures better and meaningful support to the targeted beneficiaries; in other words, better service delivery efficient use of available resources effective management of possible changes that take place development and management of contingency plans and maintenance of the planned activities reduction of waste and better value for money better management at all levels through improved decision making balance between time, cost, quality and results from better coordination with other programme partners.

Learning Objectives	Session(s) & Methodology
• Explanation of the terminology and interlinkage of sustainability in infrastructure reconstruction. • Understanding the concepts and little recommendations that can be followed for a sustainable approach. • Deliberate on the need for integrating sustainability concerns into post-disaster relief and response phases.	• One session • PowerPoint presentation and Lecture • Group Exercise • Question-Answer Session • Discussions
Enabling Units • Environmental degradation and disasters- causes, effects and need for environmental sustainability for climate and disaster risk resilience.	

Guidance	Recommended Readings
• This session intends to provide an understanding of infrastructure reconstruction and its inter linkages because of sustainability. The concept of sustainability and reconstruction from the perspective of disaster risk reduction should be discussed in brief. • The session as the first learning unit of the module should be taken up discussion model to allow trainees to share their experiences and opinions on the issues/concepts discussed during the session • Presentation and lecture should use infographics and case examples for setting the context for the next learning units of this module. • This session may include a group exercise and engage participants to develop a logical tree diagram for a particular disaster highlighting the possible impacts and consequences of the given disaster.	• https://www.dropbox.com/preview/Training%20Module/Module%204%3A%20Sustainable%20Disaster%20Recovery/Post-Disaster%20Community%20Infrastructure%20Rehabilitation%20and%20Reconstruction%20Guidelines.pdf?role=personal • PEDRR. (2010). Demonstrating the Role of Ecosystem-based Management for Disaster Risk Reduction. Partnership for Environment and Disaster Risk Reduction. • https://skat.ch/wp-content/uploads/2017/01/sustainableconstruction.pdf Sudmeier-Rieux, K. N., Nehren, U., Sandholz, S. and Doswald, N. (2019). Disasters and Ecosystems, Resilience in a Changing Climate - Source Book. Geneva: UNEP and Cologne: TH Köln - University of Applied Sciences.

Learning Unit D.2

Livelihood Restoration

Background

The livelihoods of people all over the world depend on goods and services provided by ecosystems: clean water and air, food, fuel and construction materials.

In an affected area development work aim to protect and reinforce livelihoods in such a way that people can become more resilient to hazards, and be better protected from them. This protection must come either through

- The strengthening of peoples 'base-line conditions (nutrition, health, morale and other aspects of well-being),
- Reinforcement of their livelihood and its resilience to possible hazard impacts;
- Peoples' efforts ('self-protection') to reinforce their home and workplace against particular hazards
- By access to proper support ('social protection') by institutions of government or civil society.

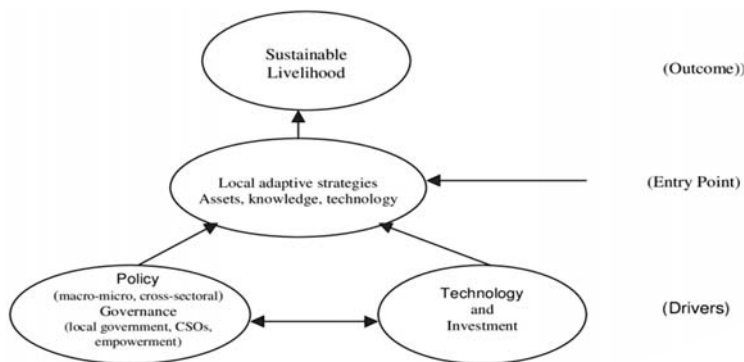


Figure D-3: UNDP's Approach to Promoting Sustainable Livelihoods

Source: Carney et al., 1999

Challenges and Key Environmental Issues

- Land issues- Difficulty in finding sufficient quality replacement land on rural resettlement projects at an affordable price. As we know globally, the land is becoming a more expensive commodity and this is more pronounced in resource projects where economic opportunities fuel an influx of migrants seeking work.

- Time frame- Intensification and the development of alternative livelihoods requires long-term support and associated funding. Support is often only provided for 3 years or even less whereas a 10-year timeframe would be more realistic.
- Vulnerable groups-The importance of women's livelihoods is often ignored with women being excluded from restoration programmes, resulting in their impoverishment. Therefore, projects must identify and support vulnerable households through the resettlement process and ensure that they are given additional support to benefit from the projected employment and economic opportunities.
- Limited guidance- There is limited guidance on restoring livelihoods on urban resettlement projects, which creates significant impacts considering the scale of urbanisation in developing countries. Poor urban households impacted by resettlement often live in low-quality housing without land titles and generally have low levels of education and skills.
- Lack of resources- Compensation alone is rarely sufficient for restoring livelihoods and in many cases results in impoverishment. Whereas benefit-sharing through project-related employment can improve livelihoods as part of an overall livelihood restoration and community development strategy.

Opportunities for Sustainability in Livelihood Restoration

Livelihoods and social protection are also influenced by social and political networks (including social and political capital), different groups may have access to different networks and sources of alleviation. These networks may have varying levels of cohesion and resilience in the face of hazards, and may also engage in rivalry and disputes, especially over aid and the recovery process. Some of the recommendations for sustainable livelihood restoration are:

1. Grassroots Level Governance Strengthening – In most cases, local government proves much more effective in helping communities recover their livelihoods as compared to state or national level developed strategies. So, capacity building and training can be given to local government and authorities about methods and ways to help people recover economically using locally available resources.
2. Business Development Strategies – Affected local communities can recover economically with the assistance of local organizations, leaders and experts. Business development at the community level using local resources with

financial and technical assistance can not only help affected people recover but also develop a sense of independence amongst them, thus making them resilient to future scenarios.

3. Inclusion of Women in the economic recovery process – Although typically livelihoods restoration policies attend to men, encouraging women into employment or business opportunities can boost the resilience at the individual, family and community level.
4. Capacity Building, Training and Skill Development norms and courses should be frequently provided to the communities often vulnerable to disaster impacts. Focus on economic recovery which is resilient should be given.
5. Innovative Funding Mechanisms and a dedicated Fund Allocation for the affected communities - Fund pooling through innovative techniques and reserved funds for the cause should not only secure the basic needs of the affected communities but also for assisting them in resilient business development using locally available, cost-effective opportunities/resources.

Box D.2.1 Case Study

2006 YOGYAKARTA EARTHQUAKE DISASTER

On the morning of Saturday 27 May, 2006, Yogyakarta and Central Java provinces in Indonesia were struck by a magnitude 6.3 earthquake (Resosudarmo et al., 2008). Due to the shallow depth of the earthquake and volcanic sediment structure of the local ground conditions,

the intensity of shaking resulted in severe damage to buildings, particularly in the housing sector (Elnashai et al., 2007). An estimated 350,000 residential buildings were damaged or destroyed, with the heaviest impacted areas in the regencies of Bantul, Yogyakarta province, and Klaten, Central Java province (Bappenas et al., 2006).

Livelihoods recovery programming after the 2006 Yogyakarta earthquake shortly after the earthquake, there was a significant response from the Indonesian government at all levels, international donors and humanitarian organisations, and individual/private donations. The largest contributor was the Indonesian central government which provided US\$570 million, followed by humanitarian organisations working under the UN cluster system (US\$175 million), and the multilateral Java Reconstruction Fund (JRF) created through US\$80 million in donations from the European Commission, the Netherlands, the United Kingdom, Canada, Finland, and Denmark.

The recovery programme included efforts to rebuild livelihoods and economic activities, although these programmes generally commenced later in the recovery period and received less funding compared to building reconstruction (Manfield, 2007; UN-HABITAT, 2008). As the majority of small-scale businesses were low-capital, home-based activities, household reconstruction efforts did provide some assistance in re-establishing entrepreneurial operations (JRF, 2007). A variety of government and NGO programmes were initiated in the months following the earthquake, with approaches varying in length, scope, and scale.

