Ecosystem-based Disaster Risk Reduction

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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"

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IUCN, a unique democratic union since 1948…

International Union for Conservation of Nature

Members

- 1350 Members worldwide from over 160 countries
  - States, Government agencies, NGO
  - Over 60 regional and national committees

Commissions

- 13000+ voluntary experts in 6 thematic groups:

CEM

CEC

CEESP

WCPA
WORLD COMMISSION ON PROTECTED AREAS

Secretariat

- 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

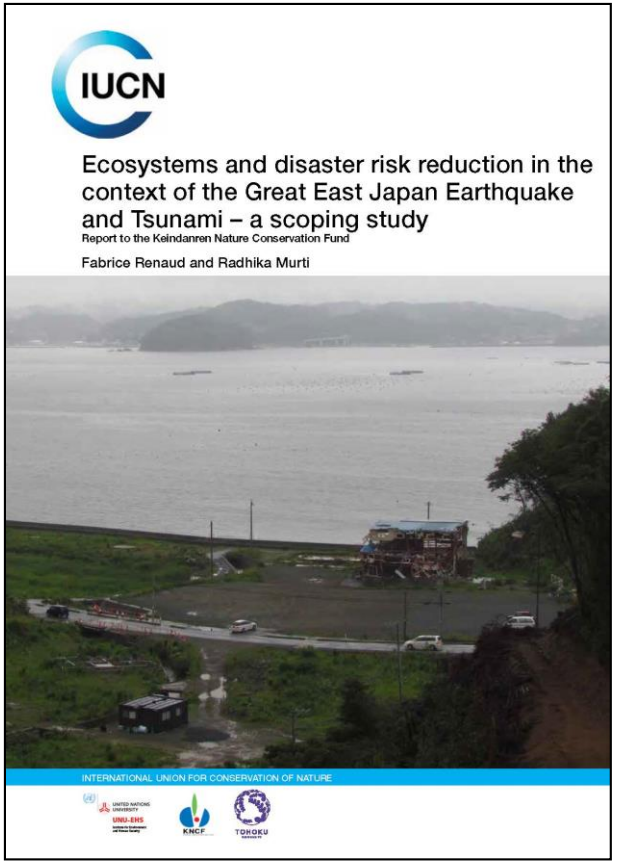
Coastal Forests of Japan

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

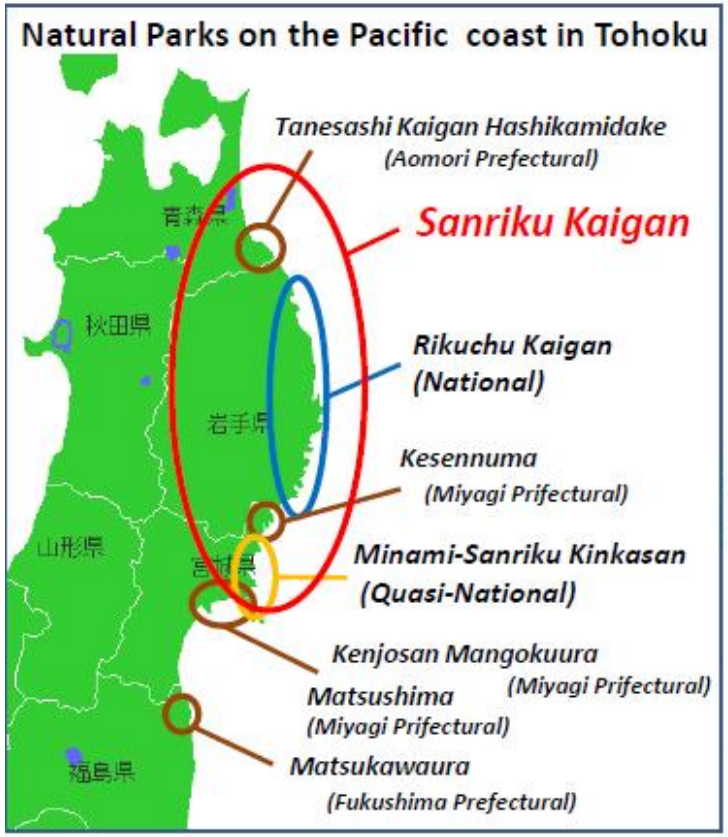
- rice paddies that were protected by the coastal forests were less damaged when compared to exposed paddies

- 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)

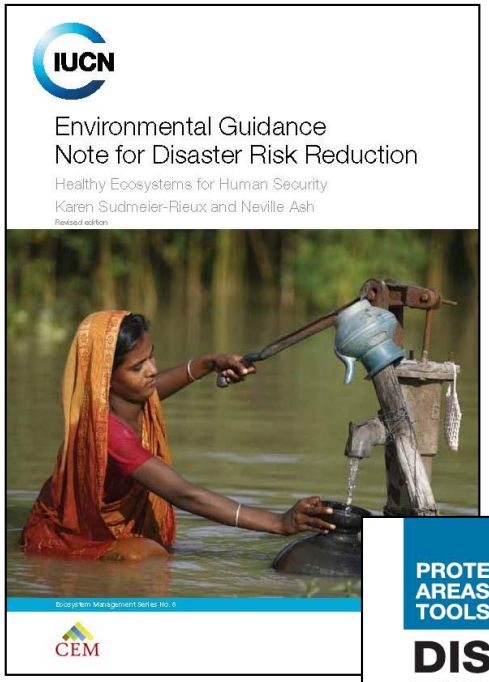


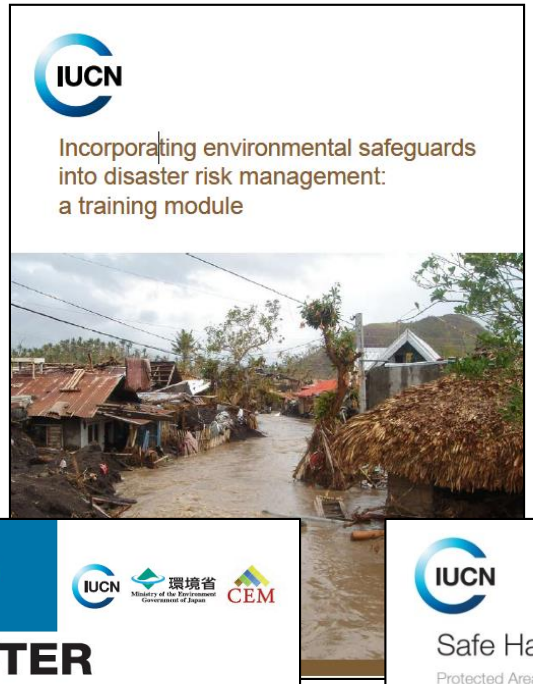
Sanriku Fukko Reconstruction National Park

