Promoting ecosystems for disaster risk reduction and climate change adaptation:

OPPORTUNITIES FOR INTEGRATION

DISCUSSION PAPER

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Written by:
Nathalie Doswald and Marisol Estrella

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Executive Summary

This paper seeks to highlight the differences and commonalities between ecosystem-based approaches to adaptation (EBA) and ecosystem-based approaches to disaster risk reduction (Eco-DRR) and suggests key integration points at the project level through examining a number of Eco-DRR, EBA and hybrid (Eco-DRR/CCA) projects. A total of 38 (Eco-DRR, EBA and hybrid Eco-DRR/CCA) projects were examined in terms of their aims, assessments, implementation, monitoring and evaluation (M&E) and policy and institutional contexts to understand how in practice these approaches differ and overlap and to find key integration points.

Based on the review of Eco-DRR and EBA projects, Eco-DRR and EBA in practice (i.e. at project level), have much more in common than they are different, primarily because of the sustainable ecosystem management approach that is applied in Eco-DRR and EBA. Hence, ecosystem-based approaches can help bridge the divide between DRR and CCA fields of practice.

Nonetheless, EBA and Eco-DRR operate under different policy fora, have slightly different foci and are often undertaken by different institutions, mirroring differences seen generally under climate change adaptation (CCA) and disaster risk reduction (DRR). Indeed, DRR covers multiple hazards, while CCA concentrates on climatic hazards. However, CCA also covers long-term mean changes in climate and the impacts these have upon ecosystems and therefore on people. DRR, on the other hand, also has an emphasis on response, recovery and reconstruction that CCA does not. Whilst the broad aims for CCA and DRR are similar, current conceptual frameworks, terminology and semantics are different, hampering communication between the two communities of practice. Assessments under DRR and CCA can be quite different because each adopts different terminologies and approaches. CCA often examines impact of long-term climate change. However, lack of good data means that CCA often falls back on DRR-like assessments. As the focus of DRR and CCA may be different, so too are differences then reflected in project design and implementation.

When projects do not take both long-term climatic change and multiple hazards into account, the result may be mal-adaptation or increased risk. Integration of CCA and DRR practice is thus imperative. Integration is most likely to succeed at the project level rather than the policy level given the significant differences in policy tracts. At the project (operational) level, it is often difficult to distinguish between CCA and DRR.

Ecosystems and their services are important to both CCA and DRR. Each community has developed its own approach: Ecosystem-based Adaptation (EBA) for CCA and Ecosystem-based Disaster Risk Reduction (Eco-DRR) for DRR. Currently, EBA is more formally "recognised" on the international arena due to specific references in UNFCCC processes. Nonetheless, current negotiations on the post-2015 global framework on DRR (the successor to the Hyogo Framework for Action) have made explicit references to ecosystem-based approaches.

EBA and Eco-DRR share the differences mentioned above (for CCA and DRR) but have more similarities given their focus on ecosystem management, restoration and conservation to increase resilience of people (or reduce risk or reduce vulnerability). However, many EBA projects focus more on the conservation of biodiversity and ecosystem services and impacts of long-term climate change than do most Eco-DRR practice because of EBA's roots from conservation organisations. On the other hand, Eco-DRR includes components such as early warning, preparedness and contingency planning, response, recovery and reconstruction, which EBA usually does not focus.

This paper identifies five areas for Eco-DRR and EBA integration in project design and implementation, namely:

1. Defining aims of the project;
2. Conducting risk and vulnerability assessments;
3. Project implementation: methods, approaches, tools;
4. Monitoring and Evaluation; and
5. Policy and institutional engagements.

In formulating project aims, understanding future change and project needs by creating future scenarios that takes into account climate, environment, development and multiple hazards would help indicate who would be best involved in the project and ensure future sustainability.

Because both Eco-DRR and EBA are emerging fields in their own right, each are developing assessment methods and tools, in which data availability plays a large role. There is sometimes cross-over in assessment needs either result-

ing in duplication or missed opportunities due to lack of knowledge of the other field. Both fields could inform each other, strengthening knowledge and practice.

Implementation approaches and activities are broadly similar between Eco-DRR and EBA. There is more of an emphasis in some EBA projects on conservation and enabling ecosystems to adapt, and using species suitable to future climatic conditions. Adaptive management, that is strongly promoted in the EBA community, is an approach that recognizes uncertain future conditions and therefore embeds learning-oriented, flexible decision-making processes. Eco-DRR could benefit from EBA knowledge to climate-proof its interventions, while EBA could learn from Eco-DRR's integrated disaster management approach.

Monitoring and Evaluation (M&E) in EBA and Eco-DRR is embryonic and, as such, working together (including with other initiatives such as REDD+) will help to avoid duplication and create synergies. Ensuring learning as part of M&E is essential.

Eco-DRR and EBA projects work mostly with environmental ministries to influence policy. However, adaptation and disaster risk reduction are broader than the reach of environmental policies. Furthermore, the environment needs to be taken into account by other sectors. Eco-DRR and EBA could work together to increase multi-disciplinary approaches within project implementation and at a policy level.

While there exists key differences in overall approach and implementation, especially at the conceptual level, practice shows that often it is a question of differences in discourse (and use of terminologies) than a real difference at the local level. Fostering collaboration at the project level would provide good lessons for future practice and facilitate integration of EBA and Eco-DRR. This would then facilitate the development of much needed integrated tools. Gaps in knowledge in both communities should be filled through inter-disciplinary research and practice, appropriate M&E frameworks that support learning and knowledge exchange platforms.

1. INTRODUCTION

Climatic hazards are the most frequent hazards impacting our communities, and any change in the climatic system exacerbates disaster risk. In the last century, we have experienced virtually certain changes in climate, especially the warming of the climate system, according to the latest Intergovernmental Panel on Climate Change (IPCC) assessment report (AR5; IPCC 2014). These changes are projected to continue with global increases in temperature, changes to precipitation patterns, intensification of extreme events and increasing sea level (IPCC 2013). These alterations in the climate system are likely to increase disaster risk in many areas by changing hazard patterns and exacerbating drivers of vulnerability.

Because of the close linkages between climate change and disaster risks, the international community is increasingly calling for integration of climate change adaptation (CCA) and disaster risk reduction (DRR). At regional level, countries are also working towards closer integration between DRR and CCA, for instance in the case of the Joint National Action Plans on Disaster Risk Management and Climate Change of the Pacific Region (UNISDR 2013).

Despite the call for integration and a number of studies on why integration would be beneficial (Thomalla et al. 2006; Shipper and Pelling 2006; Tearfund 2008; Birkman and von Teichman 2010), there exists no clear analysis on how integration is to be practically achieved (Teafund 2008; Mercer 2010). Currently, climate change and disaster risk management processes remain governed by different policy tracks, which often mean different institutions and stakeholders separately implementing measures on CCA and DRR.

In the field of CCA and DRR, ecosystem-based approaches are emerging as important measures to be undertaken within overall CCA and DRR strategies. Examining CCA and DRR projects that are based on an ecosystem-based approach as a common denominator can point to key entry points for integrating DRR and CCA. Both fields are currently elaborating their own ecosystem-based approach.

Under CCA, ecosystem-based approaches to adaptation (EBA) are fast gaining interest and have made their way formally into the climate change policy arena. Under DRR, on the other hand, ecosystem-based approaches to disaster risk reduction (Eco-DRR) is only starting to emerge in DRR policy agendas (although elements of Eco-DRR have been used in the past as part of disaster management, for instance the long history of coastal forests in Japan and mountain forests for avalanche and landslide protection in Switzerland and other Alpine countries). In terms of implementation at the project level, both EBA and Eco-DRR are emerging areas of practice, with multiple interpretations and applications. It is therefore a good opportunity to examine both EBA and Eco-DRR with a view to finding points for integrating CCA and DRR through sustainable ecosystems ma.nagement.

The main focus of the paper is to examine potential areas of integration and synergy, highlighting how sustainable ecosystems management approaches help facilitate integration of CCA and DRR. This paper will first lay out the differences and similarities between CCA and DRR and summarise the discussion on need for integration. This background is necessary to understand the context as well as norms and practices used in Eco-DRR and EBA. Second, it will discuss the role of ecosystems within CCA and DRR and outline each emerging approach, revisiting the need for integration. Third, it will examine three types of projects: (i) recent/current projects "self-labelled" as EBA, (ii) projects self-labelled as Eco-DRR, (iii) combined or hybrid Eco-DRR/CCA projects. It will discuss the differences and commonalities between EBA and Eco-DRR projects, and potential integration points, based on a structured analysis that follows the conventional project cycle: aims, assessments, implementation (ground-level) and monitoring and evaluation. It will also reflect on the policy and institutional contexts of implementing Eco-DRR and EBA projects, and their implications for integration.