Although one- and two-year post-disaster assessments indicated that up to 95% of businesses had recommenced their operations in some form, most sectors experienced a decline in production and sales, with the exception of industries that supported reconstruction efforts (i.e. the furniture sector) (JRF, 2008; JRF, 2007; UGM & IRP, 2009). Two years after the earthquake, over half of affected enterprises were struggling to reach pre-earthquake production and income levels (JRF, 2008). This slower pace of livelihoods recovery attributed to the emphasis on building reconstruction, funding gaps for livelihoods rehabilitation and delays in implementing livelihoods programmes, as well as lower working capital among households in the region (JRF, 2008).

https://www.researchgate.net/publication/275062341_Livelihood_recovery_after_disaster



Figure D-4: Picture Depicting the Extent of Damage due to Earthquake in Yogyakarta

Source: Habitat for Humanity Indonesia, 2019

Learning Objectives	Session(s) & Methodology
• To develop a conceptual understanding of livelihood restoration and its essentials. • To deliberate on the need for integrating livelihood restoration and sustainability. • To understand and getting familiarised with a few of the basic challenges of livelihood restoration and efforts required to overcome those.	• One session • PowerPoint presentation and Lecture • Question-Answer Session • Discussions
Enabling Units • Sustainable approach for livelihood restoration, scope and approaches for operationalising it.	
Guidance	Recommended Readings
• This session should cover a description of the concept and scope of sustainable development in the context of livelihood restoration [Climate linkage]. The role of livelihood restoration in facilitating sustainable recovery strategies should be highlighted in brief. • The facilitator shall have adequate knowledge on similarities and differences among the three concepts: livelihood, its reconstruction and linkage of sustainability in link to climate proofing. • Presentation and lecture should use infographics and case examples for setting the context for the next learning units of this module.	• https://www.dropbox.com/ preview/ Training%20Module/Module%204%3A %20Sustainable%20Disaster%20Reco very/improving-livelihoods-after-disasters.pdf?role=personal • Klarin, T. (2018). The Concept of Sustainable Development: From its Beginning to the Contemporary Issues. Zagreb International Review of Economics and Business, 67-94. • Strange, T. & Bayley A. (2008). Sustainable Development: Linking economy, society and environment. OECD.

Learning Unit D.3

Business Recovery

Background

Natural Disasters or climate change-induced disasters of varying intensities are a frequent business in the world today. No business is immune from disaster. Every year, businesses temporarily shut down—or close forever—because of a disaster such as a flood, fire or hurricane. Forty percent of businesses do not reopen after a disaster and another 25 percent fail within one year, according to the Federal Emergency Management Agency (FEMA). Small Businesses face the worst blow.

Many businesses—especially small- and mid-sized organizations—neglect to develop a reliable, practicable disaster recovery plan. Without such a plan, they have little protection from the impact of significantly disruptive events. Disaster recovery planning for businesses involves strategizing, planning, deploying appropriate technology, and continuous testing. Through proper planning can minimize the interruption of essential business operations and expedite the recovery process, so that normal business operations can be maintained or quickly resumed after the disaster, thereby minimizing the negative impact.

Challenges

1. **Disruption to location-specific Businesses** – In the events of disaster, the recovery of businesses is most difficult for enterprises that are location-specific and dependent on the particular area, which is affected by disasters. Destruction caused by disaster destroys the area and makes the bouncing back of such entrepreneurs delayed or sometimes never. Ultimately, many small businesses have failed by the time the space is available for re-occupancy at their original locations. These businesses also face reduced patronage if they must move far from their previous locations.
2. **Prominent losses to Small businesses** – They are more physically vulnerable as mostly they are located in non-engineered buildings and are less likely to have the capacity to design and implement hazard management programs to reduce this physical vulnerability. At the same time as they face increased costs to repair structures and replace contents.
3. **Lack of Financial and Technical Assistance** – The absence of financial and technical resources and assistance makes businesses fail when disasters strike. Lack of funding to restore and incur damages result in temporary or

permanent shutdowns. Also, improper or no knowledge of developing resilient businesses in disaster prone zones keeps them always vulnerable to such recurring disasters.

4. Poor Governance –Lack of governmental regulations and policy supports, decentralized powers to local government, resilient plans and strategies for the economic stability of local business and sustainable recovery guidelines amplify the challenges for business recovery post-disaster.
5. Entrepreneur action - The ability of the entrepreneur to make swift decisions is vital in the early recovery of a business in crisis. The decision to resume business trading and operations requires decisive action that involves relocation, financial injection and new business model creation and adaptation.

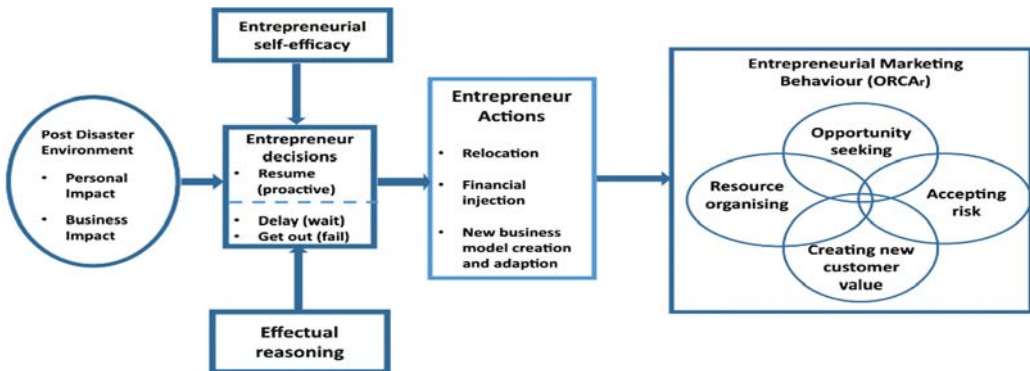


Figure D-5: Entrepreneurial Marketing Post-disaster Business Recovery Framework (EMPDBR)

Recommendations

The term “Building Back Better” has been increasingly and widely used in the context of the economic recovery from COVID-19. The notion originated in the context of recovery and reconstruction from physical disasters, with an emphasis on making preventative investments that improve resilience to, and so reduce the costs of, future disasters. The challenge of re-igniting the global economy in the aftermath of the economic crisis triggered by COVID-19 is of course different.

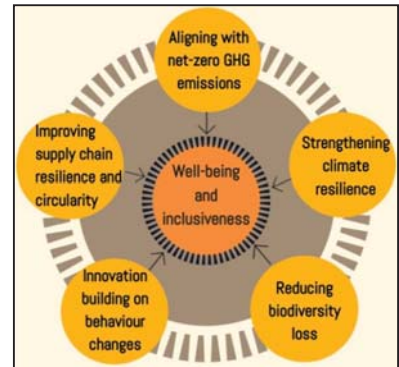


Figure D-6: Key Dimensions for Building Back Better

Yet the economic crisis is so severe, the risks from returning to previous patterns so high, and the opportunity to embrace a more sustainable recovery so clear, that the term is relevant in this context. Even at the global level, there is still an emphasis on prevention.

To “build back better”, recovery measures need to be assessed across several key dimensions. Common to all these dimensions there is a need for urgent decisions taken today to incorporate a longer-term perspective. For example, assessing measures can expose where competing potential targets for stimulus spending may offer similar near-term benefits in terms of job creation, but very different long-term outcomes for sustainability and resilience (for example, whether or not the stimulus leads to investment in long-lived high-emitting infrastructure that may lock-in GHG emissions far into the future) xiv.

Learning Objectives	Session(s) & Methodology
• To develop a conceptual understanding of business recovery and its affect especially on small scan businesses. • Understanding approach of BBB [Build Back Better] for addressing concerns. • To deliberate upon entrepreneurial aspect of the recovery of business in relation to sustainability.	• One session • PowerPoint presentation and Lecture • Activity and Group Exercise • Question-Answer Session • Discussions
Enabling Units • Integrated approach for Build Back Better.	
Guidance	Recommended Readings
• This session intends to state the need for green approach for managing disaster risk and highlight the possible areas of interventions across different phases of disaster-management cycle. The concept of Ecosystem-based Disaster Risk Reduction should be discussed in brief.	• https://www.dropbox.com/ preview/ Training%20Module/Module%204%3A %20Sustainable%20Disaster%20Reco very/document.pdf?role=personal • RECOVERY AND RECONSTRUCTION AFTER DISASTER Michael K. Lindell Texas A&M University, College Station, TX, USAIRFC. (2018).

• The module may include group exercise or discussion to encourage trainees to share experiences from their respective departments and sectors with respect to the issues/concepts discussed during the session • Case examples from different sectors of disaster response and recovery in context of environmental sustainability may be used in discussion to enrich the session. • Session may include small exercise on mapping stakeholders for planning and implementation of green disaster management strategies	• https://www.dropbox.com/ preview/ Training%20Module/Module%204%3A %20Sustainable%20Disaster%20Recovery/1-s2.0-S01482963 19302243-main.pdf?role=personal • Disaster Recovery - https://www.ibm.com/cloud/learn/disaster-recovery-introduction
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Learning Unit D.4

Ecosystem Recovery

Background

Ecological restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed through any means such as disasters, human activities, etc. Ecosystems are dynamic communities of plants, animals, and microorganisms interacting with their physical environment as functional units.

Box D.4.1 Definitions

Damage refers to an acute and obvious harmful impact upon an ecosystem such as selective logging, road building, poaching, or invasions of non-native species.

Degradation refers to chronic human impacts resulting in the loss of biodiversity and the disruption of an ecosystem's structure, composition, and functionality. Examples include long-term grazing impacts, long-term over-fishing or hunting pressure, and persistent invasions by non-native species.

Destruction is the most severe level of impact when degradation or damage removes all macroscopic life and commonly ruins the physical environment. Ecosystems are destroyed by such activities as land clearing, urbanization, coastal erosion, and mining.

