Ecosystem-based Disaster Risk Reduction

Radhika Murti
Senior Programme Coordinator – Disaster Risk Reduction

IUCN Headquarters Gland, Switzerland
A Democratic Union Since 1948

Mission:
“To influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable”

www.iucn.org
**IUCN, a unique democratic union since 1948...**
International Union for Conservation of Nature

<table>
<thead>
<tr>
<th>Members</th>
<th>Commissions</th>
<th>Secretariat</th>
</tr>
</thead>
</table>
| • 1350 Members worldwide from over 160 countries  
  o States, Government agencies, NGO  
  o Over 60 regional and national committees | • 13000+ voluntary experts in 6 thematic groups: | • 1000 full time staff worldwide  
  • 350 temporary staff, consultants and interns  
  • HQ in Gland, Switzerland  
  • Over 60 offices around the world |
Tropical storms and flooding in Guatemala / Mexico following Stan, 2005
Mosaic landscaping for Fire Management - Lebanon
Coastal Forests of Japan

- helped in saving lives (people were able to hold on to the trees)

- rice paddies that were protected by the coastal forests were less damaged when compared to exposed paddies

- in specific cases the forests, hills and rocky cliffs contributed to changing the tsunami path, redirecting waves and reducing wave energy

- acted as filters for secondary debris (such as fishing boats)
Sanriku Fukko Reconstruction National Park

Natural Parks on the Pacific coast in Tohoku

- Tanesashi Kaigan Hashikamidake (Aomori Prefectural)
- Sanriku Kaigan
- Rikuchu Kaigan (National)
- Kesennuma (Miyagi Prefectural)
- Minami-Sanriku Kinkasan (Quasi-National)
- Kenjosan Mangokuura (Miyagi Prefectural)
- Matsushima (Miyagi Prefectural)
- Matsukawaura (Fukushima Prefectural)

(Services provided by MoE, Japan 2013)
IUCN’s Work on Eco-DRR - Knowledge Products/Evidence

Environmental Guidance Note for Disaster Risk Reduction
Healthy Ecosystems for Human Security
Karen Suidmolen-Rieus and Neville Ash
Revision Edition

Incorporating environmental safeguards into disaster risk management: a training module

NATURAL SOLUTIONS
Protected areas helping people cope with climate change

PROTECTED AREAS AS TOOLS FOR DISASTER RISK REDUCTION
A handbook for practitioners
Advice for disaster risk reduction specialists and protected area managers on how to use protected areas to safeguard communities against natural hazards from developing into catastrophic disasters
Nigel Boxley, Camille Buyck, Notnya Fiorito, Clare Hird, Natasha Moreau and Karen Statham-Bevan

Safe Havens:
Protected Areas for Disaster Risk Reduction and Climate Change Adaptation
Edited by Radhika Murli and Camille Buyck
Ecosystem Services

**ECOSYSTEM SERVICES**

- **Supporting**
  - NUTRIENT CYCLING
  - SOIL FORMATION
  - PRIMARY PRODUCTION

- **Regulating**
  - CLIMATE REGULATION
  - FLOOD REGULATION
  - DISEASE REGULATION
  - WATER PURIFICATION

- **Provisioning**
  - FOOD
  - FRESH WATER
  - WOOD AND FIBER
  - FUEL

- **Cultural**
  - AESTHETIC
  - SPIRITUAL
  - EDUCATIONAL
  - RECREATIONAL

**LIFE ON EARTH - BIODIVERSITY**

**CONSTITUENTS OF WELL-BEING**

- **Security**
  - PERSONAL SAFETY
  - SECURE RESOURCE ACCESS
  - SECURITY FROM DISASTERS

- **Basic material for good life**
  - ADEQUATE LIVELIHOODS
  - SUFFICIENT NUTRITIOUS FOOD
  - SHELTER
  - ACCESS TO GOODS