2. UNDERSTANDING SIMILARITIES AND DIFFERENCES BETWEEN DRR AND CCA

Whilst efforts to mitigate climate change are still ongoing, current and now unavoidable future changes in climate have raised the need for countries to adapt to climate change. Within the United Nations Framework Convention on Climate Change (UNFCCC), the Cancun Adaptation Framework was adopted in 2010 to enhance action on adaptation, the result of which is the preparation by many countries of National Adaptation Plans (NAPs). Climate change adaptation (CCA) refers to "adjustments in natural and human systems in response to actual or expected climate change impacts, which moderate harm or exploit beneficial opportunities" (Parry et al. 2007, p.869)[1]. Thus, CCA strategies aim to reduce vulnerability to climate change impacts.

Disaster risk reduction (DRR) is a field that emerged following the International Decade of Disaster Reduction in the 1990s and the adoption of the Hyogo Framework for Action (HFA 2005-2015), the current global framework on disaster risk reduction. DRR practice has its roots in the field of disaster management, involving traditionally humanitarian organizations and agencies, civil protection and emergency responders. Disaster risk reduction is defined as "the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events" (UNISDR 2009, p. 10-11). DRR focuses its strategies on reducing risk from multiple hazards, both natural and man-made. This highlights the substantive difference between DRR and CCA, in which the latter focuses solely on climate-related hazards and their impacts. Table 1 shows the main differences and convergence between DRR and CCA.

In DRR, disasters linked to natural hazards are often viewed as part of recurring or cyclical events, for instance in the case of monsoon rains and floods, hurricanes/tropi-

1 This definition has changed with the AR5: "The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate and its effects."

Table 1. Main differences and convergence between DRR and CCA

DIFFERENCES		SIGNS OF CONVERGENCE
DRR	**Adaptation**	
Relevant to all hazard types: geological, hydro-meteorological, climatic, biological, as well as technological / industrial hazards	Addresses climate related hazards , but also looks at additional gradual effects of climate change (e.g. sea level rise, air temperature increase, snowmelt, biodiversity loss)	Both focus on increased climate-related hazards, and climate extremes (e.g. floods, storms, landslides, droughts), although DRR also increasingly addressing gradual climate change impacts e.g. sea level rise
Timeframe- immediate to medium-term Most concerned with the present- i.e. existing risks	Timeframe – long-term Most concerned with the future- i.e. addressing uncertainty/ new risks	DRR increasingly forward-looking. Existing climate variability is an entry point for climate change adaptation
Origin and culture in humanitarian assistance following a disaster event	Origin and culture in scientific theory	
Actors – traditionally coming from humanitarian sectors and civil protection	Actors – traditionally from the scientific and environmental community	Both DRR and CCA are increasingly multi-disciplinary and reliant on multiple stakeholders across sectors (e.g. engineering, water, agriculture, health, environment, etc)
Activities generally more wide-ranging, from disaster preparedness (early warning, contingency planning, etc), prevention, disaster response, recovery, rehabilitation and reconstruction	Activities generally more restricted to prevention, mitigation, preparedness and building adaptive capacities, typically excluding post-disaster activities	DRR and CCA typically overlap in the area of disaster preparedness and prevention/mitigation, although there is growing attention towards mainstreaming climate change considerations in post-disaster recovery and reconstruction.
Full range of established and developed tools	Limited range of tools under development	Increasing recognition that more adaptation tools are needed and must learn from DRR
Often low to moderate political interest	Emerging agenda, high political interest	Climate-related disasters events are now more likely to be analyzed and debated with reference to climate change

Source: Modified from Tearfund/IDS (2008), Linking Climate Change Adaptation and Disaster Risk Reduction, UK: Tearfund. p. 10.

cal cyclones, earthquakes and volcanic eruptions. In contrast, climate change is often seen as a long-term process with high levels of uncertainty linked to climate change impacts. Hence, timeframes for implementation can also vary between DRR and CCA. This view forgets that DRR are measures intended to be long-term orientated, even if in practice that is not always feasible (Birkman and von Teichman 2010). Whilst it is true that long-term projected changes in climate are taken into account in many CCA projects, current climatic hazards are also addressed, given that climate change impacts are already being felt today, as stated clearly in the AR5. Furthermore, lack of down-scaled climate projections for many regions, along with the uncertainty in the model outputs, sometimes preclude the use of future climate projections within projects. Both CCA and DRR therefore rely on past hazard trends, and both address underlying factors of vulnerability to reduce impacts and risk.

Integration between CCA and DRR presents an opportunity to have a more holistic understanding of risks over the immediate and long-term and an integrated ap-

Table 2: Different communities of climate change adaptation and disaster risk reduction

	CLIMATE CHANGE ADAPTATION	DISASTER RISK REDUCTION
Organisations and institutions	• United Nations Framework Convention on Climate change (UNFCC) • Intergovernmental Panel on climate change (IPCC) • Convention on Biological Diversity [2] • Academic research institutions • National environment and energy authorities • Non-governmental organisations (NGOs) from the environmental conservation community	• UN Office for Disaster Risk Reduction (UNISDR) • International Federation of Red Cross and Red Crescent Societies (IFRC) • International, national and local civil society organisations • National civil defence authorities • National Disaster Management Agency/ • National Disaster Risk Reduction or Disaster Management Council
International conferences	Conference of the Parties (CoP)	World Conference on Disaster Risk Reduction / Global Platforms on DRR
Strategies	• National communications to the UNFCCC • National Adaptation Plans for Action for Least Developed Countries (NAPAs) • National Adaptation Plans (NAPs)	• UN International Strategy for Disaster Risk Reduction (ISDR) • Hyogo Framework for Action 2005-15 • National Disaster Management Plans and Strategies
Funding	• Special Climate Fund • Least Developed Countries Fund • Adaptation Fund • Green Climate Fund • Multi-lateral and bi-lateral funding	• National civil defence/emergency response • International humanitarian funding • Global Facility for Disaster Reduction and Recovery (GFDRR / The World Bank) • UN Trust Fund for Disaster Risk Reduction • Multi-lateral and Bi-lateral funding

Source: Modified from Thomalla et al. 2006

proach towards adopting more cost-effective solutions. Although both approaches aim to reduce the vulnerability of society to hazard impacts, CCA and DRR need to take each other into account to avoid unwittingly increasing vulnerability (Tearfund 2008). Any CCA strategy that does not take non-climatic hazards into account could result in "maladaptation" or increased disaster risks. For example, building a sea wall to provide protection against storm surges and sea level rise does not necessarily take into account tsunamis or land subsidence, which could result in exacerbating the impacts of storm surges and coastal flooding (e.g. trapping flood waters behind the sea wall).

Conversely, DRR needs to consider future changes in climate; otherwise, it will underestimate the changes in hazard intensity or frequency as a result of climate change. For example, a modelling study showed that planting trees as a measure to decrease dryland salinity

2 However, the most recent decision adopted by the 12th Conference of the Parties to the Convention on Biological Diversity (XII/20. Biodiversity, climate change and disaster risk reduction) in October 2014, promotes a greater focus on DRR by the CBD.

and improve environmental conditions in Australia could lead to reduced stream flow under a changing climate, which would further stress water security (Herron et al. 2002). Other positive benefits of DRR and CCA integration include targeting common drivers of vulnerability to climate change and disasters; maximizing the available expertise, tools and institutional mechanisms from both communities; and more effective use of human and financial resources.

Yet, integration between CCA and DRR is still not standard practice, mainly because each operates within different communities and policy processes. Table 2 summarises these differences. The field of CCA has its origins in environmental sciences with a focus on a macro-level, long-term perspective. Consequently, it has traditionally involved mostly scientific researchers and a top-down approach to implementation (Thomalla et al. 2006). This is changing, however, with more community-based approaches. CCA focuses on prevention and development but also takes into account maximizing opportunities presented by climate change. For example, changes in climate may allow new crops to be grown in other areas, thus opening up market opportunities.

The field of DRR has its origins in engineering and natural sciences, along with a large humanitarian tradition which focuses more on local scale and community-based work (Thomalla et al. 2006). The DRR approach is in large contrast to CCA, which rarely deals with the broad range of disaster management issues, though early warning systems in CCA initiatives are sometimes put in place.

Cross-over and integration are further hampered because of key differences in norms and knowledge base (Birkman and von Teichman 2010). The most pervasive hurdle is semantics: the use of terms and their definitions, which vary widely between communities. This hurdle impacts communication between communities because they can find themselves talking at cross-purposes due to their different understanding of terms and concepts. This can be best demonstrated through laying out the conceptual frameworks of both CCA and DRR.

2.1 Conceptual frameworks and definitions

DRR is based on reducing risk which is a function of ha-zard, exposure and vulnerability. Risk is "the combination of the probability of an event and its negative consequences" (UNISDR 2009, p.25). Exposure refers to "people, property, systems or other elements present in hazard zones that are thereby subject to potential losses" (UNISDR 2009, p.15). Vulnerability is "the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard." (UNISDR 2009, p.30).