Ecological restoration seeks to initiate or accelerate ecosystem recovery following damage, degradation, or destruction. It manifests through actions as varied as new mangroves, grass or other plantings, natural or assisted regeneration, agroforestry, soil enhancement measures, or improved and sustainable management to accommodate a mosaic of land, aquatic, or marine uses.

Any degraded ecosystem including agricultural areas, savannah, wetlands, protected wildlife reserves, fisheries, managed plantations, riversides, coastal areas and many others may offer opportunities for improvement through restoration. Ecosystem restoration could focus on re-establishing ecological integrity on a hillside or a seagrass bed to the large-scale landscape restoration of a plateau or mountain-range.

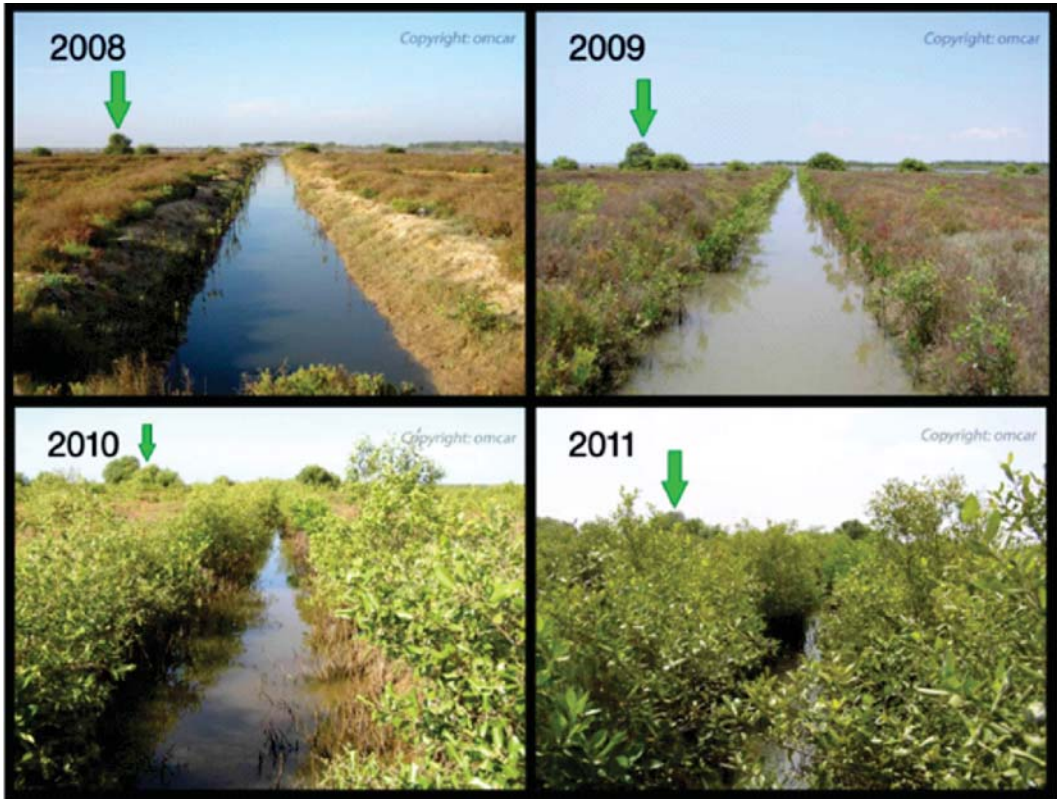


Figure D-7: Photo sequence showing Mangrove Restoration

Source: Society of Ecological Restoration

The UN General Assembly adopted a resolution proclaiming the UN Decade on Ecosystem Restoration 2021–2030.

The tangible benefits of the Decade can be viewed through the lens of the Sustainable Development Goals (SDGs) such as substantial Nature-based Solutions for climate change mitigation and adaptation, water and food security, poverty reduction, economic growth and biodiversity conservation.

Objectives of the Decade:

- To showcase successful government-led and private initiatives to halt ecosystem degradation, restore those ecosystems that have already been degraded.
- Enhance knowledge exchange on what works and why (policy, economics and biophysical aspects), and how to implement restoration at scale.

- To connect initiatives working in the same landscape, region, or topic, to increase efficiency and impact
- Create links between ecosystem restoration opportunities and initiatives with businesses interested in building a robust portfolio of sustainable production and impact investment
- Bring a broader spectrum of actors on board, especially from sectors that are not traditionally involved, by demonstrating the importance of ecosystem restoration to conservation as well as the generation of social and economic benefits.

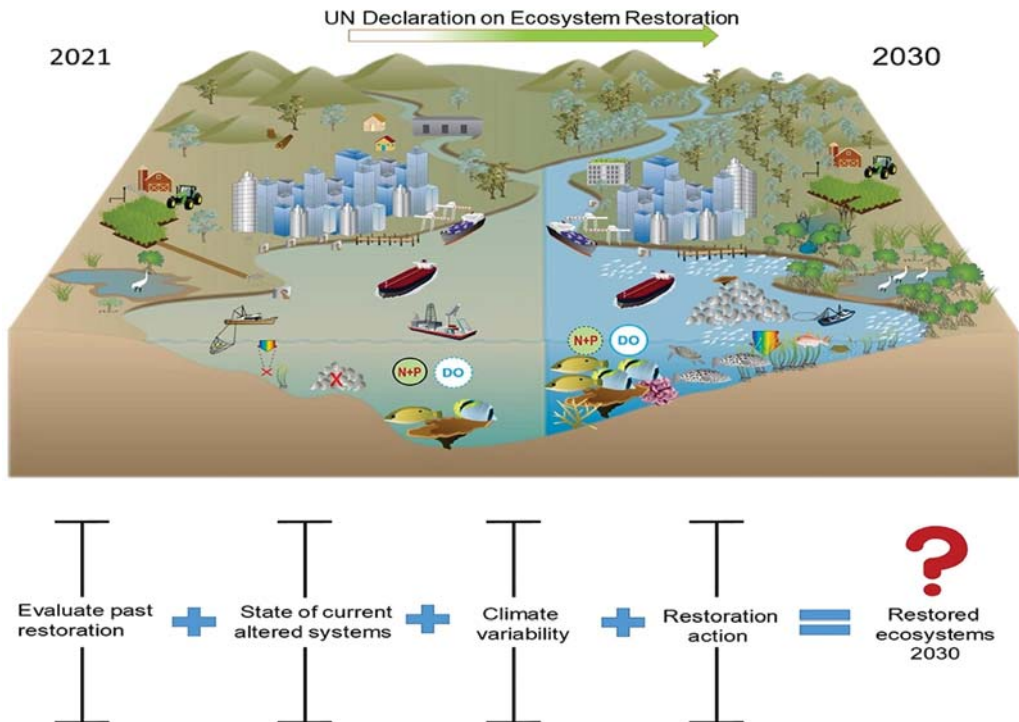


Figure D- 8: Current state of modified and impacted coastal ecosystems and expected state following the decade of restoration. Also, shown is the uncertainty in the success of past restoration efforts, current state of altered systems, climate variability, and restoration actions that are available now or on the horizon, could mean that delivering the Decade on Ecosystem Restoration for coastal systems needs to be viewed as a means of getting things going where the benefits might take longer than a decade.

(Source: <https://www.frontiersin.org/articles/10.3389/fmars.2020.00071/full>)

Challenges and Key Environmental Issues

We need to understand how a current ecosystem differs from the ecosystem that is under natural disturbance dynamics in terms of structure and function that helps in providing the basis for restoration activities. It is also crucial to realize which structures and functions of the natural ecosystems are feasible to restore, and which are beyond our capacity to restore for climatic, ecological, social or economic reasons. As some are easier to restore than others, we must be realistic about what we can and what we cannot do. For example, at a forest stand level it is fairly straightforward, even if expensive, to use prescribed burning to restore post-fire structures (e.g. burned living and dead trees) and processes (e.g. succession), but it may be unfeasible to restore the natural variability of fire regime at the landscape scale.

1. Lack of “Environment” as a Prime Consideration – Most plans and agencies do not consider the environment to any degree while preparing disaster recovery plans and strategies. This results in negative impacts on the environment and ecosystem.
2. Funding and external review – Availability of funding for environmental plans or sustainable recovery plans or ecosystem restoration post-disaster lacks as a component in most of the funding agendas. Also, the absence of technical external review is a challenge to sustainable restoration attempts.
3. Cross-sector communication and ownership of the environment remain a debatable obstacle for sustainable environment recovery planning.
4. Over-exploitation and degradation of the ecosystem and its components during the recovery of infrastructure, livelihoods and businesses often take place. Lack of prevention and monitoring mechanism enhances the degradation.
5. Incompetence in utilizing “Ecosystem-based DRR measures” as adaptation strategies to reduce the impacts of disaster results in greater impacts and exploitation of the ecosystem after the disaster during the recovery process.