- **Health**
  - STRENGTH
  - FEELING WELL
  - ACCESS TO CLEAN AIR AND WATER

- **Freedom of choice and action**
  - OPPORTUNITY TO BE ABLE TO ACHIEVE WHAT AN INDIVIDUAL VALUES DOING AND BEING

- **Good social relations**
  - SOCIAL COHESION
  - MUTUAL RESPECT
  - ABILITY TO HELP OTHERS

Source: Millennium Ecosystem Assessment
Ecosystem Services for Resilience

Increase

Resilience to disasters and climate change

Social resilience
Ecological resilience
Healthy ecosystems
Sustainable use Conservation Restoration

Decrease

Ecosystem loss and degradation
Ecological vulnerability
Social Vulnerability
Economic, Political, Social Factors
Human activities Natural hazards and climate change
“Sustainable management, conservation and restoration of ecosystems to provide services that reduce disaster risk by mitigating hazards and by increasing livelihood resilience.”
(PEDRR, 2013)
Entry points for Ecosystem based DRR

Source: RICS (2009)
## Entry points for Ecosystem based DRR

<table>
<thead>
<tr>
<th>DRR cycle phase</th>
<th>The role of ecosystems</th>
<th>Tools employed by ecosystem managers that can contribute to DRR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Risk &amp; Vulnerability assessment</strong></td>
<td><strong>Risk &amp; Vulnerability assessment methods can:</strong>&lt;br&gt;  - help identify people's exposure to potential natural hazards;&lt;br&gt;  - identify the root causes of the hazard and whether they are related to Environmental Management;&lt;br&gt;  - Consider environmental dimensions or drivers of vulnerability: extent, quality and/or usage of natural resources and ecosystems;&lt;br&gt;  - Assess risk of ecosystem collapse;&lt;br&gt;  - Quantify the role of ecosystems for mitigation.</td>
<td>Qualitative (Participatory process):&lt;br&gt;  - CRISTAL;&lt;br&gt;  - CARE sCommunity Vulnerability Capacity Assessments (CVCA)&lt;br&gt;  - UNDP Vulnerability Assessment Guidance;&lt;br&gt;Quantitative:&lt;br&gt;  - IUCN Redlist of Ecosystems;&lt;br&gt;  - UNDP RVAMP - quantifying the role of ecosystems for mitigating impacts</td>
</tr>
<tr>
<td><strong>Disaster Risk Reduction and preparedness</strong></td>
<td><strong>Vegetation for stabilizing slopes;</strong>&lt;br&gt;  <strong>Wetlands &amp; floodplains to control flood;</strong>&lt;br&gt;  <strong>Mosaic landscape for fire management;</strong>&lt;br&gt;  <strong>Vegetation management for drought resilience;</strong>&lt;br&gt;  <strong>Mangroves, saltmarshes and sand dunes as buffers from storm surges;</strong>&lt;br&gt;  <strong>Provide climate change mitigation.</strong></td>
<td><strong>Integrated Coastal Zone Management;</strong>&lt;br&gt;  <strong>Integrated Water Resource Management (WRM);</strong>&lt;br&gt;  <strong>Integrated Fire Management;</strong>&lt;br&gt;  <strong>Protected Area Management;</strong>&lt;br&gt;  <strong>Community-based Natural Resource Management</strong></td>
</tr>
<tr>
<td><strong>Relief, early Recovery, and Reconstruction</strong></td>
<td><strong>Wetland restoration for improved flood mitigation, improved water quality, increased income from fisheries.</strong>&lt;br&gt;  <strong>Green recovery (GRRT) for humanitarian Ad.</strong></td>
<td><strong>Forest landscape restoration;</strong>&lt;br&gt;  <strong>Environmental Need assessment in post-disaster situation;</strong>&lt;br&gt;  <strong>Wetland restoration techniques</strong></td>
</tr>
</tbody>
</table>

*Murti and Buyck (2014)*
Protection Forests and Avalanche modelling
Chile
Swiss Snow and Avalanche Research Institute