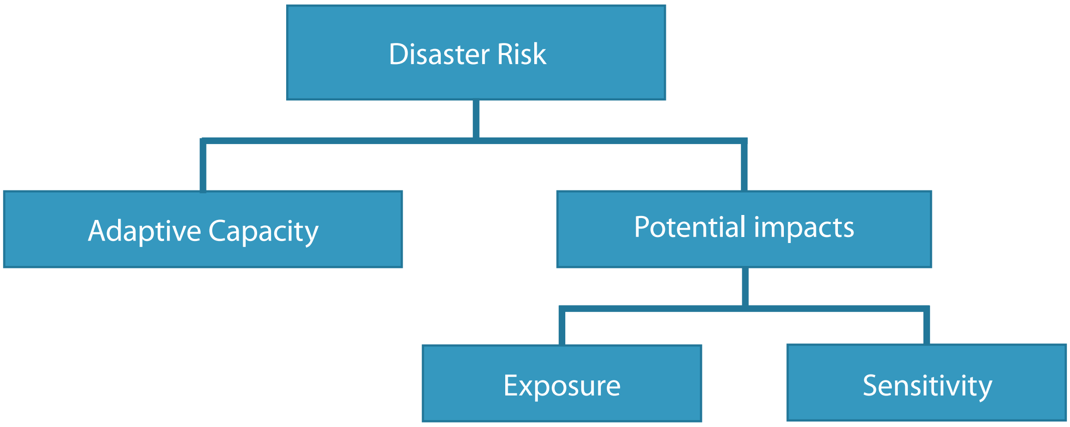
Disaster risk can be schematically viewed in Figure 1. The CCA conceptual framework that the majority of projects and studies use comes from the IPCC (AR4 and earlier) and is based on reducing vulnerability to climate change, which is seen as a function of exposure, sensitivity and adaptive capacity.

Vulnerability to climate change is defined as "the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity" (Parry et al. 2007, p. 883). Exposure is the extent to which a system will be subjected to hazards. Sensitivity is the extent to which a system is affected by a hazard. Adaptive capacity is the extent to which a system is able to exploit opportunities and resist or adjust to change.Often studies use the framework as presented in Figure 2.

As can be seen by the CCA and DRR frameworks, although the concepts are essentially the same, different terms are used, and these are defined differently. Exposure, for example, common to each framework, is used to denote very different things. In the context of CCA, exposure is essentially defined by determining hazard zones, whereas in DRR, exposure relates to elements (people and assets) located within the hazard zones (over a given period of time). The DRR concept of exposure can be found within CCA's sensitivity. Instead of sensitivity, the concept of susceptibility to hazards is recognized in DRR as a component of vulnerability. Morever, the terms vulnerability within both DRR and CCA approaches are not used in the same way. In DRR, vulnerability is a cha-

Figure 1: Disaster risk framework (adapted from Ciurean et al. 2013)

Figure 2: Disaster risk framework (adapted from Ciurean et al. 2013)



racteristic of the system, whilst in CCA vulnerability is an outcome encompassing physical exposure/hazard, the characteristic of the system and its ability to cope. Vulnerability in CCA thus has an element of DRR's "risk" (Birkmann et al. 2009). These differences arise because DRR generally takes a social science perspective, whereas CCA's vulnerability approach mainly takes a natural science perspective.

However, the IPCC has recently decided to change its conceptual framework and definitions used in the AR5 after a special report on managing risks of extreme events to advance climate change adaptation (IPCC 2012). Its concepts are now closer to those used in the DRR community:

Vulnerability is defined as "The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts including sensitivity or susceptibility to harm and lack of capacity to cope and adapt;" while exposure now refers to "The presence of people, livelihoods, species or ecosystems, environmental services and resources, infrastructure, or economic, social, or cultural assets in places that could be adversely affected." (IPCC - 28 October 2013 draft[3]).

It will take time, however, for both CCA and DRR community to be on the same page with regards to concepts and definitions, but it is promising to see a move towards a common understanding.

Resilience is a term that is used in both the CCA and DRR communities. Both communities aim to increase resilience. Whilst in some cases, resilience is seen as the inverse of vulnerability, in others it is an additional component that reduces vulnerability. Lack of formal integration of resilience within CCA and DRR frameworks increases confusion surrounding the term. Within the DRR community, resilience is defined as "the ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the pres-

3 Accessed 09/05/2014 http://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-Glossary_FGD.pdf

Figure 3: Generic steps in CCA and DRR assessments processes: a) Disaster risk assessment (UNDP 2010) b) Vulnerability Assessment

DISASTER RISK ASSESSMENTS IN CONTEXT OF DRR

Step no.

1. Understanding of the current situation, needs and gaps
2. Hazard assessment
3. Exposure assessment
4. Vulnerability analysis
5. Loss/impact assessment
6. Risk profiling and evaluation
7. Formulation of revision of DRR strategies and action plans

VULNERABILITY ASSESSMENT IN CONTEXT OF CCA

Step no.

1.
   - Scoping and designing an adaptation strategy
   - Target or vulnerable group
   - Assessment boundaries
2.
   - Assessing current vulnerability
   - Assess exposure, sensitivity and adaptive capacity
   - Vulnerability analysis
3.
   - Assessing future climate risks
   - Future scenarios
   - Vulnerability and risk analysis
4. Formulating and adaptation strategy
5. Continuing adaptation

Source: UNDP Adaptation Policy Framework; Downing and Patwardhan 2004).

ervation and restoration of its essential basic structures and functions"(UNISDR 2009 p.24). Within the CCA community, resilience is often defined as "the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change" (Parry et al. 2007, p. 880)[4]. These definitions are very similar; yet understanding of these terms changes depending on whether the viewpoint stems from social or natural sciences. In practice, resilience is a concept used loosely, either indicating a system attribute, or an umbrella concept for a range of system attributes deemed desirable, neither of which are easily operational (Klein et al. 2004).

4 Or "The capacity of a social-ecological system to cope with a hazardous event or disturbance, responding or reorganizing in ways that maintain its essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation" (Arctic Council, 2013).

2.2 Assessment methodologies in DRR and CCA

Differences in concepts and conceptual frameworks have led to different assessment methodologies in DRR and CCA. The overarching assessment tools are vulnerability and capacity assessments (VCA), hazard assessments and disaster risk assessments (DRA) for DRR. For CCA, the most common approach is vulnerability (impact) assessments (VA or VIA). Whilst approach and methodology of each vary between projects, generic steps can be identified. Figure 3 outlines generic steps of DRA and VA. However, tools used within the DRA and VA often overlap (further discussed in Section 4). Understanding differences in the assessment methodologies is important because they can lead to differences in overall project design and implementation, but also point towards better integration.

3. THE ROLE OF ECOSYTEMS IN CCA AND DRR

Ecosystems and ecosystem services are central, though not primary, to the discussion of CCA and DRR. Ecosystem services are the benefits people obtain from ecosystems, which have been classified by the Millennium Ecosystem Assessment as: supporting services, such as seed dispersal and soil formation; regulating services, such as carbon sequestration, climate regulation, water regulation and filtration, and pest control; provisioning services, such as supply of food, fibre, timber and water; and cultural services, such as recreational experiences, education and spiritual enrichment (MA 2005).

It has been demonstrated that ecosystem services can be used for climate change adaptation and disaster risk reduction (CBD 2009; World Bank 2010; IPCC 2012; Munang et al. 2013; Renaud et al. 2013). For example, forests provide flood and landslide regulation services, a phenomenon that is harnessed in watershed management programmes (Doswald and Osti 2013; Renaud et al. 2013). Coastal mangroves have been shown to protect adjacent areas from storm surges (Badola and Hussain 2005; Renaud et al. 2013). Nevertheless, ecosystems are not invulnerable to current anthropogenic pressures and are being degraded, as outlined in the Millennium Ecosystem Assessment (MA 2005). The capacity of ecosystems to provide these services may be further undermined by climate change or hazard impacts, as well as by the unsustainable measures undertaken under CCA or DRR.

Strategic management of ecosystems, therefore, is necessary to ensure provision of services that are important to society in the face of climate change and disasters. However, it is important to state that solely ecosystem-based solutions may not always be practicable. For instance, ecosystem-based solutions often require a lot of land which may not be available (Doswald & Osti 2013; Temmerman 2013), or may not provide sufficient protection against certain types and magnitude of hazards (Vosse 2008; Renaud et al. 2013).