Recommendations

- It may be essential to develop a socio-environmental plan that engages with existing traditional governance structures of host communities for the implementation of remediation and rehabilitation activities.

- To create opportunities for Community–Based Organizations (CBOs), Non-governmental Organizations (NGOs) and other organizations to participate in various aspects of the implementation of activities.
- Provide adequate information on bio-remediation processes to communities and build their capacity to support new protocols for remediation and rehabilitation activities.
- Enhance and utilize the inherent capacities of delta communities such as labour and traditional knowledge, for sustainable remediation and rehabilitation activities.
- During the implementation ensure that the communities will have adequately bought into the rehabilitation process so that SPDC can withdraw through a clearly defined exit strategy.
- Where feasible make the bio-remediation approach holistic by incorporating GMOU arrangements for effective community participation^{xvii}

Box D.2 Forest Fires as an Opportunity for Ecosystem Recovery

It is estimated that globally there are more than 2 million hectares of land in need of restoration. The fires that occurred in those places provided the people who manage them with an opportunity to change the previous bad forestry practices via a suitable process of ecological restoration. The actions to recover the environment after a forest fire must be directed toward favouring more resilient and less flammable natural vegetation that is better adapted to the new climate conditions it will have to live in.

Learning Objectives	Session(s) & Methodology
• Introduction of terminology and understanding the basic differences along with its relation sustainability. • Introduction and objectifying the UN decade of ecosystem recovery. • To deliberate upon key environmental challenges and gaps associated with different disaster response and recovery sectors.	• One session • PowerPoint presentation and Lecture • Activity and Group Exercise • Question-Answer Session • Discussions
Enabling Units	
• UN decade for ecological restoration.	
Guidance	Recommended Readings
• This session intends to state the need for ecosystem recovery because of sustainable disaster recovery. The concept of Ecosystem-based Disaster Risk Reduction should be discussed in brief. • The module may include group exercise or discussion to encourage trainees to share experiences from their respective departments and sectors concerning the issues/ concepts discussed during the session • Case examples from different sectors of disaster response and recovery in the context of ecosystem recovery may be used in discussion to enrich the session. • The session may include a small exercise on mapping stakeholders for planning and implementation of the topic.	• www.ser-rrc.org/what-is- ecological-restoration/#:~:text=Ecological%20restoration%20is%20the%20process,degraded%2C%20damaged%2C%20or%20destroyed.&text=Ecosystems%20are%20destroyed%20by%20such,%2C%20coastal%20erosion%2C%20and%20mining. • www.iucn.org/theme/nature-based-solutions/initiatives/decade-ecosystem-restoration • https://www.iucn.org/sites/ dev/files/ import/downloads/ndp_executive_summary_170113_final__2_.pdf • UNOCHA & UNEP (2014). Environment and Humanitarian Action: Increasing Effectiveness, Sustainability and Accountability. Geneva, Switzerland : UNEP/OCHA Environment Unit. • https://wedocs.unep.org/ bitstream/ handle/20.500.11822/22065/reducing_risk_recovery.pdf?sequence=1&isAllowed=y

MODULE E

Enablers for Green Relief and Recovery: Tools and Techniques

Background

Response and recovery activities have several impacts on the natural environment, typically with direct impacts on the future well-being of communities. By neglecting these aspects, there's a risk of putting communities at further risk and undermining longer-term resilience and development objectives. Once an understanding of linkages between atmosphere and disaster management is developed, it'll support in identifying the approaches or tools to deal with these challenges.

Box E.1 Case Study: Environmental Assessment

IFRC Bangladesh Population Movement Operation, 2017

An environmental specialist was deployed to carry out this assessment in Cox's Bazar, Bangladesh to identify the key environmental issues associated with the PMO and further suggest recommendations that can improve environmental outcomes for the ongoing operation.

From the initial assessment, the key environmental issues that were identified were:

- cooking fuel
- erosion and landslips
- water and sanitation
- solid waste management
- human-wildlife conflict

Deployment of such environmental specialists has the potential to improve the environmental outcomes of both the immediate and future responses to disasters and conflicts. The earlier and longer the deployment within the response and the more experienced the specialist the greater the benefits that are likely to be realised.

Source: Green Response: Environmental Assessment Report, IFRC Bangladesh Population Movement Operation. (2017). Retrieved from IFRC: https://media.ifrc.org/ifrc/wp-content/uploads/2018/08/Environmental-Assessment-Report_IFRC-Bangladesh-Population-Movement-Operation.pdf

Cyclical Linkages of Disaster Management and Environmental Management

There is a growing understanding of a cyclical link between managing the environment and disaster risk reduction. DRR policies have now begun to take into account environmental aspects, strategies and tools at every stage of the disaster cycle. Various environmental tools can be used in pre-disaster and post-disaster situations to identify the causes and risks for disasters (pre-disaster), and in assessing the damage and impacts of disasters on the local environment (post-disaster), informed response and recovery plan.

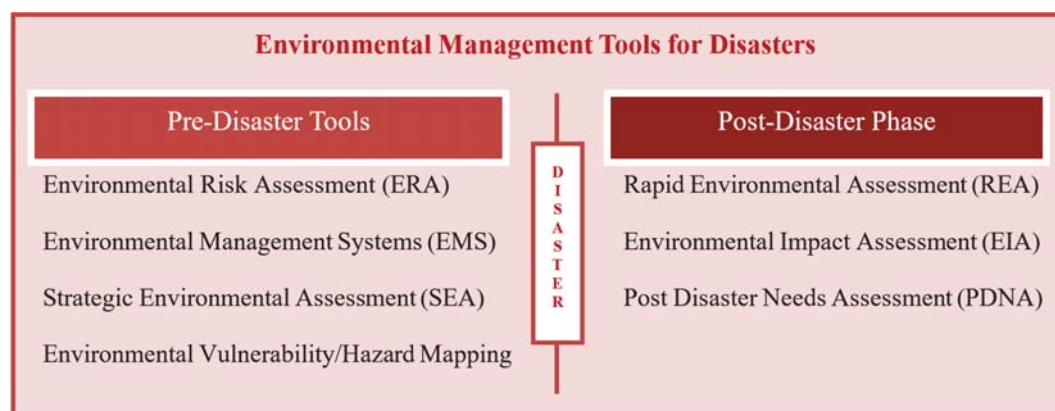


Figure E-1: Environmental Management Tools for Disasters

Pre-Disaster Phase

The pre-disaster approach to understanding the cyclical linkages of disaster management and environmental management focuses on aspects like global climate change, the importance of multilateral environmental agreements and underlining the importance of sustainable mitigation capabilities. Environmental management tools that can be used to understand and reduce disaster risks²:

1. Environmental Risk Assessment (ERA): ERA is a systematic analysis of the possibility of harm to the environment due to a natural disaster or anthropogenic activity. ERA can support in determining the situations of potential environmental concern and permit decision-makers to pick management choices with the least, and still acceptable level of risk.

²<http://www.gdrc.org/uem/disasters/disenvi/tools/pre-post.html>

2. Environmental Management Systems (EMS): EMS is a problem-identification and problem-solving tool to ensure environmental problems are managed systematically and consistently. EMS can support integrating and addressing environmental concerns in disaster management plans.
3. Strategic Environmental Assessment (SEA): SEA is a method to ensure that the impact on the environment due to disasters is identified, assessed, mitigated, communicated to decision-makers, monitored and that public involvement is ensured. It supports understanding the environmental consequences of pre-and post-disaster activities.

Box E.2 Case Study: Environmental Management Systems

The South Asian tsunami – long-term damage to coral reefs and degradation of mangrove swamps in some areas reduced the capacity of natural systems to absorb or cushion the kinetic energy of the tsunami surge.

Deleterious effects of degraded environmental conditions are felt most keenly (though not exclusively) by the poor, residents of shantytowns, “favelas,” and other marginal or hazardous areas. They are clustered on steep slopes subject to flash floods and erosion, in dwellings built of substandard materials, with poor water and waste disposal systems. Natural disaster effects can be greatly magnified by the poor environment in which these people live.

Source : <https://training.fema.gov/hiedu/docs/emt/labadie.doc>

Box E.3 Case Study: Strategic Environmental Assessment

In Bangladesh, for example, the National Adaptation Plan Action (NAPA) and subsequent design of flagship adaption measures were prepared through a forward-looking multi-stakeholder, multi-sectoral process. Available data indicated high levels of vulnerability to coastal hazards. A review of existing afforestation programmes demonstrated that they had limited success because local communities converted the sites to settlements or other uses. Combining these elements through the NAPA process, coastal afforestation was identified as a leading priority. And in designing coastal afforestation measures, planners recognised that success relied on identifying co-benefits in related areas, including livelihoods and disaster reduction. A new programme that integrates these elements is now under consideration. The United Nations Development Group/UNISDR Task Team on Disaster Risk Reduction has prepared guidelines for integrating disaster risk reduction into the Common Country Assessment and United Nations Development Assistance Framework.