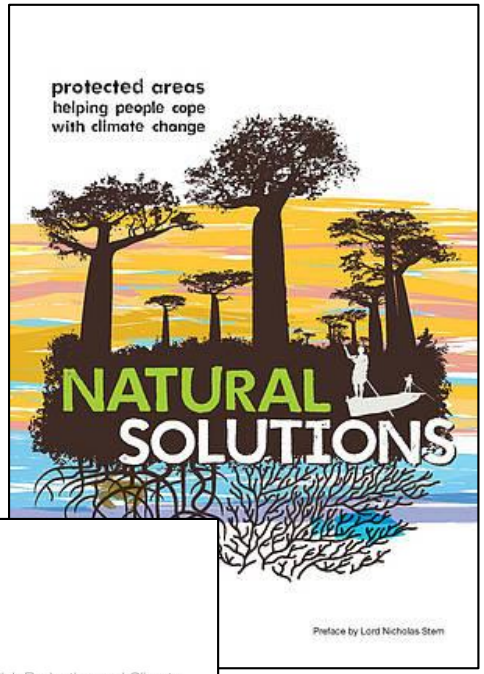


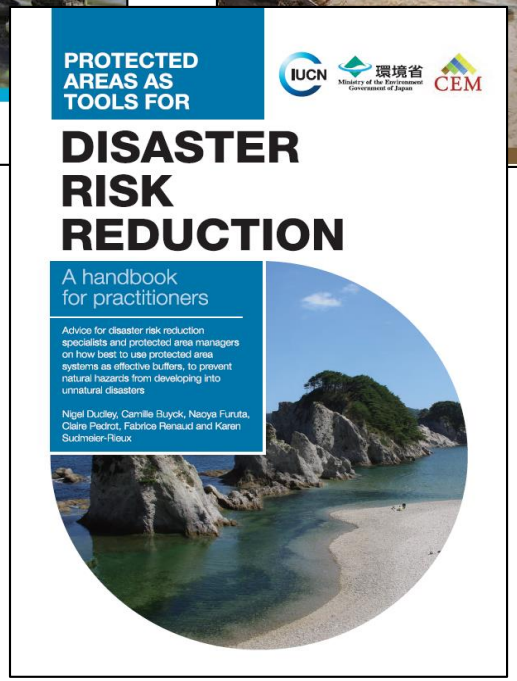
(MoE, Japan 2013)

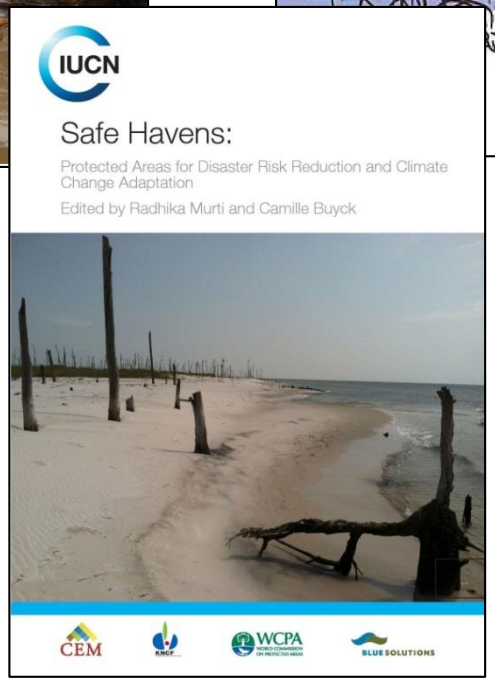
IUCN's Work on Eco-DRR - Knowledge Products/Evidence