At the policy level, the importance of including sustainable ecosystem management for CCA and DRR is recognised. UNFCCC's Cancun agreement invites parties to "build resilience of socio-economic and ecological systems" (UNFCCC 2010, p.5), whilst the HFA recognises environmental degradation as a major contributing factor in disaster risk, mainly through HFA Priority 4. As this discussion paper goes to press, the current iteration of the post-2015 global framework on disaster risk reduction (successor to the HFA) provides a more explicit recognition of the role of sustainable ecosystems management for reducing disaster risk and building resilience.

Ecosystem-based approaches for adaptation to climate change (EBA) have emerged in international climate policy platforms as a "new" approach, involving the use of biodiversity and ecosystem services through sustainable management, conservation and restoration of ecosystems, to help people adapt to the adverse effects of climate change (CBD 2009). The EBA concept stems from a long history of using environmental management to adapt to climatic variations. The discipline of EBA is currently growing with interest in policy arenas,[5] with inclusion in the AR5, and with the production of catalogues of case studies, research, and development of guidelines and tools including under the Nairobi Work Programme on adaptation.

Ecosystem-based approaches for DRR (Eco-DRR) aims to manage the environment (through sustainable management, conservation and restoration of ecosystems) in such a way that risk to communities is reduced (Estrella & Saalismaa 2013). In contrast to EBA, Eco-DRR is emerging as a field of practice but has not yet received significant attention in DRR policy contexts. Although environmental degradation as a driver of disaster risk is now well-recognized in the DRR community, what is less understood is the role of ecosystems and ecosystems management in reducing disaster risk.

One of the additional arguments to using ecosystem-based approaches within CCA and DRR, aside from their capacity to reduce and buffer against hazard impacts, is the fact that they provide multiple social, economic and cultural benefits for local communities. These multiple benefits increase resilience of communities in numerous ways and thus are especially effective in terms of adaptation, because successful adaptation needs to be undertaken in a multi-faceted, integrated manner (Doswald et al. 2014). There exists a number of case studies and research that show the benefits of ecosystem-based approaches, especially with respect to climate change adaptation (i.e. EBA).

Furthermore, studies show that its use is mainstreamed within many sectors (e.g. coastal protection, agriculture and forestry, urban areas) albeit the term EBA or Eco-DRR is not used (Doswald and Osti 2013).

It is worth pointing out, however, that there is a cross-over in terms of case studies that have been used to advocate for EBA and Eco-DRR (ProAct Network 2008; Doswald and Osti 2013; Renaud et al. 2013). Interest from the climate change arena is one of the reasons that these case studies have been subsequently "labelled" as EBA rather than Eco-DRR.

In many of the available case studies, there is a focus on ecosystems in relation to addressing climate-related hazards as well as climate change. This is so because ecosystem-based approaches are not widely applied for non-climatic hazards, such as earthquakes or volcanic eruptions, although several studies have shown how re-vegetation and forest management can reduce risk of rock falls or landslides triggered by earthquakes (e.g. in the case of protection forests in Switzerland; see also Peduzzi 2010).

Just as CCA and DRR overlap, so do EBA and Eco-DRR, but perhaps even more so given their common focus on ecosystem-based approaches. Furthermore, there exist "hybrid projects" that integrate CCA and DRR using an ecosystem-based approach. Yet, due to the largely different policy and institutional contexts of CCA and DRR, EBA and Eco-DRR communities-of-practice tend to operate in separate silos. Moreover, hybrid projects tend to have either an EBA or Eco-DRR "slant" depending on the experts involved in the project. Understanding what are differences and similarities between Eco-DRR and EBA approaches, as well as examining hybrid Eco-DRR/CCA approaches at the project level will facilitate integration between the two fields of practice, and the integration of DRR and CCA more broadly, and will improve future project and programme planning.

5 EBA is not mentioned directly in any agreement under the UNFCCC aside from a decision to hold a technical workshop on EBA. The UNFCCC also has a database on projects, which complement an information paper (FCCC/SBSTA/2011/INF.8).However, EBA is defined and outlined within decision X/33 of the Convention on Biological Diversity.

4. ECOSYSTEM-BASED APPROACHES TO CCA AND DRR: PROJECT ANALYSIS

4.1 General overview

Whilst environmental management undertaken to tackle climate variability and climatic hazards is not new and much evidence exists as to the effective use thereof (Doswald et al. 2014), many EBA, Eco-DRR and EBA/Eco-DRR projects are either embryonic or currently underway. Thus, complete information on these is lacking. Therefore, juxtaposing theory with practice will be useful to highlight differences and commonalities between the fields of practice. Moreover, understanding the theory behind the practice can reveal the sources of similarities and differences in practice.

Projects and initiatives were selected after both online searches for CCA and DRR projects involving environmental management and after discussions with institutions involved with such projects. A total of 38 projects/initiatives were compiled (Annex 1). This is not an exhaustive compilation of projects. Many more projects or initiatives that serve as EBA or Eco-DRR or both can be found (see for example Doswald et al. 2014; Doswald and Osti 2013; Renaud et al. 2013). Those which were selected provided enough information on project implementation. Classification into EBA, Eco-DRR and hybrid Eco-DRR/CCA projects was undertaken through an examination of the project labels (whether they call themselves one or the other), their aims and how they were implemented. There were 15 EBA projects, 12 Eco-DRR projects and 11 hybrid Eco-DRR/CCA projects. It is important to point out that this paper does not set out to assess or evaluate the projects but only to use these to understand how EBA and Eco-DRR projects are undertaken in practice and find key integration points.

Based on this review, a summary of the key similarities and differences between Eco-DRR and EBA projects is provided on Table 3. In general, Eco-DRR and EBA projects tend to follow the main similarities and differences between DRR and CCA practice, as discussed in Table 1. However, the project review showed that, in practice, Eco-DRR and EBA have much more in common than they are different, primarily because of the sustainable ecosystem management approach that is central to both Eco-DRR and EBA projects. Applying a sustainable ecosystem management approach can therefore help bridge the gap between CCA and DRR practice. A comparison between Eco-DRR and EBA projects is made in order to understand tangible key areas for integration between Eco-DRR and EBA efforts. Section 4 of this paper discusses each of these key integration points.

Types of hazards and hazard impacts covered in projects

Both EBA and Eco-DRR projects typically addressed climate-related hazards, such as drought, flood, storms, landslides and fires. Eco-DRR also dealt with non-climate related hazards, such as tsunamis, earthquakes, and avalanches, while EBA also dealt specifically with sea-level rise and broad (potential) changes to temperature and rainfall patterns. Hybrid Eco-DRR/CCA projects also included glacial lake outbursts (Figure 4).

More differences could be observed in the types of impacts addressed by both approaches. Whilst Eco-DRR mainly addressed impacts in terms of loss of livelihoods, lives, food security, water security and health, EBA also included dealing with long-term impacts such as biodiversity loss, changes within ecosystems (e.g. coral bleaching and habitat suitability changes) and potential increase in disease/pest outbreaks, alongside issues dealt by Eco-DRR such as livelihoods, food and water security.

Ecosystems covered in projects

Projects equally covered dryland, mountain, forest, inland waters, marine, urban and agricultural ecosystems. Urban projects tend to label their actions more as adaptation (i.e. EBA[6]) than disaster risk reduction (Eco-DRR). However, this is more likely due to the current political prominence of climate change (Mercer 2010) than a real difference.

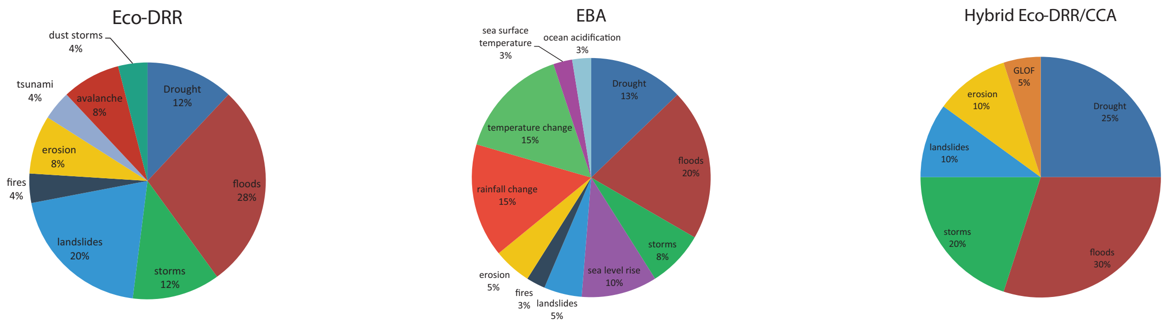
6 The term "ecosystem-based adaptation" is not used by these projects. They mostly refer to climate change adaptation in conjunction with green infrastructure or solutions.