The guidelines include examples of countries that have considered the disaster risk and vulnerability implications of UN development assistance. Other examples of good practices in multi-sectoral risk and vulnerability assessment linked to policy and programme design or can be found at <http://www.Preventionweb.net>, a website maintained by the ISDR Secretariat to provide ready access to a variety of technical resources for policymakers and practitioners working in the field of disaster risk reduction. While risk reduction work offers useful parallels to SEA, environmental considerations are generally underrepresented in risk and vulnerability assessments.

Source: http://content-ext.undp.org/aplaws_publications/1769941/SEA%20and%20Disaster%20Risk%20Reduction%20full%20version.pdf

4. **Environmental Vulnerability/Hazard Mapping:** A simple visual tool that identifies environmental assets of a populated area, along with the vulnerabilities and risks it faces. Vulnerability/Hazard Mapping supports collating environmental practices and issues, communicating environmental problems to the community, engaging them in environmental practices, and implementing action at the local level.

Box E.4 Case Study: Environmental Vulnerability/Hazard Mapping

The headwater catchment of the Xiapu River Basin in central China was selected as a pilot study area for flash flood hazard mapping. A conceptual distributed hydrological model was developed for flood calculation based on the framework of the Xinanjiang model, which is widely used in humid and semi-humid regions in China. The developed model employs the geomorphological unit hydrograph method, which is extremely valuable when simulating the overland flow process in ungauged catchments, as compared with the original Xinanjiang model. The model was tested in the pilot study area, and the results agree with the measured data on the whole. After calibration and validation, the model is shown to be a useful tool for flash flood calculation. A practicable method for flash flood hazard mapping using the calculated peak discharge and digital elevation model data was presented, and three levels of flood hazards were classified. The resulting flash flood hazard maps indicate that the method successfully predicts the spatial distribution of flash flood hazards, and it can meet the current requirements in China.

Source: <https://www.sciencedirect.com/science/article/pii/S1674237015000563>

Post-Disaster Phase

The post-disaster approach focuses on aspects like Rapid Environmental Assessment (REA) of damage to the environment, environment management and post-disaster restoration, waste management and assessing degradation, contamination and pollution. Some tools that enhance response and recovery to disasters are:

1. **Rapid Environmental Assessment (REA):** REA is used for rapid assessment and analysis of the environmental impact of any crisis or disaster. It allows for strategic and efficient response planning to mitigate environmental risks and also mainstream concepts like climate risk, resilience and environmental protection.
2. **Environmental Impact Assessment (EIA):** Process of EIA is used to predict the environmental consequences of any project or an event. It ensures that the potential issues are identified and addressed at an early stage. In a disaster context, EIA supports informed decision making facilitates by identification,

analysis and determination of potential environmental impacts and the identification of mitigation measures.

3. **Post Disaster Needs Assessment (PDNA):** The Post-Disaster Needs Assessment (PDNA) is an internationally accepted methodology for deciding the physical damages, economic losses, and prices of meeting recovery desires once a natural disaster is over through a government-led method. The Post Disaster Needs Assessment (PDNA) is the initiative towards developing a holistic recovery programme that promotes equity and inclusion. Environment as a cross-cutting sector in PDNA is discussed in detail in LU E.1.

Box E.5 FRAME Toolkit- Rapid Environmental Assessment

Framework for Assessing, Monitoring and Evaluating the environment in Refugee-Related Operations

This REA Guideline can assist agencies, Implementing Partner staff and communities to:

- compile relevant environmental information – baseline data – to allow informed decisions to be made and to establish the basis for future monitoring;
- analyse, summarise and prioritise environmental concerns of relevance to relief operations;
- identify environmental impacts that require immediate action; and
- identify environmental impacts that require further analysis and investigation, possibly by technical experts.

As such, the REA is a management tool that can influence decisions to the benefit of the environment – and ultimately the population of concern – by assisting decision-makers in prioritising activities and planning for future impacts of relief operations.

While an REA can highlight key environmental concerns in an emergency, prioritise them and influence discussions before actual implementation, its purpose is not to provide the definitive solution or identify needed actions to the concerns identified. It will, however, begin to provide the answers to some of the problems identified and the broad overview of the prevailing environmental situation it will create should allow more informed decisions to be taken. Equally important is the fact that an REA will also – from the outset of an emergency – identify environmental concerns that may require immediate action or further investigation. Prevention, being far better than cure, might therefore be enabled.

Source: <https://www.unhcr.org/4a9690239.pdf>

Box E.6 Sphere India's Joint Rapid Needs Assessment (JRNA)

Joint Rapid Needs Assessment (JRNA) is a post-disaster assessment tool adopted by Sphere India and its network to measure and quantify a disaster's impact on the community:

- JRNA identifies priority needs of the affected population.
- Provide approximate numbers of affected people.
- Identifies severely affected geographic areas.
- Mapping critical needs in the immediate aftermath of the extreme event.
- Provides general recommendations to inform strategic decisions on resource mobilization and response planning.
- JRNA assists authorities in making data-driven decisions.

Using environmental management tools to assess the risks of disasters give an extra layer of safety data that permits vulnerable communities to be better prepared and resilient.

Box E.7 Humanitarian actions that support climate and environmental sustainability

According to IFRC World Disasters Report 2020, some of the actions or strategies that can be adapted to support climate Action and Environmental Sustainability are described below:

1. **Establish a common approach across all organizations:** Definitions, standards, safeguards and reportage mechanisms to be established that successively permits tools, guidance and resources to be shared across the humanitarian sector. The common approach should also align with international sustainability industry standards and other humanitarian frameworks, standards and safeguards.

2. **Reduce our carbon footprint:** When assessing their environmental impact, all humanitarian organizations should include emissions from the humanitarian supply chain more accurately along with other established standards and parameters to improve environmental sustainability across their internal practices and programme delivery.
3. **Design climate-smart and sustainable response and recovery operations**
 - a) **Use environmental risk data to inform programming:** all development, disaster risk reduction (DRR) and humanitarian efforts should be supported by a sound risk analysis informed by present and future risks. This should include evolving risks and vulnerabilities and impacts of various response and recovery efforts.
 - b) **Mainstream climate and environmental considerations into existing processes and tools:** Identification of climate and environmental risks and mitigating measures and other environmental issues should be effectively integrated across existing processes and tools. This should be done in preparedness so that it can be effectively rolled out in response and recovery operations.
 - c) **Build capacity within the humanitarian sector:** Environmental specialists ought to be deployed to support response and recovery operations and also building capacity for environmental competencies of emergency response and recovery staff.
4. **Invest in local environmental capacities:** Local voices and communities should be included in discussions on strengthening the environmental sustainability of response and recovery operations. Local and native communities have an important role in environmental management and sustainable development and their experience should be brought in for all programs. Women's leadership should also be promoted.

Source: IFRC. (2020). World Disasters Report: Come Heat or High Water. Federation of Red



CHECKLIST FOR CLIMATE-SMART DESIGN OF RESPONSE AND RECOVERY OPERATIONS

- ✓ 1. Are camps and reconstruction sites positioned and planned with the changing local risks in mind – for example, in potential flood risk zones (new flood risk levels with climate change-induced extreme events)?
- ✓ 2. Are they set up to handle ever-increasing heatwave risks? For example, in the various camps managed by several agencies in the Middle East, how do they cater for vulnerable inhabitants' needs to stay cool and hydrated?
- ✓ 3. Are camps/refugee settlements established in wooded localities sensitive to local energy demand (wood fuel) that could lead to speedy depletion of forest cover (for example, the case of the Mantapala Refugee Settlement hosting thousands of Congolese refugees in Northern Zambia)? Is there a risk of inducing long-term variability of rainfall patterns?
- ✓ 4. Are camp management systems heeding early warnings to take early action in case of disaster, such as floods or heatwaves?
- ✓ 5. Are WASH facilities and water provisions able to handle water shortages in 'new extreme' drought scenarios?

Figure E-2: Checklist for Climate Smart design of response and recovery

Source: World Disasters Report, 2020

Training Module

This is the final module of the manual which focuses on Tools and techniques that can support in enabling sustainable disaster relief and recovery operations. This module also highlights cyclical linkages of disaster management and environmental management at both, pre-disaster and post-disaster phases. The module is developed as guidance to support climate and environmental sustainability in all humanitarian actions for improving environmental outcomes of disaster management strategies and intervention particularly.

The module has 4 learning units:

LU-E.1: PDNA

LU-E.2: CBA

LU-E.3: Ecological footprint

LU-E.4: Climate Finances

Training objective

- To deliberate upon environment and disasters linkages in disaster relief and recovery.
- To identify tools and strategically approached to address the cyclical linkages of disaster management and environmental management.
- To identify strategies to support climate Action and Environmental Sustainability in disaster relief and recovery.