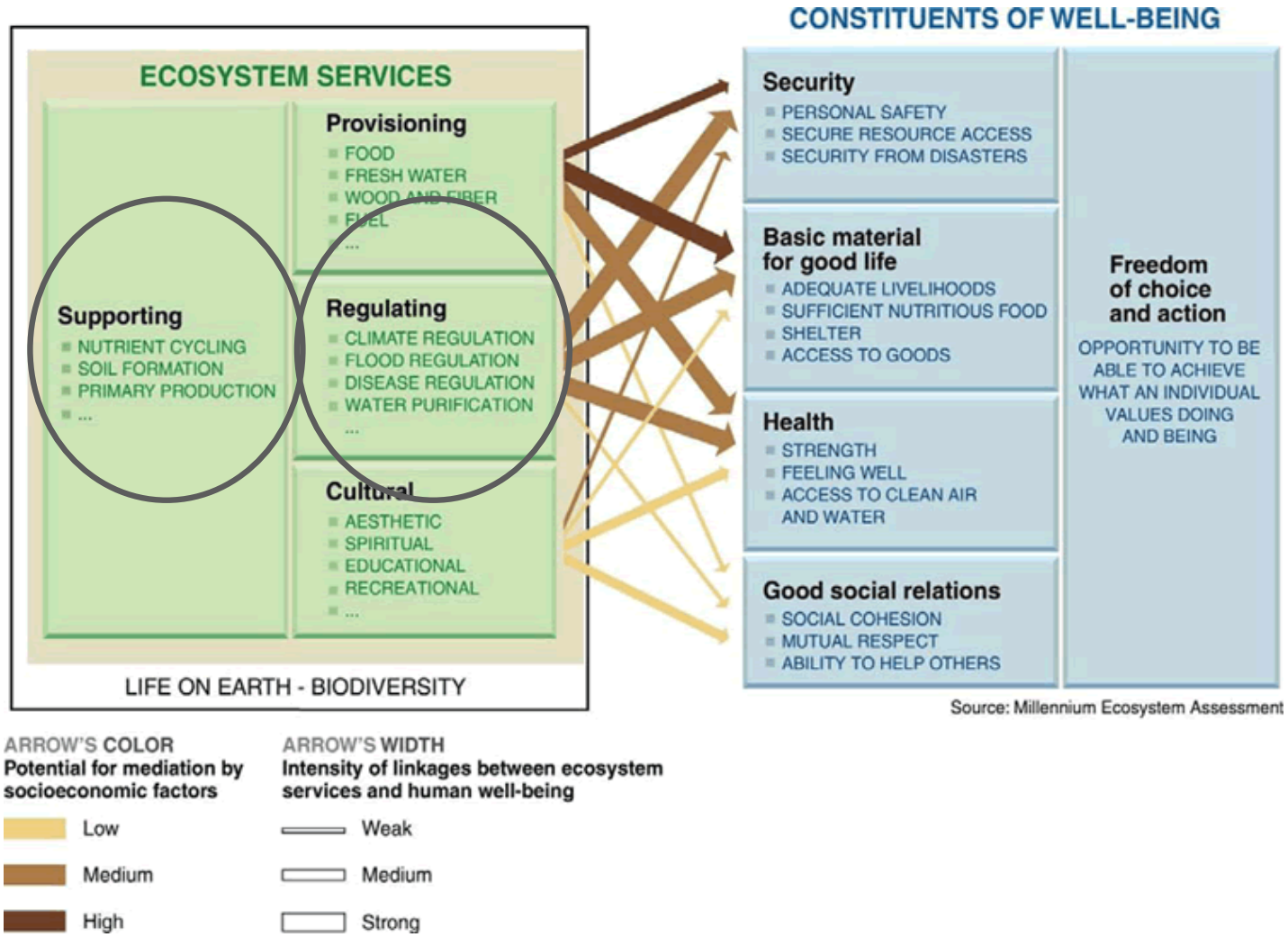




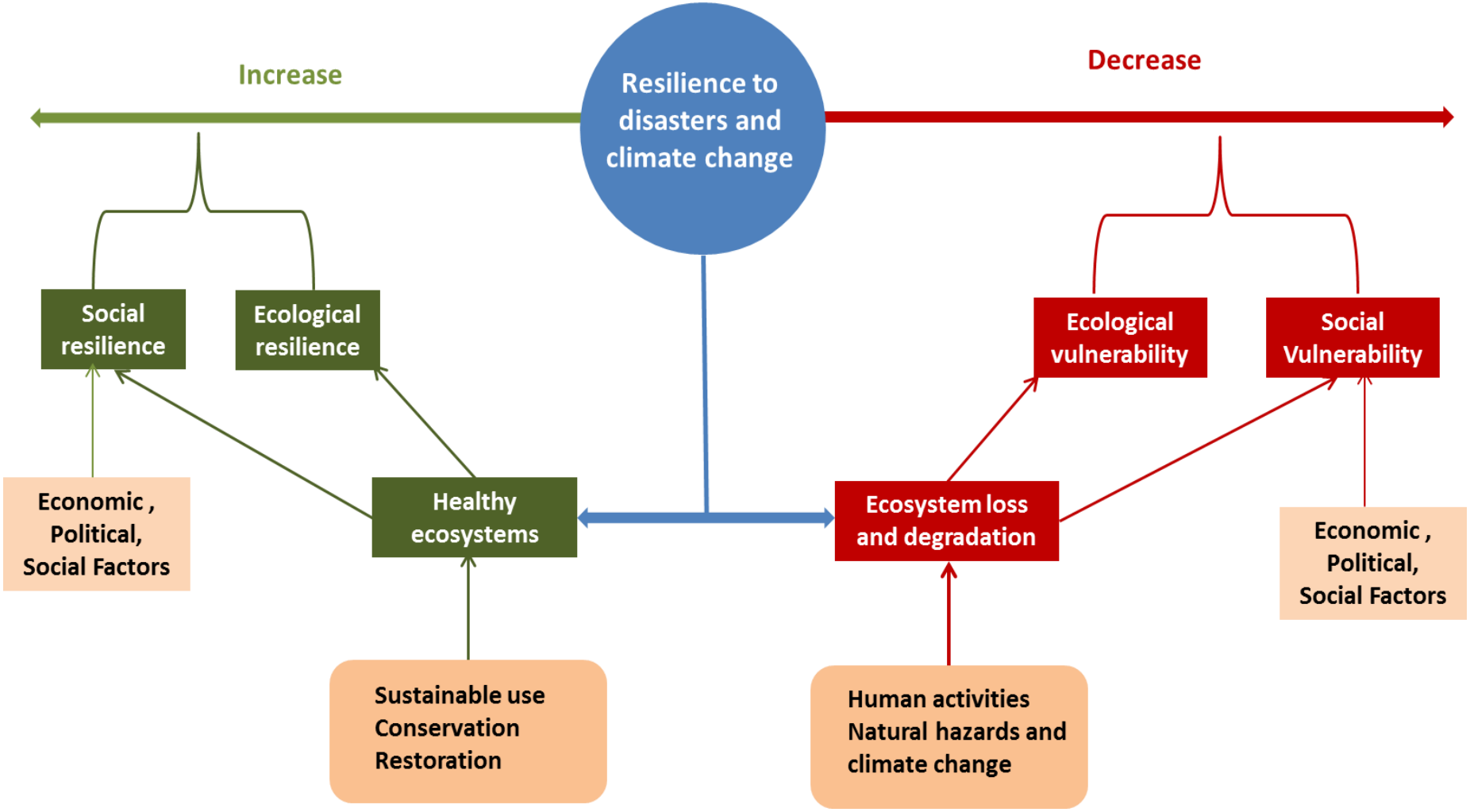




Ecosystem Services



Ecosystem Services for Resilience

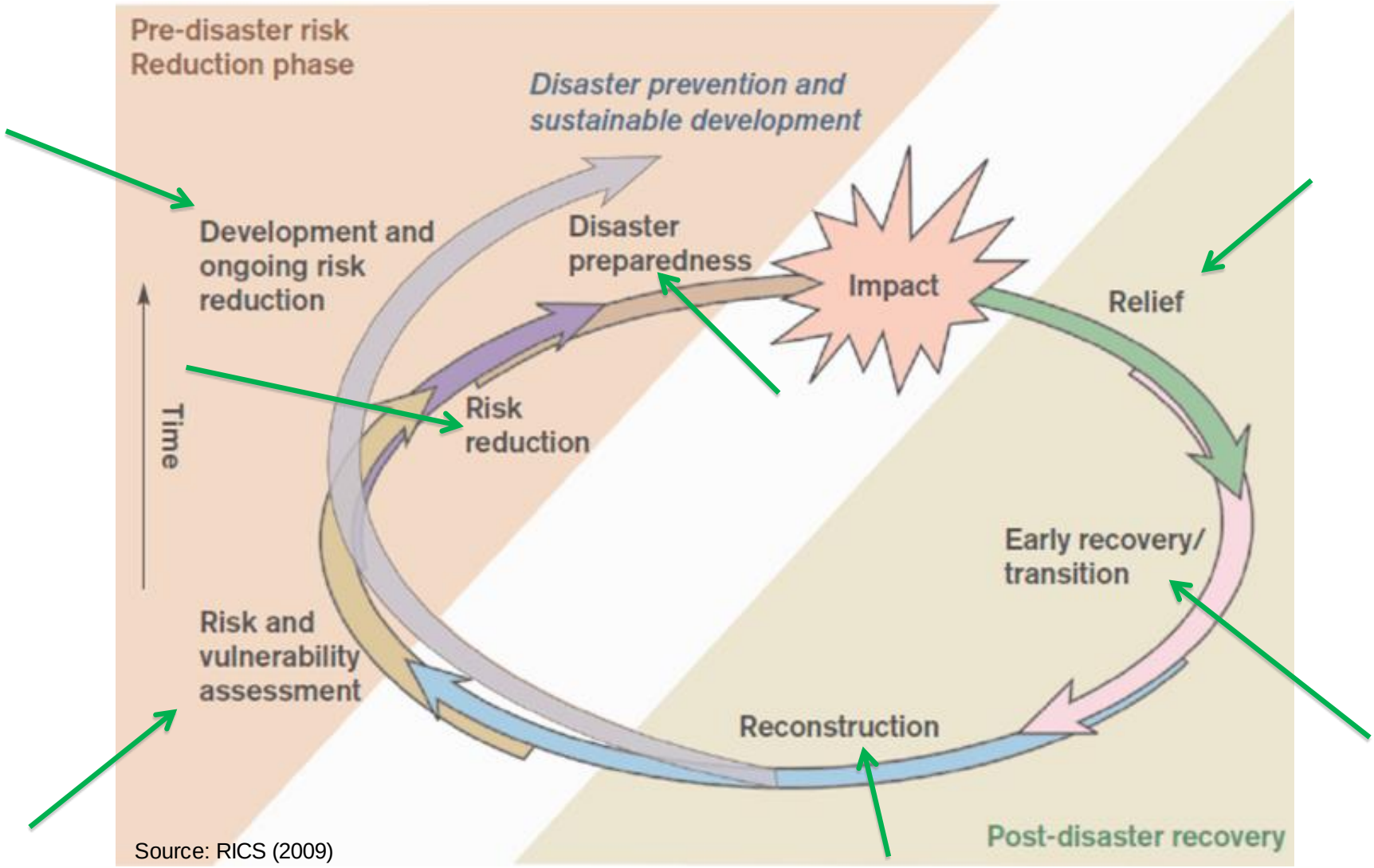


Defining Ecosystem based Disaster Risk Reduction

"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

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

Murti and Buyck (2014)