Table 3. Key differences and similarities between Eco-DRR and EBA

DIFFERENCES		POINTS OF CONVERGENCE
ECO-DRR	EBA	
Usually adopts UNISDR **terminology** in defining disaster risk (as a function of hazard, exposure and vulnerability)	Usually adopts UNFCCC **terminology** in defining vulnerability (as a function of sensitivity, exposure and adaptive capacity)	Greater convergence towards adopting common terminologies
Deals with climate-related **hazards**, but also non-climate hazards such as tsunamis, earthquakes, avalanches and rockfall	Deals with climate-related **hazards**, but also deals with climate change impacts, including sea level rise, glacial lake outbursts, and broad changes to temperature and rainfall patterns	Most Eco-DRR and EBA projects deal with water- and climate-related hazards; Eco-DRR increasingly factoring in climate change impacts ww
Aims to "reduce disaster risk", "increase protection and resilience against hazards"	**Aims** to "reduce vulnerability", "increase resilience to climate change", "undertake appropriate adaptation"	Key differences in stated aims are purely semantics in how terminology is being used. Both Eco-DRR and EBA emphasize the multiple benefits of ecosystem services, including for sustainable livelihoods.
Conducts disaster risk **assessments** (DRA), usually starting with a focus on hazards, exposure and vulnerabilities as core elements to understanding disaster risk, but also assessing linkages to environmental conditions and natural resource management	Conducts vulnerability **assessments** (VA), usually starting with an ecosystem focus (e.g. impact of climate change on biodiversity loss and ecosystem integrity), and developing future change scenarios.	Both seek to incorporate ecosystems and environmental factors within their assessment frameworks; with growing appreciation in Eco-DRR to incorporate future climate trends. But given difficulties in determining future climate change projections, especially at a field/local level, both Eco-DRR and EBA projects tend to rely on examining past and current risks, a key characteristic of DRR practice.
Implementation approach - Less focus on biodiversity conservation and protection as a primary aim; focus is on optimizing ecosystem services for increasing resilience of people or reducing exposure and vulnerability to hazard impacts	**Implementation approach** - Greater emphasis (but not always) on the health status of ecosystems and their services, and on biodiversity conservation; focus on maintaining and increasing resilience of biodiversity and ecosystem services to enable people adapt to climate change impacts.	Both apply sustainable ecosystem management principles and utilize a common set of tools and approaches, such as: integrated water resource management (IWRM), integrated coastal zone management (ICZM), protected area management, drylands management, among others.
Typically incorporates other key aspects of disaster risk management, such as establishing early warning systems and undertaking disaster preparedness	Emphasis is on strengthening "adaptive management" due to uncertainty of climate change impacts;	Both incorporate disaster preparedness / mitigation measures, including early warning systems
Less attention given to **M&E**, apart from standard project reporting requirements	Active discussions on developing **M&E** frameworks and guidelines for EBA / CCA projects	Both face challenges of attribution in evaluating effectiveness and impacts through an ecosystem-based approach. Little attention overall given to developing indicators for EBA and Eco-DRR projects.

DIFFERENCES		POINTS OF CONVERGENCE
ECO-DRR	EBA	
Actors involved - Typically Involve environmental agencies/ ministries, conservation NGOs but also humanitarian and disaster management actors at local and national levels, as well as climate change focal points	**Actors involved** - Typically involve environmental agencies/ ministries, conservation NGOs, climate change national focal points; usually does not engage with humanitarian or disaster management actors	Both increasingly recognize the importance of bringing together different communities and sectors, including from disaster management, climate change, environment and other key sectors (e.g. water, agriculture).
Policy advocacy can target a broad range of policies, including climate change adaptation strategies, environmental policies, and other sectoral policies (e.g. water, agriculture)	**Policy advocacy** generally focuses on the national adaptation strategy as well as other development policy sectors affected by climate change (e.g. water); rarely works on DRR-related policies	Both typically engage with the environmental ministries/agencies and the conservation community, but still with a tendency to operate in separate policy tracks, depending on whether the project is more oriented towards DRR or CCA.

Figure 4: Percentage of hazards addressed in Ecosystem-based approaches for adaptation (EBA), Ecosystem-based approaches to disaster risk reduction (Eco-DRR) and hybrid projects (Eco-DRR/CCA)



4.2 Aims/expected outcomes as articulated in Eco-DRR, EBA and hybrid Eco-DRR/CCA projects

In terms of the projects compiled, project goals tended to be very broad and vague. Eco-DRR projects mainly aim to "reduce risk", "increase protection and resilience against hazards"; whilst EBA projects aim to "reduce vulnerability to climate change", "increase resilience" and "undertake appropriate adaptation measures". Hybrid Eco-DRR/CCA projects typically aim to "reduce disaster risk through adaptive measures". As can be seen, the difference in stated aims is purely semantics. Nevertheless, there are differences in the breadth of aims and expected outcomes within projects.

EBA and Eco-DRR both aim to achieve their goals using the same measures: sustainable management, conservation and restoration of ecosystems to achieve their goals. EBA, however, because of its connection to the Convention on Biological Diversity (see CBD 2010), place more emphasis on biodiversity conservation than Eco-DRR. Indeed, some EBA projects primarily focus on maintaining and increasing the resilience of biodiversity and ecosystem services as a way to help people adapt to climate change impacts (**Box 1**). The focus is then on the environment that people depend upon rather than on

BOX 1. EBA PROJECTS GENERALLY PLACE EMPHASIS ON ECOSYSTEMS AND BIODIVERSITY CONSERVATION

- A project funded by the Global Environmental Facility (GEF) entitled, 'Natural Resources Management in a Changing Climate in Mali', aims to "expand the adoption of sustainable land and water management practices in targeted communes in Mali. This objective will be achieved through the implementation of capacity building, biodiversity conservation and support to poverty reduction activities through an ecosystem-based adaptation approach. It is an integrated approach to conservation, restoration and sustainable management of territories to enable people to adapt to climate change, and ultimately increase their resilience".

- Conservation International's (CI) EBA projects in Brazil and South Africa focus on marine, terrestrial and coastal regions as a means of improving livelihoods and conserving biodiversity in the face of climate change and aim to increase the resilience and adaptive capacity of vulnerable people to climate change, through implementing EBA. In the Philippines, CI's EBA project aims to "maintain and increase the resilience of biodiversity and ecosystem services in the Verde Island Passage in the face of climate change".

people and their surrounding environment. However, this is not always the case: some EBA projects make no mention of biodiversity within their aims. UNEP/UNDP/IUCN 'Mountain EBA' projects, for example, aim "to reduce vulnerability and increase resilience to climate change through EBA".

Eco-DRR projects do not have such a heavy focus (at least in the stated aims) to protect biodiversity. Instead,

BOX 2. ECO-DRR INITIATIVES TYPICALLY PLACE GREATER EMPHASIS ON REDUCING RISKS FROM HAZARDS AND INCREASING RESILIENCE, WITH LESS EMPHASIS ON BIODIVERSITY CONSERVATION

- UNEP's Eco-DRR project in The Democratic Republic of the Congo, for example, aims to "strengthen the community's capacity to maximise ecosystem service benefits provided by the Lukaya river catchment, including its potential to mitigate floods and water pollution".

- The University of Lausanne and IUCN are implementing an Eco-DRR project in Nepal, where bioengineering measures utilize local species for the re-vegetation of slopes to promote safer roads and mitigate against landslides. Road construction is generally a major cause of landslides in Nepal, resulting in significant loss of lives and livelihood assets.

the focus is on increasing resilience of people or reducing risks from hazards using improved environmental management or optimizing ecosystem services (**Box 2)**.

Hybrid Eco-DRR/CCA projects mainly state aims to reduce risk or increase resilience and apply adaptive measures often in broad terms. One such example is the Partners for Resilience (PfR) consortium which integrates sustainable ecosystems management, DRR and CCA in order to enhance community resilience against disasters and climate change impacts. Case study 1 elaborates on one of PfR's projects in India. Although these differences in aims between Eco-DRR and EBA projects may seem small or superficial, there can be large differences in approach taken in terms of project assessment and implementation, depending on the project's orientation towards either DRR or CCA and on the implementing institutions.

CASE STUDY 1

An Example Of An Eco-DRR/CCA Project: Building Resilience in the Mahanadi delta and Kosi-Gandak Floodplains

Case study contributors: Ritesh Kumar and Marie-Jose Vervest, Wetlands International

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The Mahanadi delta served the important function of absorbing excess flood waters and acting as water reservoirs during the dry periods, and remains vital to local livelihoods.

The Partners for Resilience is working in India to address the impact of flooding from the Mahanadi delta in Odisha and Kosi-Gandak floodplains in Bihar on people whilst maintaining the integrity of the wetland ecosystems. They aim to build resilient communities in order to boost their preparedness to disasters and improve their livelihoods in a changing climate and hydrological environment.

Every year, the region is devastated by inland floods and extreme weather events hitting the coast, such as cyclones, affecting lives and livelihoods of millions of people. These areas are densely populated with the majority of people living off agriculture. Exposure and vulnerability to disasters remain high. Climate change is likely to exacerbate disaster risk because rainfall is projected to increase by 15-40% by 2100 in these regions, increasing risk of flooding.