Storm surges and Mangrove Restoration
Thailand
Mangrove Action Project

Stabilising slopes with vegetation for Landslides
China
CIRAD - INRA

Droughts, floods and salinization using vegetation regeneration and traditional practices
Burkina Faso & Senegal
Centre de Suivi Ecologique

Restoration of slopes and bioengineering for landslide and sediment runoff
Nepal
University of Lausanne
Collating scientific evidences from the field and credible documentation of Eco-DRR processes and impacts

Mainstreaming into relevant national and subnational policies, capacity development

Implementation of interventions through community action and partnerships

Science & Knowledge

Local

Governments
local communities
NGOs
research institutes
private sector

Practice

Global

Policy
Practice/Implementation
Community action for desalinization and floods (Burkina Faso)

Participatory vulnerability

Identification of priority disaster risks

Identification of local solutions
Burkina Faso

- 6 villages located in the 5 districts of the North region

- Vulnerability and Capacity Assessments + Promoting Local Innovations

- Key Vulnerabilities = drought and high temperature, floods, wind, desertification

- Innovations identified:
  - Soil restoration through Zaï and “cordons pierreux”;
  - Replanting for increasing the vegetation cover and restoring banks (erosion and silting)
Identification and Appraisal of Local Solutions

1) **Context of the innovation** (through a drawing, description etc.)
2) **History of the innovation** (through a timeline – see exercise 2-1)
3) **Characteristics of the innovation**

<table>
<thead>
<tr>
<th>Characteristics of the innovation</th>
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<tbody>
<tr>
<td>Technical</td>
<td>...</td>
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<tr>
<td>Social</td>
<td>...</td>
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<tr>
<td>Cultural</td>
<td>...</td>
</tr>
<tr>
<td>Ethical</td>
<td>...</td>
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<tr>
<td>Ecological (incl. Climate Change)</td>
<td>...</td>
</tr>
<tr>
<td>Economical</td>
<td>...</td>
</tr>
<tr>
<td>Others</td>
<td>...</td>
</tr>
</tbody>
</table>
### Example – Community’s Solutions from Burkina Faso

<table>
<thead>
<tr>
<th>Village</th>
<th>Innovations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basnéré</td>
<td>1. Soil Restoration</td>
</tr>
<tr>
<td></td>
<td>2. Reforestation</td>
</tr>
<tr>
<td>Tougou</td>
<td>1. Bank protection of the dam of Tougou</td>
</tr>
<tr>
<td></td>
<td>2. Recovering degraded lands</td>
</tr>
<tr>
<td>Birdininga</td>
<td>1. Soil Restoration</td>
</tr>
<tr>
<td></td>
<td>2. Sustainable management of water bodies</td>
</tr>
<tr>
<td>Ramdolla</td>
<td>1. Feed crops</td>
</tr>
<tr>
<td></td>
<td>2. Soil Restoration (Zai)</td>
</tr>
<tr>
<td>Sillia</td>
<td>1. Soil Restoration</td>
</tr>
<tr>
<td></td>
<td>2. Bank protection of the dam of Sillia</td>
</tr>
<tr>
<td>Tibtenga</td>
<td>1. Soil Restoration</td>
</tr>
<tr>
<td></td>
<td>2. Reforestation</td>
</tr>
</tbody>
</table>
Science, Knowledge, Advocacy
Nepal

• Sarangkot, Kaski, Tilahar, Parbat, Bhatkhola, Sjangya districts

• Project Activities
  – Bio-engineering sites along road sides, demonstrating “eco-safe” roads
  – Nursery activities for bio-engineering seedlings
  – Community awareness raising activities, including through involvement in implementation
  – Capacity development of local authorities and communities
  – Mainstreaming ecosystem-based approaches in policies related to road construction, land management and DRR

• Research Activities
  – Bio-engineering techniques and most suited species for climate change
  – Monitoring of bio-engineering using LiDAR equipment
  – Resilience and indicators
  – Links amongst out-migration, DRR, CCA and sustainable land management
Participatory Research for Local Context