Guidance

- Sharing of learnings from both sides - from the faculty/trainers and the participants is important, to ensure the learning scope is fulfilled by end of the module.
- Other expectations regarding basic rules for participants, trainers, etc. to be communicated at the beginning of the course.
- This learning unit should cover the strategic approaches that can be adopted in Disaster relief and recovery to ensure sustainable development.
- The module should be taken up in discussion mode to encourage greater participation from trainees making the discussion more open and interactive between trainer and participants.
- Case examples/ case studies drawn from past disasters highlighting the environmental outcomes of disasters would help in enriching the discussion.

Methodology

- Lecture/PowerPoint presentation
- Case study (preferably based on the film)
- Group exercises
- Discussion & Experience sharing

Learning Unit E.1

Post Disaster Needs Assessment (PDNA)

Background

In the aftermath of disasters, affected countries have to invest vital resources to handle the recovery needs of the community. The Post-Disaster Needs Assessment (PDNA) is an internationally accepted methodology for deciding the physical damages, economic losses, and prices of meeting recovery desires once a natural disaster is over through a government-led method. The Post Disaster Needs Assessment (PDNA) is the initiative towards developing a holistic recovery programme that promotes equity and inclusion.

The PDNA tool was developed by the international organization development cluster i.e. UN Development Group, the World Bank and the European Union as one of the key commitments of their 2008 agreement to develop and use common assessment and recovery planning approaches in post-crisis settings. The goal was to assess the full extent of a disaster's impact, outline the needs of the community for recovery, plan for a recovery strategy and guide donors' funding. A PDNA aims to restore damaged infrastructure, houses, livelihoods, services, governance and social systems and emphasizes reducing future disaster risks and building resilience.

PDNA–Environment (Cross-cutting sector)

The main objective of PDNA–Environment is to come up with a recovery strategy that guides the restoration of surroundings and natural resources damaged because of a disaster. This could additionally alter environmentally friendly reconstruction in all sectors. The recovery plan additionally supports the restoration of surroundings and natural resources as a disaster risk reduction (DRR) strategy.

Environment affects all sectors of economic and social activity. Hence the strategy employed PDNA Environment guidelines about those aspects of post-disaster effects and impacts which are not covered in other different sub-sectors. Because of the cross-cutting nature of the surroundings, the environment PDNA team should work closely with different sector groups, and additionally presumably participate in (or learn from) key consultations. Coordination with different sector groups is necessary to avoid repetition in calculating the consequences and impacts.

Box E.1.1 Key elements to assess the disaster effects on environment

- Environmental effects followed by the disaster and relief operations as well as potential environmental pressures caused from recovery;
- Response-related activities or coping mechanisms resulting from the disaster that can impact the environment or create new environmental risks;
- Factors which can have compact the access of stakeholders to environmental resources, notably vulnerable teams like women, indigenous people, and ethnic minorities with high dependence on natural resources for livelihoods;
- Impact of the disaster on institutional capacities for environmental governance;
- Underlying environmental drivers, such as environmental degradation that may precipitate or aggravate a future disaster;
- Opportunities to build back greener.

Source: Cross-Cutting Sector- Environment: PDNA Guidelines Volume B

Table 8: Common and Recurrent Natural Disasters and Some Environment-Related Consequences

TYPE OF DISASTER	PRIMARY ENVIRONMENTAL IMPACT	SECONDARY IMPACT
Hurricane/ Cyclone/ Typhoon	• Loss of vegetation cover and damage to natural landscapes • Short-term heavy rains and flooding of inland • Mudslides • Saltwater intrusion to underground freshwater reservoirs • Damage to offshore coral reefs and natural coastal defence mechanisms • Waste (some of which may be hazardous) and debris accumulation • Loss of productive systems, e.g. agriculture	• Impact on wildlife habitat • Increased soil erosion • Soil contamination from saline water • Changed marine environment and its impact on coral reefs • Secondary impacts by temporarily displaced people

Tsunami	• Water pollution through sewage overflow • Saline incursion • Loss of coastal forest/plantations • Destruction of coral reefs • Marine pollution from backflow of wave surge • Soil contamination • Waste accumulation—additional waste disposal sites required	• Contamination of groundwater reservoirs • Coastal erosion and/or beneficial deposition of sediment on beaches/small islands • Secondary impacts by temporarily displaced people • Damaged infrastructure as a possible secondary environmental threat. e.g. tailing dams
Earthquake	• Damage to natural landscapes and vegetation Possible mass flooding if dam infrastructure is weakened or destroyed • Waste accumulation – additional waste disposal sites required	• Secondary impacts by temporarily displaced people • Damaged infrastructure as a possible secondary environmental threat, e.g. leakage from fuel storage facilities • Damage to industrial facilities resulting in a toxic release
Flood	• Water pollution through sewage overflow • River bank damage from erosion • Chemical releases from factories	• Secondary impacts by temporarily displaced people • Excessive siltation affecting marine biodiversity • Contamination of groundwater
Volcanic Eruption	• Loss of wildlife following the gas release • Toxic chemicals from an eruption • Lahars • Toxic ash	• Forest fires as a result of molten lava • Secondary impacts by temporarily displaced people • Secondary flooding should rivers or valleys be blocked by lava flow • Damaged infrastructure as a possible secondary environmental threat, e.g. leakage from fuel storage facilities

Landslide	• Damaged infrastructure as a possible secondary environmental threat, e.g. leakage from fuel storage facilities • Secondary impacts by temporarily displaced people	• Impacts associated with reconstruction and repair to damaged infrastructure (e.g. deforestation, quarrying, waste pollution)
Drought	• Loss of surface vegetation • Loss of species	• Increased migration • Loss of biodiversity
Epidemic	• Loss of species • Forced human displacement • Introduction of new species	• Loss of biodiversity
Forest Fires	• Loss of forest and wildlife habitat • Loss of biodiversity • Air pollution from smoke and haze	• Loss of ecosystem services • Soil erosion • Secondary encroachment for settlement or agriculture
Sand Storms	• Soil erosion	• Desertification

Source: Cross-Cutting Sector- Environment: PDNA Guidelines Volume B

Learning Objectives	Session(s) & Methodology
• To develop an understanding of the PDNA tool for recovery planning approaches in post-disaster settings. • To deliberate on the need for restoration of the environment and natural resources post-disaster. • To identify approaches and strategies that can be adopted to address post-disaster environmental concerns in PDNA.	• One session • PowerPoint presentation and Lecture • Question-Answer Session • Discussions
Enabling Units	
• Need assessment • Sphere Standards • Assessment tools	

Guidance	Recommended Readings
• This learning unit should cover the overview of PDNA tools and introduce guidelines for PDNA- Environment as a cross-cutting sector. • The trainer should encourage the participants to be actively involved and share their experiences of dealing with such kinds of experiences and challenges on the field. • Examples and case studies for PDNA, especially PDNA of the Environment sector should be discussed.	• Global Facility for Disaster Reduction and Recovery (GFDRR), World Bank Group, European Union, United Nations Development Programme (UNDP). (n.d.). Cross-Cutting Sector-Environment: PDNA Guidelines Volume B. Retrieved from https://www.gfdr.org/sites/default/files/publication/pdna-guidelines-vol-b-environment.pdf • Global Facility for Disaster Reduction and Recovery (GFDRR), World Bank Group, European Union, United Nations Development Programme (UNDP). (2017). The Post Disaster Needs Assessment: an overview. Retrieved from https://www.gfdr.org/sites/default/files/publication/PDNA%20-%20ACP-EU%20NDRR%20Focus%20Day%20presentation%20-%209%20June%202017.pdf • Sphere India JRNA Tools: https://drive.google.com/drive/folders/1qSZ57g4GGbNJ28yLchh_igvcU4kgMRWM?usp=sharing

Learning Unit E.2

Cost-Benefit Analysis (CBA)

Background

Cost-benefit analysis (CBA) is a tool that is employed by businesses, NGOs, and government organizations to estimate the efficiency of any project, compare all options, and efficiently comprehend the costs and benefits of a program or action. It consists of a collection of procedures for outlining and scrutinizing advantages and prices. The tool assists in identifying, measuring and valuing in financial terms the advantages and prices of a project.

Though CBA is a customary tool for assessing the economic potency of projects and policies, it is also being used in disaster risk management to support in determining whether preparedness activities in an area or a community before natural disaster provide considerable benefits that can reduce the need for costly response and recovery efforts after a disaster.

Box E.2.1 Case Study, Nepal 2010

Cost-Benefit Analysis for Community-Based Disaster Risk Reduction in Kailali, Nepal

The following project is undertaken by Mercy Corps Nepal and the Nepal Red Cross Society during 2007-09 in Kailali, Nepal. The aim was to help selected communities in the region address the adverse impacts of annual flooding. The study has two main outcomes: 1) analyse the cost-effectiveness of DRR measures via Cost-Benefit Analysis 2) propose a quantitative methodology to carry out the similar assessment in similar contexts. Data collection and analysing techniques include - social science research methods (structured surveys, field visits, and interviews) with a mathematical model and computer program called Community-based Sigmoid Exponential Disaster Risk (CSEDR).