Rich in biodiversity, the wetland ecosystems of both the Mahanadi delta and Kosi-Gandak floodplains previously served the important function of absorbing excess flood waters and acted as water reservoirs during dry periods. However, many of these areas have been degraded or reclaimed for agriculture and settlements, interrupting and fragmenting the natural water flows and putting additional pressure on the ecosystem. This, alongside a changing climate, have resulted in increased floods downstream and more droughts upstream. Flood defences were built in response to this problem. However, these defences also stopped water from flowing into the wetlands. This has resulted in communities being even more vulnerable to these hazards.

An integrated approach, taking into account disaster risk, climate change, ecosystem integrity and livelihoods, is viewed as the foundation for building resilient communities.

Sources:

- http://www.partnersforresilience.nl/
- http://www.wetlands.org/Whatwedo/Ouractions/tabid/2661/mod/601/articleType/ArticleView/articleId/3395/Default.aspx

Note:
The Partners for Resilience is a collaboration between the Netherlands Red Cross, CARE Netherlands, Cordaid, the Red Cross/Red Crescent Climate Centre, Wetlands International and 60 civil society partners in Asia, Central America and West and East Africa.

4.3 Assessments

The projects assessed for this document tended to use VA and DRA approaches (see section 2), often adapting them to their needs. Both Eco-DRR and EBA aim to incorporate ecosystems and the environment within their assessment frameworks. There is currently no set methodology in both fields of practice, and many institutions are creating their own ways of doing so, depending on their own project needs and objectives.

Presently, some EBA projects start their assessment processes with an ecosystem focus: examining how ecosystems (and their services) may be impacted by climate change and, in turn, how this impacts communities that depend upon ecosystem services (**Box 3 and Case study 2**). Developing future change scenarios are generally part of such assessments. EBA assessments are often top-down or externally-driven; although community assessments (and mixed approaches) have been used, especially in community-based adaptation projects that have an ecosystem focus.

Assessments in Eco-DRR and hybrid Eco-DRR/CCA projects usually start with a focus on hazards, exposure and vulnerabilities, as the core elements used to understand disaster risk. However, in such projects, there is an emphasis on assessing linkages to environmental conditions, natural resource use and environmental/ natural resource management practices in the participating communities. The starting point is generally a standard disaster risk and vulnerability assessment that is expanded to integrate ecosystem and environmental considerations. In Eco-DRR and hybrid Eco-DRR/ CCA projects, community-based risk assessments (CRA) and mapping are common. Generally, the assessment focuses on disaster impacts experienced by local communities based on a historical perspective (i.e. looking at past and current events), although there is growing appreciation for understanding future trends and scenarios and driving factors of change, including climate change as well as other developmental trends (e.g. population growth). The Partnership for Resilience, which is implementing several hybrid Eco-DRR/CCA projects, has revised its CRA to include climate change and ecosystem considerations (**Case study 3**).

No two VA or DRA are the same. Some institutions are developing guidance and methodologies, yet there is currently no standardisation. Difficulties arise especially for ecosystem-based approaches because existing VA and DRA methodologies and tools do not take ecosystems and services properly into account. Recently, there has been a project with the aim to develop an assessment methodology that integrates ecosystems and climate change factors in the analysis of disaster risk and vulnerability (RiVAMP[7]). However, the RiVAMP methodology is data demanding and may not be easily applied in countries with limited baseline information. There are now a number of online, GIS-based tools that seek to integrate ecosystems in assessments, including the software InVEST developed through The Natural Capital Project (**Case study 4**). The availability of data plays a huge role in shaping the types of VA and DRA used in EBA / Eco-DRR projects. The advantage of InVEST is its relatively low data requirements. However, the outputs are descriptive and qualitative, and their accuracy depends on the precision of input data.

Some generalities in terms of differences and similarities between VA and DRA can nevertheless be drawn from the projects examined. The DRAs occasionally use environmental impact assessments (EIA), Socio-economic assessments (SEA), and early warning monitoring, which at present many VAs do not (though European VAs tend to include EIAs). This stems from DRR's prevention, preparedness and humanitarian focus, aspects that are also taken into consideration in Eco-DRR projects. The VAs tend to put high importance on future vulnerability, taking long-term projections into account. They tend mostly to look at the impact of changes in temperature and precipitation, sometimes undertaking climate impact modelling. They also examine sea level rise and use relevant models for this, when data are available. In practice, one finds that future climate change projections used in the VAs are not useful, for more than giving an overview of possible future risk. Generally, the scale of projections is not useable for small areas where field-level interventions are generally implemented, and current climate models are not good at predicting extreme events, although these have improved in the

7 RIVAMP stands for Risk and Vulnerability Assessment Methodology Project (UNEP 2010).

AR5. VAs then tend to fall back on examining past and current vulnerability in a manner more reminiscent to that undertaken under DRAs.

Whilst climate impact modelling, future scenario development or sea level rise impact analysis may be tools specific to EBA assessments, many tools used for Eco-DRR assessments have high relevance for (and are sometimes used within) VAs. These include modelling or analyses concerning erosion, landslides, floods, drought, etc. However, these tools are not often applied to VAs mainly because of the climate change adaptation community's focus on broad changes in climate, and sometimes because of a perceived inability to predict climatic extremes. In this regard, the EBA community could learn much from the Eco-DRR community, and vice versa. One sector where both communities use very similar/the same tools is in coastal areas, for instance in the analysis of beach erosion and coastal flooding either as a result of storm surges or sea level rise. Through consideration of ecosystems and environmental changes within VA and DRA assessments and understanding current and future risks, integrated Eco-DRR/CCA assessment frameworks could clearly help bridge gaps between DRR and CCA practice.

BOX 3. SOME EBA PROJECTS USE ECOSYSTEMS AS A STARTING POINT IN THEIR VULNERABILITY ANALYSIS

- CI's South Africa EBA project, modelled future changes in biomes under climate change to assess areas of stability and change. They then modelled areas important for supporting resilience to climate change. Combining both maps along with certain priority maps (such as water yield areas), they determined priority areas for undertaking EBA.

- In the UNEP/UNDP/IUCN Mountain EBA project taking place in Peru, potential changes to agricultural crops were modelled alongside water yield and other factors to indicate areas vulnerable to climate change within agricultural and water sectors.

CASE STUDY 2

Using vulnerability assessments for identifying EBA options

Case study contributors: Nancy Soi, UNEP Climate Change Adaptation Unit

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Coral reef restoration will be implemented in Windward, Grenada, as a climate change adaptation measure

UNEP's project "Building capacity for coastal Ecosystem-based Adaptation in Small Island Developing States" is being implemented in Grenada and Seychelles. In Grenada, social and ecological vulnerability impact assessments (VIAs) were carried out in three local sites (Lauriston Beach, Windward and Grand Anse Bay). The focus of the VIA process was modelling and analysing the impacts of climate change in terms of extreme events (e.g. hurricanes and tropical storms) and sea level rise on coastal communities and coastal/marine habitats, highlighting the problem of beach erosion in all three areas. Nonetheless, human activities, such as building constructions on beaches, were also examined.

Various coastal adaptation options were proposed based on the identified vulnerabilities including coral reef and mangrove restoration, locally managed marine area, beach nourishment, breakwaters, stone revetments, among others. Thereafter, a cost benefit analysis was undertaken against each of these identified options. Results and recommendations have been validated by stakeholders during a national workshop held in Grenada in November 2014. Windward and Grand Anse Bay were selected as field demonstration sites. In Grand Anse Bay, a locally-managed marine area will be supported, while active coral reef restoration will be implemented in Windward. These EBA options will also be designed and implemented with local communities in order to enhance ownership of the interventions and benefit from local knowledge and experiences.

References:

Government of Grenada, Ministry of Finance, Planning, Energy and Corporative (2010), Grenada Disaster Vulnerability Reduction Project Environmental Impact Assessment, Prepared by Edward Niles, Environmental and Physical Planning Consultant.

Caribbean Community Climate Change Centre (2002) Grenada's Coastal Vulnerability and Risk Assessment. Published in 2014.