I. Penna (2013)
Example – Policy brief based on Nepal Research

Ecosystems Protecting Infrastructure and Communities (EPIC) - NEPAL

Policy Brief

EPIC is a Global Project Involving six countries (Nepal, Chile, Thailand, Senegal, China and Burkina Faso). This project aims to demonstrate the multiple benefits and effectiveness of environmental management in a potentially important "Ecosystem-Based Disaster Risk Reduction (E-BDRR)" strategy in reducing climate-risks and enhancing resilience in rural communities especially through financial benefits in the field. Research by bio-engineering and risk analysis experts was combined with on-the-ground livelihood strengthening activities in selected vulnerable communities based upon good practices from work on EDRR and livelihood security. At the national level, IUCN worked with multiple stakeholders in advocating for greater considerations and investment in E-DRR activities, such as soil bio-engineering. This policy brief summarises key findings from the University of Lausanne (UNIL) research and suggests recommendations for greater mainstreaming of E-DRR, including greater uptake of the concept of "Eco-Safe Roads" in Nepal.

Project Duration: September 2012 to August 2017
Project Sites: Kaski, Parbat and Syangja Districts of Western Development Region, Nepal

Purpose

The main purpose of the project is to identify and quantify the role of ecosystems in protecting vulnerable communities against the risks associated with climate change and natural hazards. In Nepal, the project falls within the specific context of rural areas, exacerbating erosion and landslide risk in the Panchase area.

Context

- Rural earthen roads or "unmanaged roads" are constructed by communities themselves without any design, drainage or grading and environmental considerations and are commonly wiped out during heavy monsoon rains.
- Such roads require costly cleaning with heavy equipment and are a leading cause of erosion, shallow landslides, economic losses to agriculture, fields and forests.
- Instead, low-cost and environmentally friendly soil bio-engineering along roadways or "eco-safe roads" using local resources (e.g., locally available deep rooted grasses and low-cost civil engineering structures) can significantly reduce economic losses and environmental degradation.

Quick facts

- The number of rural earthen roads in Nepal increased from approximately 200 km in 1999 to over 4000 km in 2013/14.
- In Phewa Lake watershed, there were 179 erosion events recorded along 120 km of rural roads, amounting to 1.5 million cubic meters of soil released in the watershed.
- In Talivar village, the EPIC bio-engineering works reduced soil losses from 30 m³ in 2014 to less than 2 m³ in 2015.
- 135 community people trained by EPIC Nepal project.
- 10% of all road projects are prioritized for environmental protection (SOLDAP) policy but seldom implemented.
- 1 million NRS is an average budget for 1 km of bio-engineering roads versus 5 km of poorly designed roads in the Middle Hills.
- More than half of the allocated road budget in the Middle Hills area are used for clearing up rural roads before any monsoon season.

Figure 1: Illustration from Syangja district showing rural road which is migrating sub-landslide, threatening over 100 households. Credit: J. Perre, UNIL.

Figure 3: Phewa Lake Watershed study of land use changes 1979-2010 illustrates the 2016 road network and 174 landslides after July 29, 2015 rainfall event and the 14 landslides pre-existing landslides in 2014. Credit: M. Tonini and C. Vallet, UNIL.

Results

1. Gather empirical evidence on the value of ecosystem based approaches to landslide and erosion reduction through three pilot sites

- Three soil bio-engineering pilot sites were established in Western Development Region of Nepal. Syangja, Kaski and Parbat districts to demonstrate the effectiveness of low cost community based road-side bio-engineering in collaboration with each District Soil Conservation Office (DSCO). All three sites were designed, implemented and maintained in partnership with each community, using local knowledge of most appropriate plant species and techniques for low cost soil bio-engineering such as drainage and dry wall construction.