Results - Benefit: Cost (B: C) ratios over one were found under a broad range of conditions and for a set of highly conservative assumptions. Using a rigorous and conservative estimate, the project yielded a B:C ratio of 3.49. This means that for every Euro spent, there are 3.49 Euros in economic benefits. These benefits represent the prevention of economic losses or the avoidance of otherwise necessary humanitarian assistance. This B:C ratio does not include the important qualitative benefits of the DRR programming like benefits associated with increased social cohesion, education, empowerment, saved lives, and indirect impacts on economic capital, but they were considered in the qualitative

analysis. The final B:C ratio would have certainly been significantly greater if these qualitative factors were also considered.

The inference from the study was that a similar level of DRR programming in a community prone to similar types and intensity of hazard can expect benefits from DRR measures to around 3.49 times the cost of implementation of these DRR measures.

Source: https://www.preventionweb.net/files/15620_mccbareportfinal20102.pdf

Benefits of Cost-Benefit Analysis of Disaster Risk Management

Natural disasters are affecting more of the world's population, and are projected to increase in severity and intensity under climate change. The cost of disasters, both in terms of lost GDP as well as spending on relief and rehabilitation, is significant. Investment in DRR is, however, limited. CBA is an appropriate method for the assessment of the economic efficiency of DRR measures. It provides a decision-making tool for comparing scenarios with or without DRR in place. The tool assists in identifying, measuring and valuing in monetary terms the benefits and costs of a project. A favourable CBA result for a DRR measure can be a strong argument for investment. Furthermore, CBA is an established and proven tool in public decision-making processes and in some countries, for example, Germany, it is a statutory requirement. From an economic perspective, the implementation of a DRR project only makes sense when there is a sufficiently high risk of potentially harmful events in the analysis period. Initial research suggests that DRR measures often bring greater benefits than the costs they incur, but this may vary significantly depending on factors such as the type of disaster, the country concerned and the DRR measures employed.

Learning Objectives	Session(s) & Methodology
• To develop a conceptual understanding of CBA as a tool for decision making. • To deliberate on the need of integrating DRR in CBA to minimise the impact on the environment.	• One session • PowerPoint presentation and Lecture • Question-Answer Session • Discussions
Enabling Units	
• Estimation and costing • Calculating tools	
Guidance	Recommended Readings
• The trainer should encourage the participants to actively involve and share their experiences of dealing with such kinds of experiences on the field. • Examples and case studies for integrating CBA in Disaster Risk Management should be discussed. • The module may include group exercise or discussion to encourage trainees to share experiences from their respective departments and sectors concerning the issues/ concepts discussed during the session	• White, B. A. & Rorick, M. M. (2010). Cost-Benefit Analysis for Community Based Disaster Risk Reduction in Kailali, Nepal. Lalitpur: Mercy Corps Nepal. Retrieved from https://www.preventionweb.net/files/15620_mccbareportfinal20102.pdf • https://www.aktion-deutschland-hilft.de/fileadmin/fm-dam/pdf/publikationen/ADH_Studie_EN_rev3.pdf • https://www.preventionweb.net/files/15620_mccbareportfinal20102.pdf

Learning Unit E.3

Ecological Footprint

Background

The Ecological Footprint emerged as a response to the challenge of sustainable development, which aims at securing each one's well-being within planetary constraints. It sharpens sustainable development efforts by providing a metric for this challenge's core condition: keeping the human metabolism among the means of what the world will renew. Therefore, Ecological Footprint accounting seeks to answer one specific question: what quantity of the biospheres (or any region's) regenerative capability will any human action demand?

Hence, the ecological footprint measure helps -

COUNTRIES - improve sustainability and well-being

LOCAL LEADERS - optimize public project investments

INDIVIDUALS - understand their impact on the planet

What does the Ecological Footprint measure?

The Ecological Footprint measures the number of biologically productive land and ocean space an individual, a region, all of humanity, or human activity that vies for the biologically productive area. This incorporates manufacturing renewable resources, accommodating urban infrastructure and roads, and breaking down or absorbing waste products, significantly carbon dioxide emissions from fossil fuel. The Footprint then is compared to what quantity of land and ocean space is obtainable.^{xx}

Box E.3.1 Definitions

Biocapacity is shorthand for biological capacity, which is the ability of an ecosystem to produce useful biological materials and to absorb carbon dioxide emissions.

Overshoot, in this context, is shorthand for ecological overshoot, occurs when populations demand on an ecosystem exceeds the capacity of that ecosystem to regenerate the resources it consumes and to absorb its carbon dioxide emissions.

Calculation -

The Ecological Footprint of an individual is calculated by adding up all of the people's demands that vie for the biologically productive area, like cropland to grow potatoes or cotton, or forest to provide timber or to sequester carbon dioxide emissions. All of those materials and wastes are then one by one translated into a constant range of global hectares.

To accomplish this, the quantity of material consumed by that person (tonnes per year) is divided by the yield of the specific land or ocean space (annual tonnes per hectare) from that it was harvested, or wherever its waste product was absorbed.

The Ecological Footprint of a gaggle of individuals, like a town or nation, is just the total Ecological Footprint of all the residents of that city or nation.

EXAMPLE- Ecological Footprint of consumption (EFC) is calculated by adding to the ultimate Footprint value the Footprint embedded in locally produced products (EFP) and the imported products (EFI) and subtracting the Footprint of exported products (EFE), as in equation 1:

$$EFC = EFP + EFI - EFE$$

(Clean consumption= production+ importation- export)

Need and Benefits of Ecological Footprint as a tool in Disaster Management

Calculation of Ecological Footprint can be used as a tool for Greener Disaster Mitigation/Prevention and Disaster Relief/Recovery. How sustainable disaster prevention strategies are can be known by calculating the estimated ecological footprint for the mitigation strategies. Disaster Management Plans, policies, strategies or design level interventions proposed by institutions and organizations need to be along the path of sustainability and combating climate change. Otherwise, they can in turn contribute to unsustainable preventive methods leading to future chances of disaster occurrence. Similarly, disaster relief and recovery should be green and environmentally friendly. Ecological Footprint when used as a technique to calculate the consumption of natural resources during disaster relief and recovery stages, can provide us deeper insights into the sustainability factor of these interventions. Such insights help build a governance system comprised of government, organizations, experts, local communities focused on resilient mitigation, adaptation and recovery process, which will help in reducing the risk of future disastrous events and increase the capacities of the regions.

Limitations of the tool

- The tool just captures to what extent overall human demand is within the regenerative capacity of our planet. Different dimensions, like human well-being or environmental quality, are not taken into consideration.
- Predictive analytics is not taken into account. Ecological Footprint merely record inputs and outputs as they're and provide no extrapolation on what proportion of bio capacity can be depleted by human activities within the future.
- Ecological Footprints calculations are strictly based on UN statistics. These statistics might not embody all consumption things like the impact of deforestation, soil depletion or water insufficiency on future productivity isn't captured.

Challenges

- Lack of “Environment” as a Prime Consideration – Most plans and agencies do not consider the environment to any degree while preparing disaster recovery plans and strategies. As a result, no attention is given to green and sustainable metric systems (like ecological footprint) to measure the impacts or drawbacks of existing relief and recovery operations under disaster management.
- Funding and external review – Availability of funding for sustainable disaster management operations tolls/techniques, environmental plans or sustainable recovery plans or ecosystem restoration post-disaster lacks as a component in most of the funding agendas. Also, the absence of technical external review is a challenge to sustainable restoration attempts. Donors typically don't have any resources to invest in green solutions. Hence, there is a chronic lack of funding for environmental initiatives (analysis and execution) in any respect at all stages of the programme cycle.
- Cross-sector communication and ownership of the environment remain a debatable obstacle for sustainable environment recovery planning. For some, putting up a solar panel is enough to justify that environmental consideration has been established into an operation. This ends up in scattered, stand-alone environmental projects that serve solely to distract from the larger need. There is little recognition of the environment as a life-saving priority, despite clearly recognising that people's immediate survival once a disaster goes is based upon accessibility of natural resources like water, wild foods, and wood for cooking, heating and shelter construction.

- Lack of institutional commitment: There is a lack of accountability and seemingly no intention to redress the situation i.e., environmental challenges—at all levels government agencies, humanitarian organisations and other stakeholders. There is also poor coordination at and between all levels, even among humanitarian responders.
- Over-exploitation and degradation of the ecosystem and its components during the recovery of infrastructure, livelihoods and businesses often take place. Lack of prevention and monitoring mechanism through measurement and regulatory tolls paves way for the degradation.
- Expertise Deficiency - Incompetence in utilizing “Sustainability Measurement tools/techniques and Ecosystem-based DRR measures” as adaptation strategies to reduce the impacts of disaster results in greater impacts and exploitation of ecosystem after the disaster during the recovery process.
- No Mandate in Humanitarian Organisations: Most of the agencies don't necessarily have the mandate to enforce the principle of environmental mainstreaming.