EPIC
Ecosystems Protecting Infrastructure and Communities

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

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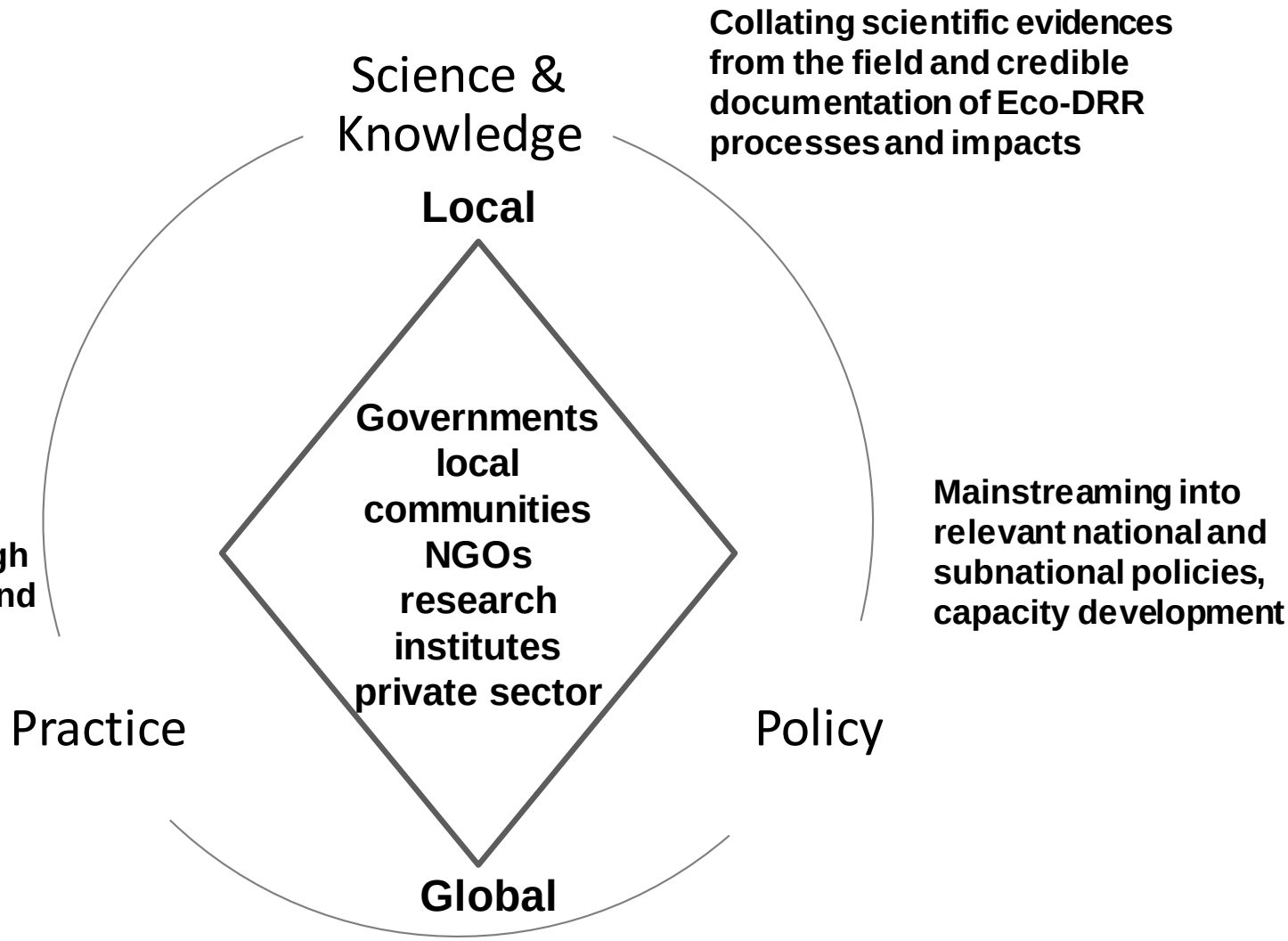

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Practice/Implementation

Community action for desalinization and floods (Burkina Faso)

Participatory vulnerability

↓

Identification of priority disaster risks

↓

Identification of local solutions

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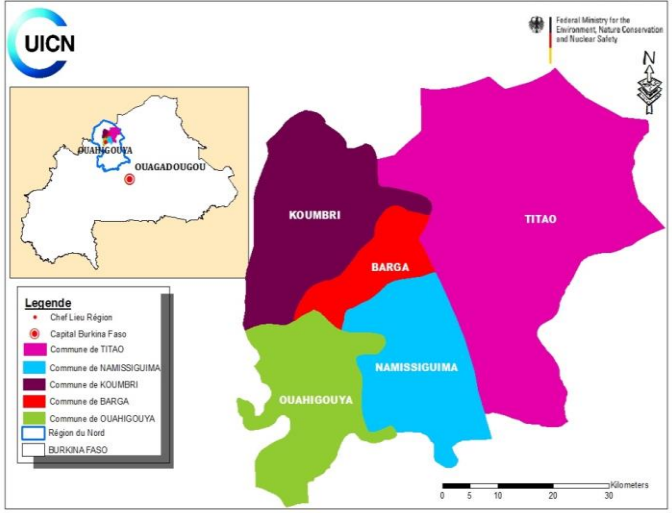
Burkina Faso



- 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

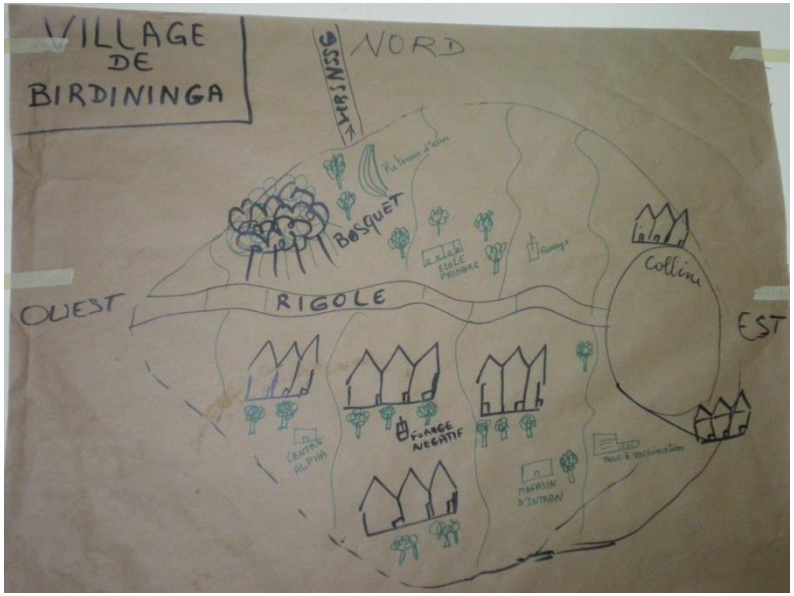
1) **Context of the innovation** (through a drawing, description etc.)
2) **History of the innovation** (through a timeline – see exercise 2-1)
3) **Characteristics of the innovation**

Characteristics of the innovation	
Technical	…
Social	…
Cultural	…
Ethical	…
Ecological (incl. Climate Change)	…
Economical	…
Others	…