CASE STUDY 3

Integrating climate change and ecosystems as part of disaster risk assessments: The Partners for Resilience Approach

Case study contributors: Alejandro Jimenez, Marie-Jose Vervest and Ritesh Kumar, Wetlands International

APPROACH TO REVISE CRA TOOLS	EXAMPLE	RESULTS
Partners continue to use their own tools but make use of their 'complementarity' relying on each other for specific advice: e.g. when incorporating climate and ecosystem considerations into existing tools	In Nicaragua, Wetlands International advised its PfR Partners to introduce Ecosystem Management and Restoration (EMR) into their own CRA process in order to expand analysis beyond community-based DRR.	1. CARE now considers the impact of reduced forest cover on increasing landslide vulnerability. 2. Nicaraguan Red Cross now considers new issues alongside emergency response measures, such as watershed management and deforestation
Partners adapt only a few community risk assessment tools to ensure climate and ecosystem risks are considered.	1. Partners in the Philippines applied an ecosystem and climate lens to three tools only: seasonal calendar, historical calendar, and risk maps. 2. Partners tested the tools in 28 communities and developed a comprehensive DRR lobby & advocacy strategy	A narrower focus enabled Partners to expand analysis to a broader geographical scale and gain better understanding of the evolution of climate through time as well as the root causes of risk in relation to the environment

The PfR programme aims at strengthening community resilience to disasters in nine countries through an integrated risk management approach. The initial phase of the PfR programme involved conducting community risk assessments (CRAs). To move beyond "business-as-usual" CRAs, Partners sought to explicitly consider factors related to climate change and ecosystems when conducting the CRAs in participating communities, which led to a more integrated, holistic approach to understanding community risks.

The conventional approach to CRAs typically looks at social, economic, political as well as cultural drivers of vulnerability, which may include demographic changes, urbanization, governance and livelihoods. PfR partners sought to achieve a more integrated understanding of risk, using different geographical and time scales. DRR assessment tools generally used by PfR partners, such as seasonal calendars, risk maps and historical calendars, were enhanced to include climate-related risks and ecosystem-related issues. For instance, risk maps were used to visually describe and assess trends related to changing hazards and ecosystems over time. Risk mapping exercises were supported by facilitated discussions to identify and analyse the changes, trends and linkages between climate, ecosystems and disaster risks over time, taking a landscape perspective. Participating villages were encouraged to look beyond their village boundaries and appreciate how they were interconnected within a wider landscape, such as a river basin or delta.

The table above shows how PfR partners revised their traditional community risk assessment processes to account for climate and ecosystem-related factors. Results of the enhanced CRAs were used as a basis for identifying with the communities more broad-based, integrated disaster resilience strategies. Key lessons with developing climate- and ecosystem-smart CRAs include improved understanding of the underlying risk factors, importance of taking early (preventive) actions, developing a longer-term view in disaster risk reduction, and appreciating the relevance of a landscape and ecosystems approach to DRR.

References:

Bachofen, C., Coughlan, E., Jimenez, A., Monasso, F. et al. "Integrating climate and ecosystems into community risk assessments: Examples and lessons learned from the Partners for Resilience Programme", Version 3.0. March 2014.

CASE STUDY 4
Integrating ecosystems in analysing exposure to coastal hazards

Case study contributor: Niloufar Bayani, Data analyst, UNEP

The Natural Capital Project has created software called InVEST (Integrated Valuation of Environmental Services and Tradeoffs) that can be used as part of disaster risk assessments with a focus on ecosystem linkages and exposure to different types of hazards. Developed as a package of assessment tools that are designed to provide qualitative assessments and be less data intensive, InVEST has already been tested in several countries especially in the Caribbean, with Belize recently having completed a nation-wide application of InVEST.

UNEP is testing the InVEST assessment methodology in its Eco-DRR Projects. In Haiti, UNEP is applying InVEST Coastal Vulnerability to demonstrate the role of coastal and marine ecosystems in reducing exposure to storm surges and flooding in Port Salut Municipality. Using this tool, UNEP has estimated that the loss of local ecosystems would more than double the area of high exposure, while ecosystem restoration can drastically reduce exposure to flooding and storm surges. The results of this assessment are being used to identify priority ecosystems for sustainable management and inform local land use and disaster risk reduction plans.

In DR Congo, UNEP is applying InVEST Sediment Retention to model reforestation and urbanization scenarios and their subsequent impacts on soil erosion (Figure 2). Extreme levels of erosion and sedimentation in the Lukaya River Basin are the two major hazards leading to loss of agricultural land and livelihoods and high risk of flash floods. InVEST Sediment Retention has been designed to take into account the role of vegetation in retaining soil and reducing erosion. This tool has allowed UNEP to demonstrate the benefits of ecosystems in mitigating hazards and identify priority areas for re-forestation and re-vegetation.

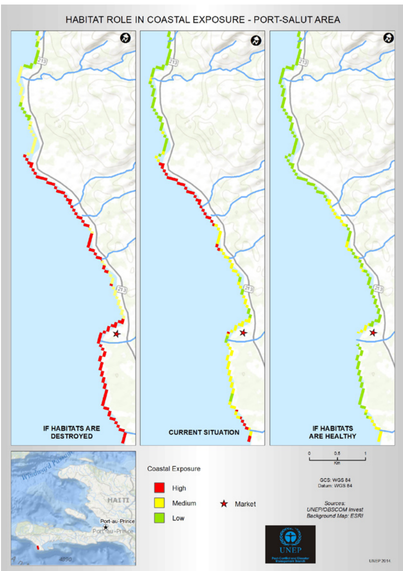


Figure 1. Exposure to coastal storm surges and flooding in Port Salut, Haiti, under current ecosystem conditions (middle), and scenarios of degradation (left) and restoration (right) of coastal and marine ecosystems.

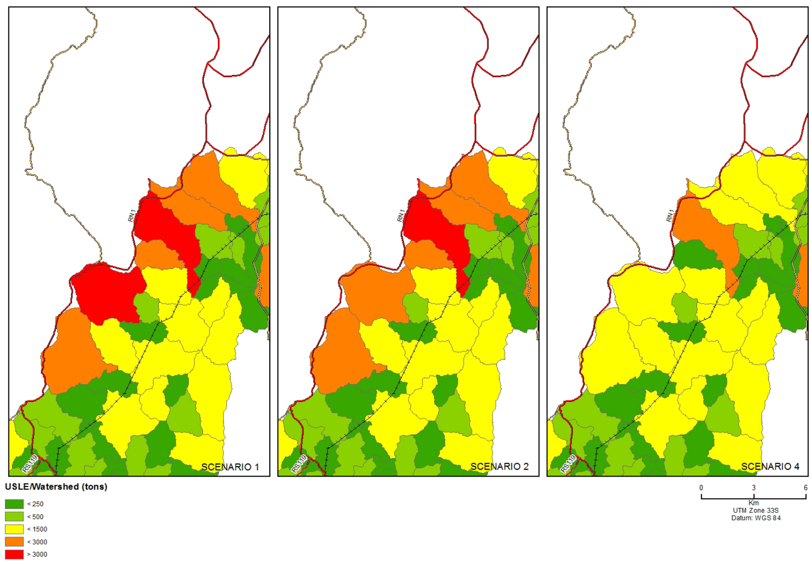


Figure 2. Soil loss estimates (tons/subwatershed) under current conditions (left), urbanization (middle) and reforestation (right) scenarios on the steep denuded slopes of the Lukaya River Basin.

4.4 Implementation

Implementation of Eco-DRR and EBA projects often utilizes a combination of "hard" and "soft" approaches. For the purposes of this report, "hard" approaches in this case refer to activities such as tree planting; whilst "soft" approaches refer to activities such as capacity-building and policy development[8]. In this paper only "hard" approaches will be primarily discussed because these are where Eco-DRR and EBA are more distinctive to other DRR and CCA measures. Within this section, we will examine a) the overall methodology or approach taken in projects and b) on the ground activities.

Methodology/approaches

Nearly all Eco-DRR projects use early warning systems in contrast to EBA. EBA and hybrid Eco-DRR/CCA projects, on the other hand, often include establishment or improved management of protected areas and protected area networks, including corridor establishments, whereas it is less common in Eco-DRR projects surveyed (with exception to UNEP's Eco-DRR project in Haiti; see Box 4).

Certainly, most methodologies and approaches used by both EBA and Eco-DRR are exactly the same, which is expected since both seek to apply sustainable management, restoration and conservation of ecosystems. These ecosystem-based or environmental management approaches include:

- Land use planning and zoning
- Sustainable (natural resource) management within forestry, agriculture and pastureland
- Integrated water resource management (IWRM)
- Integrated coastal zone management (ICZM)
- Integrated watershed or river basin management (IWM)
- Integrated land management (ILM)
- Protected Areas Management
- Drylands management
- Community-based action
- Stewardship systems

Case studies 5 and 6 detail two case studies on project implementation illustrating approaches and measures used in ecosystem-based approaches to adaptation and disaster risk reduction. From the description of projects, it is impossible to know whether there exist differences in how these instruments are used to contribute to Eco-DRR and EBA.

BOX 4. EBA AND SOME ECO-DRR PROJECTS OFTEN INCLUDE ESTABLISHMENT OR IMPROVED MANAGEMENT OF PROTECTED AREAS

➔ In Peru, UNEP's 'Mountain EBA' project in Peru involves the management of a protected area in order to tackle flood risks and impacts of climate change.