Table 9: Recommendations to Reduce Ecological Footprint
 – Sector Specific & Cross-Sector

SECTOR	RECOMMENDATIONS
Shelter and Settlement 	• Use of sustainable building materials and latest humanitarian innovative solutions. • Develop programs that are community inclusive and include various service-oriented strategies. • Develop easy-to-use tools to assess the sustainability of programs.
WASH 	• Sustainability of ground and surface water supplies and physical resilience of water and sanitation services must be ensured • Sustainable use of natural resources and source materials should be promoted for WASH infrastructure. • Wherever possible greenhouse gas emissions should be reduced for humanitarian relief activities, such as water trucking.

Food, Nutrition and Livelihood 	• Systematic consideration of energy-efficient solutions in food assistance programmes. • Promotion of locally purchased food. • Promotion of sustainably produced food.
Health 	• Better use of pre-existing hospital safety assessment tools, complying with standards, ought to be created a priority. • Developing strategies and SOPs for biohazard and medical waste disposal in camp/post-disaster emergency settings. • Developing disaster recovery plans. • Pre-incident debris management planning.
Debris & Waste Management 	• Create performance measures and monitoring systems for waste management programs. • Invest as much as possible in educating the community about types and waste and handling of waste.
Supply Chain Management 	• Anticipating likely impact of disasters and having early warning systems, pre-positioned stock, infrastructure and expertise in place, to respond quickly and effectively. • Reliance on local skills and expertise, and supporting local production and markets. • Ensuring essential household items provided as emergency aid are appropriate. • The Life-cycle of relief items should be identified. • Meeting people's needs while at the same time aiming to relieve pressure on natural resources and ecosystems. • Facilitate a worldwide consultation method to analyse the utility of common principles and guidance to support smart practices in logistics.

Learning Objectives	Session(s) & Methodology
• Understanding of the terminology and calculation methods for ecological foot print. • Familiarising with the challenges and way to respond such issue. • To deliberate upon the inter linkage of challenges and gap associated with different issues like global warming, carbon footprint, pollution, sustainability etc.	• One session • PowerPoint presentation and Lecture • Activity and Group Exercise • Question-Answer Session • Discussions
Enabling Units	
• Methodology for calculating the ecological footprint.	
Guidance	Recommended Readings
• This session intends to state the need for studying and reducing the ecological footprint. • The module may include group exercise or discussion to encourage trainees to share experiences from their respective departments and sectors concerning the issues/ concepts discussed during the session • Case examples from different sectors of disaster response and recovery in the context of ecosystem recovery may be used in discussion to enrich the session. • The session may include a small exercise on mapping stakeholders for planning and implementation of the topic.	• https://www.dropbox.com/home/Training%20Module/Module%205%3A%20Enablers%20for%20Green%20Relief%20and%20Recovery%3A%20Tools%20and%20Techniques?preview=Ecol • https://www.footprintnetwork.org/faq • https://www.footprintnetwork.org/faq • https://en.reset.org/act/reduce-your-ecological-footprint-0

Learning Unit E.4

Climate Finance

Background

Climate finance refers to native, national, or transnational financing, which can be drawn from public, private and different sources of finance. Climate finance is vital to addressing climate change because large-scale investments are needed to significantly reduce emissions, notably in sectors that emit large quantities of greenhouse gases. Climate finance is equally necessary for adaptation, for which important financial resources are equally needed to permit societies and economies to adapt to the adverse effects and cut back the impacts of climate change.

Historical Climate Finance (based on approvals)
(\$ million)



Figure E.4: Climate Financing by ADB (2005)

Need and Benefits of Climate Finance in Disaster Management

Climate finance presents a new opportunity to finance DRR. Climate Financing is a mechanism that helps to reserve sufficient funds or to develop an investment-revenue business model for climate mitigation and adaptation measures. Natural Disasters which are lately recognized as Climate change-induced disasters can be effectively managed to a great extent if climate financing is incorporated at multiple levels and in several domains. Disaster Management mainly incorporates Prevention (1), Response, Relief and Recovery stages. Disaster Risk Reduction mainly comprises Mitigation and Adaptation mechanisms. In all of these,

sustainable interventions with the assistance of financial resources can prove to be beneficial in reducing the risks and impacts and increasing resilience. Strong governing institutions and organizations with the help of financial experts can help communities develop business models associated with mitigation and adaptation, which can not only make them financially resilient but also over time reduce their vulnerability to disasters, and maybe over the long run reduce the chances of occurrence of climate change-induced disasters.

Challenges

- Development (financial) assistance for DRR and climate mitigation/adaptation is a small fraction of the total international aid finance.
- Financial Assistance from International Agencies mainly focuses on Disaster Preparedness (response, recovery, reconstruction, rehabilitation). Very little focus is given on Disaster Risk Reduction (Mitigation/Adaptation), research and development, regulatory norms and frameworks and strengthening of institutional mechanisms through capacity building and training, etc.
- Financial aid from developing countries mainly is focused on countries with high mortality risk, but poorer and drought-prone countries are inadequately represented.
- Inefficacy of National institutions, policies and plans to be efficient for an effective and financed DRR response through Climate Financing. Insufficient institutional arrangements, including unclear roles and responsibilities of different ministries.
- Insufficient technical processes and systems to identify and record climate finance receipts and expenditures.
- Lack of capacity to monitor different financial instruments.
- Limitations on the availability of private financial data
- Lack of transparency and predictability on the part of development partners contributing to climate finance
- Limited use by development partners of the developing country national systems and different administrative requirements by each development partner.

Recommendations

- Setting up an exclusive funding mechanism dedicated to climate-responsive and disaster risk reduction measures through international, national and regional level aids.
- Focusing the fiscal resources towards mitigation and adaptation interventions to ensure long-term resiliency, instead of just looking for short-term preparedness goals.
- Setting up a lucrative marketing strategy through policy measures to attract potential private sector investors in development that contributes to greater financial resilience against disasters. Both government and the private sector can invest to reduce loss and tackle risk at the same time.
- Sound data analytics and modelling mechanisms can be installed to allow decision-makers to make informed choices based on facts and objective understanding regarding climate finance.
- Knowledge Management & Global Partnerships can help to support stakeholders with information that will lead to and inform actions in support of building financial resilience.
- International agreements must provide strong signals that reinforce the reduction of disaster risk as a key element of sustainable development finance.
- Ensuring all new investments are resilient to disaster risk is an opportunity to reduce, rather than lock-in risk.

Learning Objectives	Session(s) & Methodology
• To develop an understanding of Climate Finance as a concept. • To deliberate on the needs and Benefits of Climate Finance in Disaster Management. • To identify strategic interventions for climate finance in disaster management.	• One session • PowerPoint presentation and Lecture • Question-Answer Session • Discussions
Enabling Units	
• Global Bank policies • Initiatives and funding for climate finance • CSR initiatives	
Guidance	Recommended Readings
• This session intends to state the need for climate finance in disaster management. • The module may include group exercise or discussion to encourage trainees to share experiences from their respective departments and sectors concerning the issues/ concepts discussed during the session. • Case examples for climate finance should be used in discussion to enrich the session.	• https://www.unep.org/explore-topics/climate-change/what-we-do/climate-finance • https://www.issueab.org/resources/18288/18288.pdf • https://data.adb.org/dashboard/climate-change-financing-adb • https://www.adb.org/news/infographics/climate-finance-2020 • https://data.adb.org/dataset/climate-change-financing-adb • https://www.adb.org/search?facet_query=sm_field_subjects%24name%3AClimate%20finance • https://www.undp.org/content/dam/undp/library/crisis%20prevention/disaster/Finance%20for%20reducing%20disaster%20risk-10-Things-to-know-report.pdf • https://www.worldbank.org/en/programs/disaster-risk-financing-and-insurance-program

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RECOVERY AND RECONSTRUCTION AFTER DISASTER Michael K. Lindell Texas A&M University, College Station, TX, USA

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About the Authors

Prof. Anil K. Gupta, Head - ECDRM, NIDM, Gol, New Delhi, India.

Dr. Eilia Jafar, Senior Advisor, Sphere India.

Ms. Shweta Bhardwaj, Junior Research Fellow, NIDM, Govt. of India, New Delhi, India.

Ms. Nupur Tyagi, Research and Development Coordinator, Sphere India.

Mr. Vaibhav Mahajan, Program Associate, Sphere India.

Ms. Riya Sethia, Research Associate, Sphere India.

Dr. Uzma Parveen, Research Associate, NIDM, Govt. of India, New Delhi, India.

Maj. Gen. Manoj Kumar Bindal, VSM, Former ED, NIDM.

Technical Support

Ms. Pritha Acharya, Research Associate, NIDM.