- Two studies document the role of rural earthen roads in contributing to increased erosion and landslides:
  - The first study completed in 2015 by UNIL documented over 179 erosion events along 120 km of roads surveyed (of 340 km), amounting to an estimated 100 m³ of soil released to the watershed each year along earthen rural road sides in Phewa Lake watershed.
  - A second study focused on land use changes in Phewa Lake watershed over 30 years documenting an increase in roads from 23 km in 1979 to 340 km in 2016. The study was ongoing when an intense rainfall event (315 mm) occurred on 24 hours on July 28-29, 2015, killing nine persons in the study area due to a landslide. As a result of this event, UNIL documented 174 landslides (as compared to 14 landslides before the event), of which 68 landslides were situated either at the top or bottom of a road.

- Quantifying the role of vegetation in reducing erosion rates:
  - Terrestrial LIDAR technology is a state of the art method for monitoring surface changes and vegetation growth. The three pilot sites were measured before any interventions were undertaken, then twice after the 2014 and 2015 monsoon seasons. Plantations were made in strips along the demonstration site road segments, with plants selected from the most common bio-engineering species, in consultation with each community.
  - Figure 4 illustrates the slopes in Talivar village before the bio-engineering interventions were installed, where about 30 m³ of soil were lost during the monsoon season in 2014. In 2015, the slopes were modified with a toe wall and planted with four different types of species. Results in 2016 demonstrate that soil loss was reduced to 1.6 m³ after the 2015 monsoon season. (Fig. 5), or a 95% reduction in erosion at this site.
## Cost Effectiveness

### Solutions? Economic costs of grey vs green roads

<table>
<thead>
<tr>
<th></th>
<th>Conventional earthen roads</th>
<th>Eco-safe roads</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average cost USDs per km</strong></td>
<td>8,000-15,000</td>
<td>15,000-20,000</td>
</tr>
<tr>
<td><strong>Initial construction</strong></td>
<td>17,500-30,000</td>
<td>5,000-7,500</td>
</tr>
<tr>
<td><strong>Annual maintenance in normal monsoon year</strong></td>
<td>30,000-50,000</td>
<td>10,000 – 20,000</td>
</tr>
<tr>
<td><strong>Annual maintenance with heavy monsoon</strong></td>
<td>41,250 – 70,000</td>
<td>12,500 – 40,000</td>
</tr>
<tr>
<td><strong>20 year maintenance cost</strong></td>
<td>49,250 – 85,000</td>
<td>27,500 – 60,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>49,250 – 85,000</td>
<td>27,500 – 60,000</td>
</tr>
</tbody>
</table>

+ Ecosystem benefits???

- Based on calculations from UNDP, 2011
*Out of 20 years it is assumed 5 years of extreme monsoon conditions
Senegal

- 6 villages in the Rural Community of Djilor (Fatick region)

- Vulnerability and Capacity Assessments + Promoting Local Innovations

- Key Vulnerabilities = floods, soil salinization, drought, erosion, water access and fishery

- Innovations identified:
  - Mechanism for regulating the exploitation of forest resources and fishery;
  - Anti-salt bunds built with local materials;
  - “Assisted Natural Regeneration” for conserving forest resources.
Zaï and Assisted natural regeneration
‘Fascines’ (Anti-salt bunds) and Gabions
Half-moons (Demi-lunes)
Mainstreaming, Policy Advocacy
Parallel Efforts for Multiple Levels

• Global
  – Convention on Biological Diversity (2014)
  – Ramsar Convention (2015)

• Regional Mechanisms
  – UNISDR regional platforms
  – Inter-governmental processes
  – IUCN Regional conservation forum
Collating scientific evidences from the field and credible documentation of Eco-DRR processes and impacts

Mainstreaming into relevant national and subnational policies, capacity development

Implementation of interventions through community action and partnerships

Practice

Policy

Global

Local

Governments
local communities
NGOs
research institutes
private sector

Science & Knowledge

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Collating scientific evidences from the field and credible documentation of Eco-DRR processes and impacts