Example – Community's Solutions from Burkina Faso

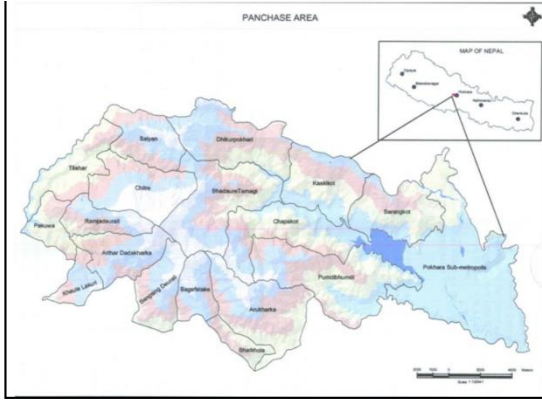
Village	Innovations
Basnéré	1. Soil Restoration 2. Reforestation
Tougou	1. Bank protection of the dam of Tougou 2. Recovering degraded lands
Birdininga	1. Soil Restoration 2. Sustainable management of water bodies
Ramdolla	1. Feed crops 2. Soil Restoration (Zaï)
Sillia	1. Soil Restoration 2. Bank protection of the dam of Sillia
Tibtenga	1. Soil Restoration 2. Reforestation


VISION
Tougou
Zamlongo
Yargo
Dingo
Bas fond


VILLAGE
DE
BIRDININGA
NORD
BOSQUET
ECOLE PRIMAIRE
Colline
OUEST
RIGOLE
EST
FORAGE NEGATIF
CENTRE ALPHA
MAGASIN D'INTRANT

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

Ministry of Forests and Soil Conservation
Department of Soil Conservation and Watershed Management (DSCWM)

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Ecosystems Protecting Infrastructure and Communities (EPIC)- NEPAL

Eco-safe roads through nature-based solutions:
soil bio-engineering, ecosystem management and community resilience

Policy Brief **October 2016**

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 as a potentially important "Ecosystem-based Disaster Risk Reduction (Eco-DRR)" strategy in reducing climate risks and enhancing resilience of vulnerable communities especially through practical action. In the field, research by leading 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 DRR and livelihood security. At the national level, IUCN worked with multiple stakeholders in advocating for greater considerations and investment in Eco-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 Eco-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 catalyse 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 earthen roads, exacerbating erosion and landslide risk in the Panchase area.

Quick facts

- The number of rural earthen roads in Nepal has increased from around 200 km in 1998 to over 4000 km in 2013/14.
- In Phewa Lake watershed, there were 179 erosion events recorded along 129 km of rural roads, amounting to 1.5 erosion events recorded per kilometer of earthen roads or 70,133 m^3 soil released in the watershed.
- In Tilahar village, the EPIC bio-engineering works reduced soil losses from 30 m^3 in 2014 to less than 2 m^3 in 2016.
- 125 community people trained by EPIC Nepal project
- 1.5% of all road budgets are earmarked for environmental protection (DOLIDAR policy) but seldom implemented.
- 1 million NPR is an average budget for 1 km of bio-engineering roads versus 5 kms of poorly designed roads in Middle Hills.
- More than half of allocated of road budgets in the Middle Hills area are used for clearing up rural roads after each monsoon season.

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 clearing with heavy equipment and are a leading cause of erosion, shallow landslides economic losses to agriculture fields, and forests.
- Instead, low-cost and environmental friendly soil bio-engineering along roadsides 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.

Figure 1: Illustration from Syangja district showing new road which is reactivating old landslide, threatening over 100 households. Credit: I. Penna, UNIL

EPIC Policy Brief.indd 1 9/29/2016 12:29:50

Results

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

- Three soil-bioengineering pilot sites were established in Western Development Region of Nepal: Syangja, Kaski and Parbat districts to demonstrate the effectiveness of low cost community based roadside bio-engineering in collaboration with each District Soil Conservation Office (DSCO) (Figure 2). 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.

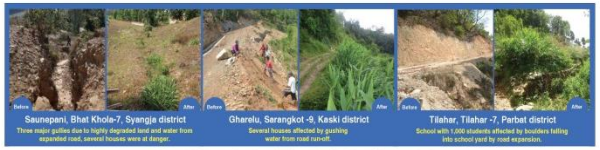

Figure 2: Three pilot sites in Syangja, Kaski and Parbat districts

- 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 129 km of roads surveyed (of 340 kms), amounting to an estimated 100 m^3 of soil released to the watershed /km/year along earthen rural roadsides 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 kms in 1979 to 340 kms in 2016. The study was on-going when an intense rainfall event (315 mm) occurred over 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.

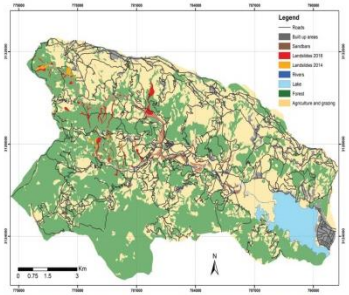

Figure 3: Phewa Lake Watershed study of land use changes 1979-2016 illustrates the 2016 road network and 174 landslides after July 29, 2015 rainfall event and the 14 landslides pre-existing landslides in 2014. Credit: M. Tonini and C. Vuillet, UNIL

- 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 roadside segments, with plants selected from the most common bio-engineering species, in consultation with each community.
  - Figure 4 illustrates the slopes in Tilahar village before the bio-engineering interventions were installed, where about 30 m^3 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 1.5 m^3 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

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

+ Ecosystem benefits???

- Based on calculations from UNDP, 2011

*Out of 20 years it is assumed 5 years of extreme monsoon conditions

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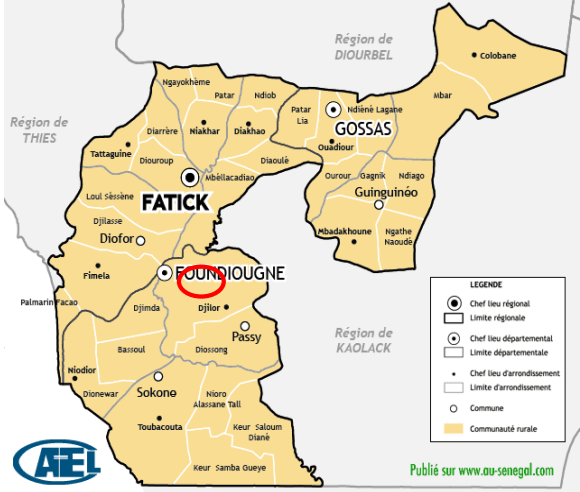
Senegal



- 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)