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Science & Knowledge

Local

Governments
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research institutes
private sector

Implementation of interventions through community action and partnerships
Policy Frameworks and Synergies

• Inventory of upcoming national and sub-national policy reviews

• Inter-ministerial policy platforms, especially inactive platforms

• Local agreements and mechanisms – LMMA, private abandoned shrimp farms, etc.
### National and sub-national

<table>
<thead>
<tr>
<th>Country</th>
<th>Policy</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chile</td>
<td>The revision process of the national territorial planning for biodiversity and conservation</td>
<td>National</td>
</tr>
<tr>
<td></td>
<td>The national Plan for Adaptation to Climate Change in Biodiversity sector</td>
<td>National</td>
</tr>
<tr>
<td></td>
<td>Integration of hazard maps that promote use of protection forests for avalanche and rockfalls into the regional and local land use planning, in progress.</td>
<td>Local/ BioBio Region</td>
</tr>
<tr>
<td></td>
<td>Road management and planning</td>
<td></td>
</tr>
<tr>
<td>Senegal</td>
<td>Established a commission in charge of prevention and disaster risk management in the department of Foundiougne (in August 2015)</td>
<td>Local/ Department of Foundiougne</td>
</tr>
</tbody>
</table>
## National and sub-national

<table>
<thead>
<tr>
<th>Country</th>
<th>Policy</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nepal</td>
<td>Integration of eco-DRR into the new National Strategic Framework for Nature Conservation (NSFNC)</td>
<td>National</td>
</tr>
<tr>
<td></td>
<td>In 2014, the Department of Soil Conservation and Watershed Management drafted the National Watershed Management Policy Act based on the Eco-DRR pilot, EPIC project</td>
<td>National</td>
</tr>
<tr>
<td>Thailand</td>
<td>Established Marine and Coastal Resources Management Promotion Act</td>
<td>National</td>
</tr>
</tbody>
</table>
Multi-sectoral, multi-stakeholder, multiple levels!!
Multi-sectoral, multi-stakeholder, multiple levels!!
Lessons Learnt

• The need for capacity building, awareness raising and knowledge transfer – local to global levels, inter-ministerial, NGOs of DRR and conservation

• Actively bring together Ministries of Environment and DRR as they may not naturally interact with each other – building trust and establishing mutually beneficial opportunities
  – Territorial issues
  – Replicating rather than sharing mandates
  – Focus on hard infrastructure for which funding (even if loans) can easily be mobilised

• Use existing champions – IUCN focal points in Ministries of Environment
Lessons Learnt

• Strong national and sub-national policy engagement, otherwise challenging to scale up from pilot levels
  – Environment management can have a strong national focus (nationally assessed Redlist of Species, nationally designated Protected Areas) OR a very local approach – community based natural resource management
  – DRR can have multiple levels and especially sub-national, municipality, city/town council etc.,…levels which conservation has limited engagement with

• Climate change ≠ environment
  – Focus is on environment as a ‘problem’ due to CC, degradation, unsustainable development, species extinction, exploitation
  – Environment management is a solution
Ecosystem Services for Resilience

Increase

Resilience to disasters and climate change

Social resilience
Ecological resilience
Healthy ecosystems
Ecosystem loss and degradation

Decrease

Ecological vulnerability
Social Vulnerability
Economic, Political, Social Factors
Sustainable use Conservation Restoration
Human activities Natural hazards and climate change

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Gaps/Opportunities

• An Eco-DRR project design framework
  – Involvement of at least 2 Ministries
  – Conducting a social vulnerability and capacity assessment
  – Conducting an ecosystem risk assessment
  – Guidance to develop M & E

• An Eco-DRR Monitoring and Evaluation framework
  – Attribution versus contribution
  – Projected results in absence of an event
  – Projected results due to short project timeframes
  – Overall increased resilience of the local populations
Gaps/Opportunities

• A more comprehensive approach to DRR
  – Involvement of relief/recovery stakeholders
  – Links with early warning systems, evacuation and preparedness training
  – Capacity development in using weather predictions to plan farming practices

• Improving understanding of coping versus adaptation mechanisms
  – Being able to differentiate coping from adapting (short/long) and values of both
  – Establishing appreciation of benefiting in the future
What makes it different from other conservation approaches?

STORM SURGE AND FLOODING RISK

PROTECTED AREA
Scaling Up With Sendai Framework

ADVANCING IMPLEMENTATION OF THE
Sendai Framework for Disaster
Risk Reduction (2015-2030) through
Ecosystem Solutions
## Opportunities at Cancun

<table>
<thead>
<tr>
<th>No.</th>
<th>Title of Event</th>
<th>Date</th>
<th>Time</th>
<th>Location</th>
<th>PEDRR partner/s engaged</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Interactive session</strong>&lt;br&gt;“Views from the Frontline”</td>
<td>22/5/2017</td>
<td>13:30 -15:30</td>
<td>Expo Center 4</td>
<td>Global Network of Civil Society Organisations for Disaster Reduction (GNDR)</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Consultations and Preparatory Meeting</strong>&lt;br&gt;(PEDRR++other partners welcome)</td>
<td>22/5/2017</td>
<td>16:00-18:30</td>
<td>Expo Center 8</td>
<td>PEDRR - Fabrice Renaud (UNU) and Susanna Tol (WI) as focal points</td>
</tr>
<tr>
<td>3.</td>
<td><strong>Consultations and Preparatory Meeting</strong>&lt;br&gt;NGOs CSOs Preparatory Meeting</td>
<td>23/5/2017</td>
<td>11:30-13:30</td>
<td>Arena D</td>
<td>Global Network of Civil Society Organisations for Disaster Reduction (GNDR)</td>
</tr>
<tr>
<td>4.</td>
<td><strong>PEDRR side-event</strong>&lt;br&gt;“A fundamental shift in DRR: integrating ecosystem-based solutions with climate and development dimensions”</td>
<td>24/5/2017</td>
<td>13:30-14:30</td>
<td>Sunrise 10</td>
<td>UNESCO, UN Environment, Helvetas Swiss Intercooperation, UNU</td>
</tr>
<tr>
<td>5.</td>
<td><strong>Working Session</strong>&lt;br&gt;“Contribution of Science and Technology to Achieving the 2020 Sendai Target on National and sub-national DRR Strategies”</td>
<td>25/5/2017</td>
<td>11:15-12:45</td>
<td>Arena E</td>
<td>Global Fire Monitoring Center (GFMC)</td>
</tr>
<tr>
<td>6.</td>
<td><strong>Working Section</strong>&lt;br&gt;Ecosystem Protection, Management and Resilient Agriculture for Reducing Disasters Risks</td>
<td>25/5/2017</td>
<td>17:00-18:30</td>
<td>Arena F</td>
<td>UNISDR, PEDRR and other partners</td>
</tr>
</tbody>
</table>
Opportunities at Cancun

<table>
<thead>
<tr>
<th></th>
<th>Working Session</th>
<th>Date</th>
<th>Time</th>
<th>Location</th>
<th>Organizer</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>&quot;Cultural Heritage and Indigenous Knowledge for Building Resilience&quot;</td>
<td>26/5/2017</td>
<td>11:15-12:45</td>
<td>Arena E</td>
<td>Global Fire Monitoring Center (GFMC)</td>
</tr>
<tr>
<td>8</td>
<td>Side-event &quot;Technological Hazards: Engaging a New Community in DRR&quot;</td>
<td>26/5/2017</td>
<td>13:00-14:00</td>
<td>Expo Center 3</td>
<td>UN Environment</td>
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</tbody>
</table>
Thank You
Merci

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Tedx talk Radhika/DRR -
https://www.youtube.com/watch?v=AcHT6kJbVFM