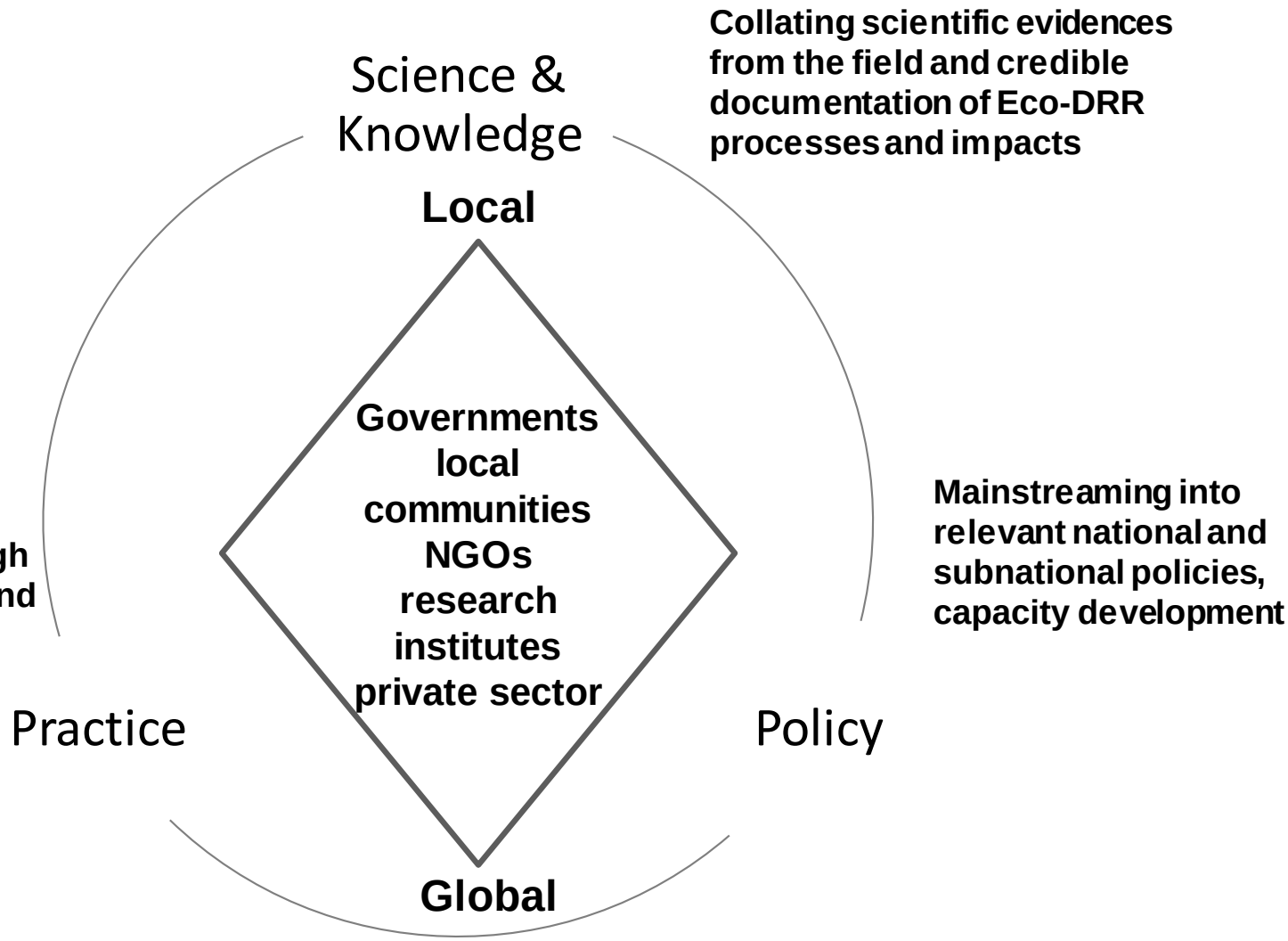
Mainstreaming, Policy Advocacy

Parallel Efforts for Multiple Levels

- Global
  - Convention on Biological Diversity (2014)
  - Sendai Framework (2015)
  - Ramsar Convention (2015)
  - Paris Agreement (2015)

- Regional Mechanisms
  - UNISDR regional platforms
  - Inter-governmental processes
  - IUCN Regional conservation forum

EPIC
Ecosystems Protecting Infrastructure and Communities



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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.

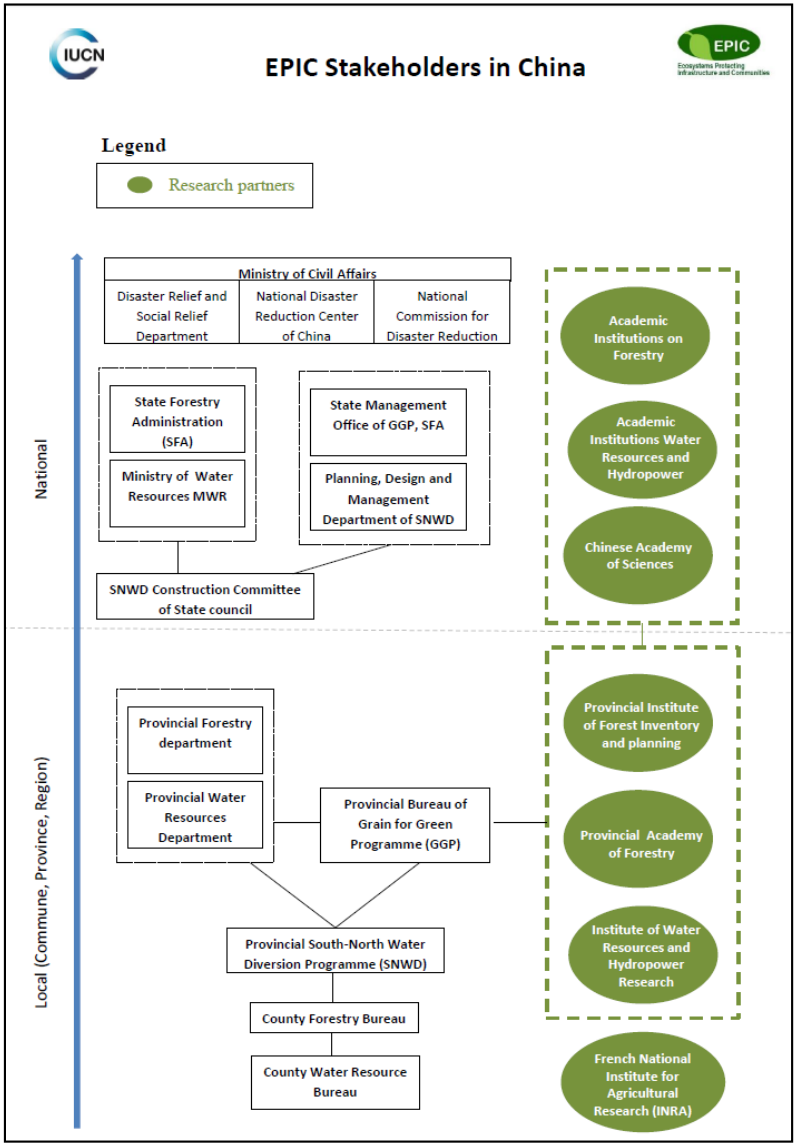
National and sub-national

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

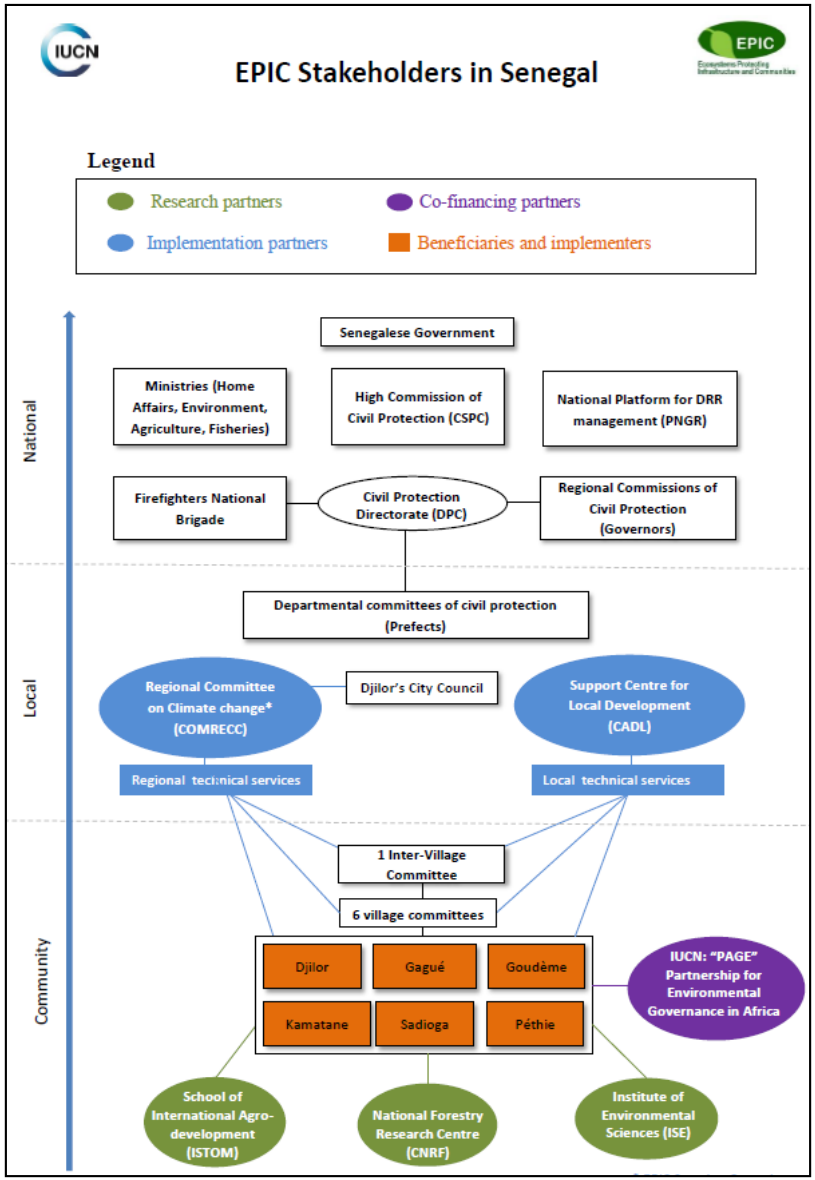
National and sub-national

Country	Policy	Level
Nepal	Integration of eco-DRR into the new National Strategic Framework for Nature Conservation (NSFNC)	National
	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	National
Thailand	Established Marine and Coastal Resources Management Promotion Act	National

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

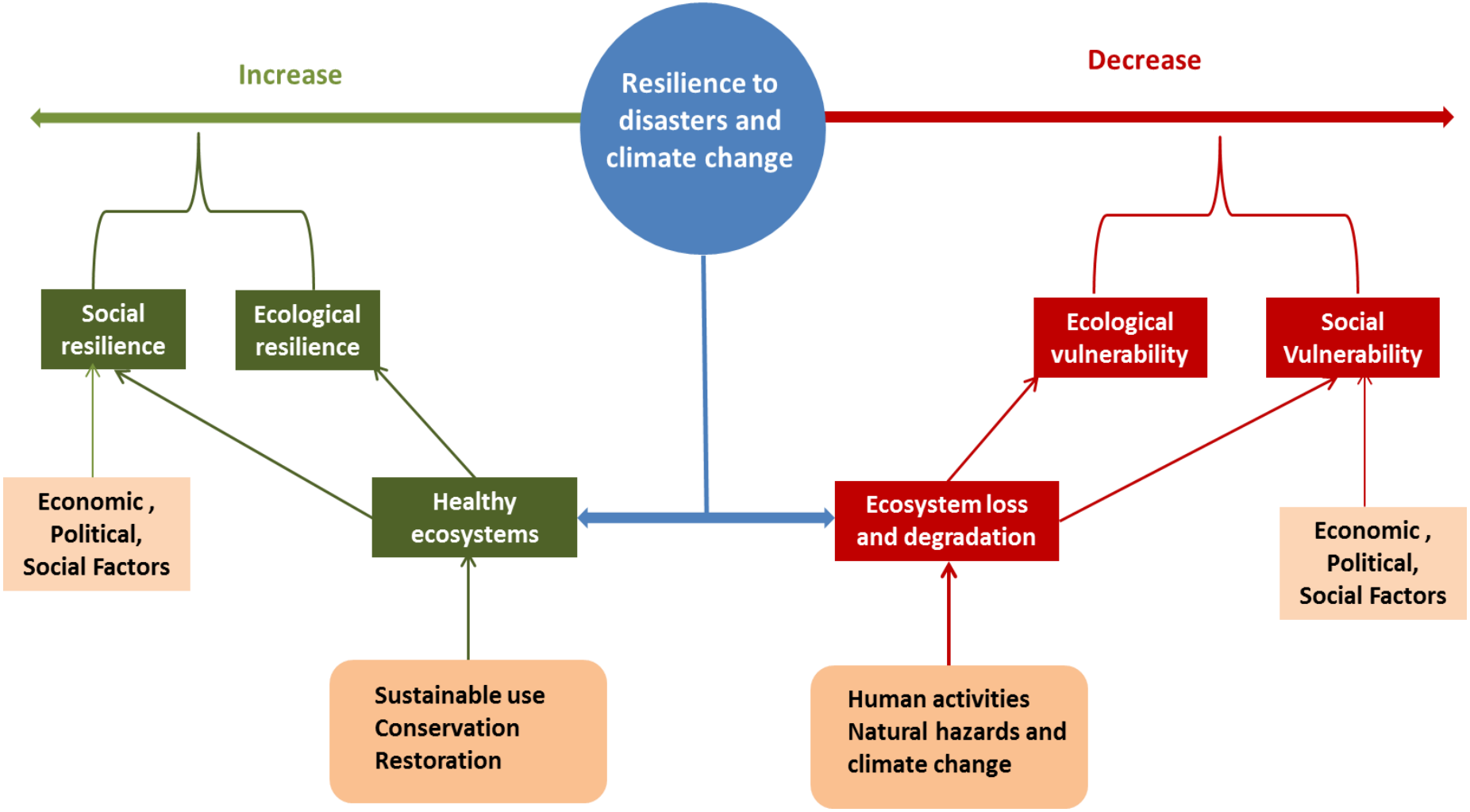
- Use existing champions – IUCN focal points in Ministries of Environment

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



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

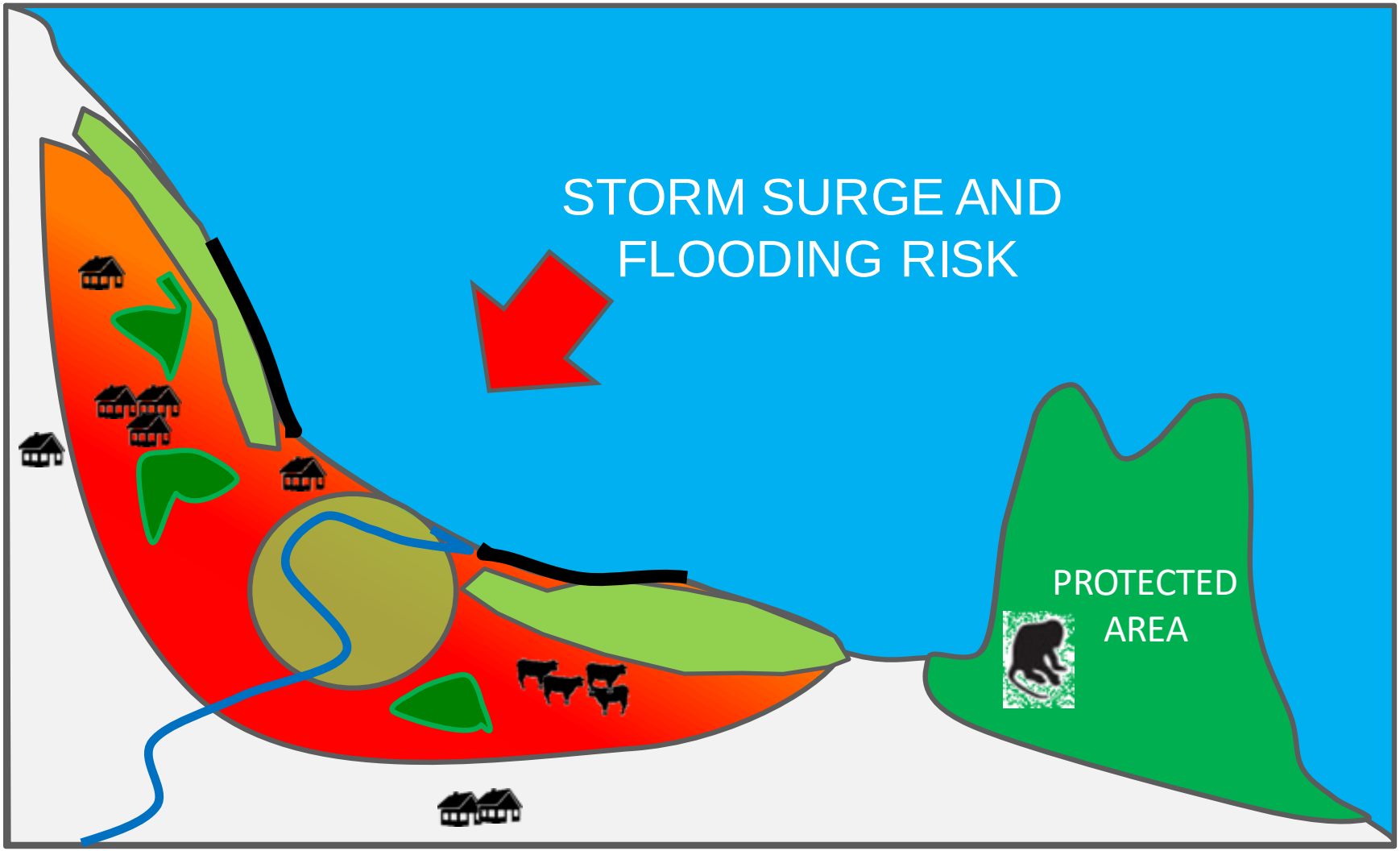
- An Eco-DRR Monitoring and Evaluation framework
  - Attribution versus contribution
  - Projected results in absence of an event
  - Projected results due to short project timeframes
  - Overall increased resilience of the local populations

Gaps/Opportunities

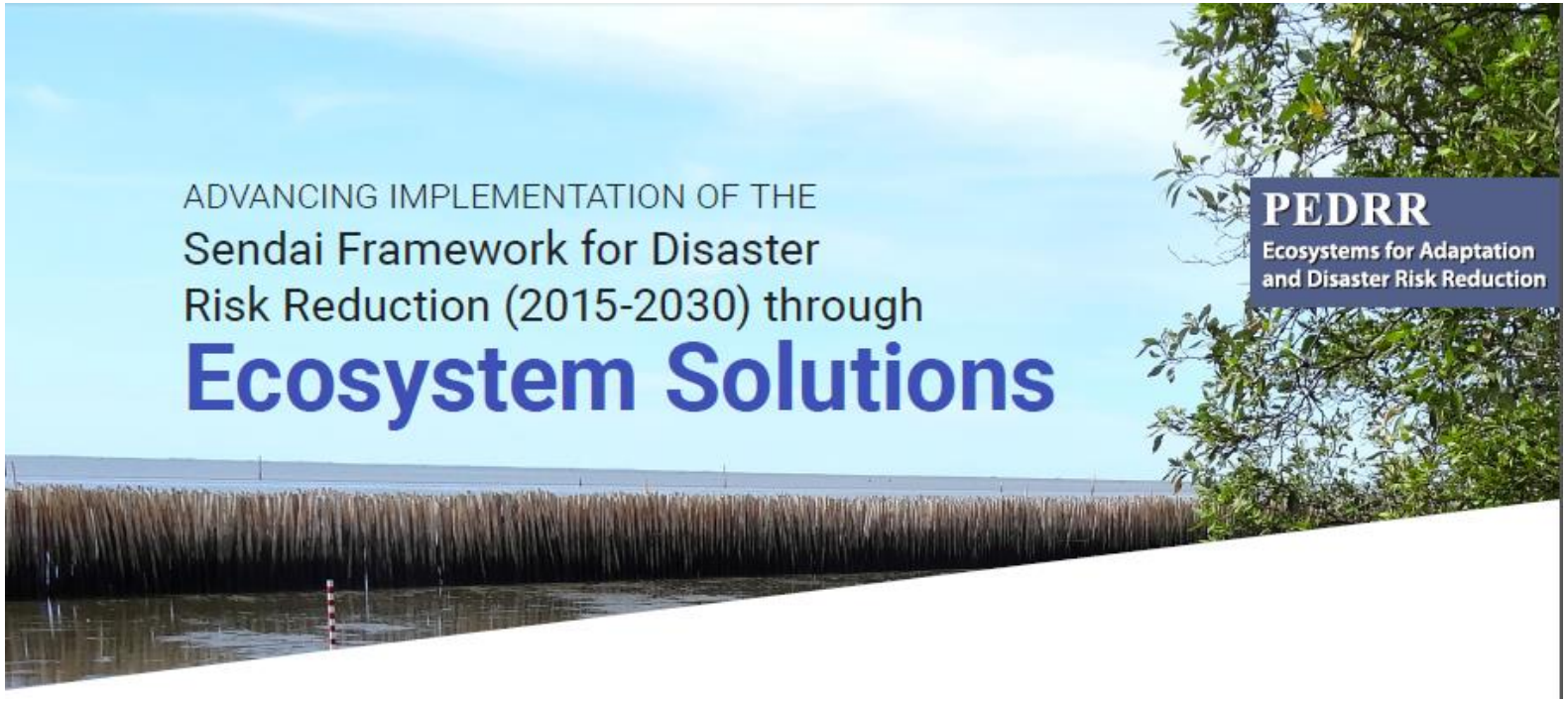
- A more comprehensive approach to DRR
  - Involvement of relief/recovery stakeholders
  - Links with early warning systems, evacuation and preparedness training
  - Capacity development in using weather predictions to plan farming practices

- 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?



Scaling Up With Sendai Framework



Opportunities at Cancun

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

Opportunities at Cancun

7.	Working Session "Cultural Heritage and Indigenous Knowledge for Building Resilience"	26/5/2017	11:15-12:45	Arena E	Global Fire Monitoring Center (GFMC)
8.	Side-event 'Technological Hazards: Engaging a New Community in DRR'	26/5/2017	13:00-14:00	Expo Center 3	UN Environment

Thank You
Merci

radhika.murti@iucn.org

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