➔ In the Philippines, CI's EBA project has strengthened the marine protected areas within the Cape Verde Passage, as well as protecting mangrove areas.

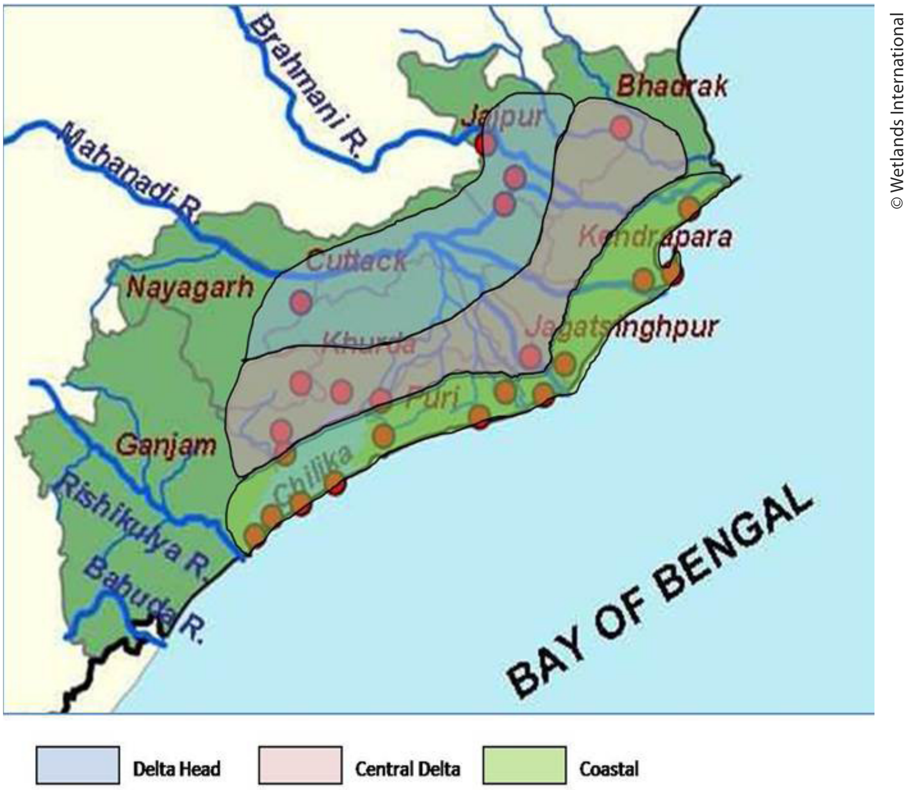
➔ In Colombia, the GEF-funded EBA project implemented by Conservation International Colombia, established a coral conservation area within their marine management plan to meet anticipated impacts of climate change in insular areas. This project also focused on high mountain areas, where land use planning was established with the aim to enabling the continued delivery of ecosystem services and reducing vulnerability of agro-productive systems.

➔ In Haiti, UNEP's Eco-DRR project is working with the Government of Haiti on strengthening marine protected area management to maintain healthy, coastal and marine ecosystems for two main objectives: disaster resilience and sustainable livelihoods and diversification.

8 In the literature, "hard" approaches to CCA/DRR often refer to structural or technical (or "grey") solutions, whilst "soft" approaches refer to ecosystem-based ("green") solutions.

CASE STUDY 5
Applying a landscape approach in integrated Eco-DRR/CCA projects

Case study contributors: Ritesh Kumar and Marie-Jose Vervest, Wetlands International



Clusters identified for risk reduction plans in the Mahanadi delta region

In the Mahanadi delta in northeast India, communities are under risk of floods and storms that occur more and more frequently and cause widespread loss of life and property. As a strategy to deal with such risk, PfR partners Wetlands International and Cordaid applied 'the cluster approach': clusters of villages in the same geographical region are linked together to conduct risk assessments and jointly invest in landscape-scale ecosystem and natural-resource management projects.

Results of the participatory risk assessments revealed hazard patterns within each delineated geographical cluster. For example, most of the villages within the coastal cluster experienced hazards such as tidal inundation, coastal storms, saline intrusion and erosion. In the Mahanadi delta, three clusters were distinguished: an upstream, midstream and downstream/coastal cluster. Cluster villages were given opportunities to jointly invest in DRR activities, such as reforesting the hill slopes and nearby mangrove forests, dredging of silted lakes and rivers and reactivating the floodplain. Village-level institutions were strengthened to implement risk reduction plans within their respective geographical clusters. Villages successfully managed to link their risk reduction plans to existing government schemes and leveraged over €3 million for implementation of activities identified in their risk reduction plans.

The cluster approach is unique because it allows communities to team up in addressing the root causes of disaster risks, such as ecosystem degradation, by working at a landscape level. Meanwhile, they implement village-specific DRR interventions within their own respective communities. This landscape approach is part of an integrated strategy and vision used to inform the work of PfR in the Mahanadi delta. Landscape approaches are integrated with conventional early-warning, disaster preparedness and response measures to increase community resilience, and are implemented to support diversified and sustainable livelihoods, including micro-enterprise development.

CASE STUDY 6

Integrated National Adaptation Project in Colombia

Case study contributor: Angela Andrade, Conservation International Colombia

Colombia's First National Communication to the United Nations Framework Convention on Climate Change (UNFCCC) indicated that high mountain ecosystems, insular and coastal areas, and public health as areas of high vulnerability under climate change in Colombia. Consequently, a Global Environmental Facility (GEF) project was set up to support Colombia's efforts to define and implement specific pilot adaptation measures and policy options to meet the anticipated impacts of climate change. These pilot projects were undertaken within a) Chingaza and Los Nevados National Parks (high mountain ecosystems), b) Caribbean insular areas, and c) the country's health plans (concerning increased threat of dengue and malaria).

Ecosystem-based adaptation (EBA) measures were undertaken through a number of methods, approaches and tools. Within the high mountain ecosystem, territorial planning was linked with adaptation to restore natural infrastructure and reduce vulnerability to natural disasters through a) the incorporation of adaptation programmes within land-use plans and b) through the creation of guidelines on land-use planning in high mountain ecosystems.

Ecosystem management actions were implemented in the Rio Blanco watershed, one of the main watersheds of the Chingaza National Park, which provide water to Bogotá. More specifically, EBA activities entailed:

- Conservation of natural vegetation of riparian belts alongside streams;
- Conservation and recovery of soils;
- Adoption of a management program to prevent and mitigate activities, including forest fires, that would further reduce water retention capacity in the soil;
- 26 participatory ecological restoration processes underway and 14.000 m restored in headwaters, riversides, landslide areas;
- Recruitment of 36 native species and installation of nurseries in local farms;
- Establishment of herbariums by local communities;
- Identification of diseases in natural vegetation (Espeletia) and crops;
- Adaptation measures to climate change identified and being implemented: home gardens; preparation of compost; "live fences" with native plants; soil and conservation practices,
- Implementation of activities responding to changes in water variability: water efficiency measures in 8 localities;
- Strengthening of local organizations and capacity building to face climate change.

Conservation actions also played a key role in implementing EBA. Within the high mountain ecosystem, the Chingaza National Park management plans were strengthened and ecological corridors promoted outside of the protected area. Within the Caribbean insular areas, the project focused on strengthening the performance, monitoring and protection of key marine ecosystems. Integrated water management was also undertaken to improve water quality.

The implementation of these activities was shown to be more effective and sustainable when a participatory approach was used. Indeed, where communities were not only informed but were actively engaged, they became more proactive, motivated and willing to participate in adaptation activities.

Sources:

World Bank (2012) Colombia Integrated National Adaptation Project http://www.worldbank.org/projects/P083075/colombia-integrated-national-adaptation-program?lang=en

Andrade, A. & Schutze Páez, K. (2010) Integrated National Adaptation Pilot INAP: Ecosystem-based Adaptation in High Mountain Ecosystems. Presentation at Adaptation Knowledge Day I, 8 June 2010, Bonn, Germany.

http://www.unep.org/climatechange/adaptation/Portals/133/documents/AdaptationKnowledgeDay_AngelaAndrade.pdf

An Eco-DRR approach within these instruments would consciously aim to reduce hazards, exposure and vulnerability through an ecosystem-based approach, but also typically address other elements of disaster risk management, including early warning and disaster preparedness. For example, tree planting within an IWM/Eco-DRR project would be focused near flood areas and buffering against or mitigating flood impacts, as is the case of UNEP's Eco-DRR project in the Lukaya River Basin, in DR Congo. EBA would likely undertake similar measures; however, it would also take into account climatic suitability of species within the area (i.e. planting trees that are suitable to the emerging climatic conditions) as well as utilising tools to help ecosystems adapt to change (e.g. through use of natural corridors; Indeed CI's EBA project in South Africa promotes the creation of such a conservation corridor).

Implementation – activities on the ground

Intuitively, implementation of activities is where one would expect most overlap between EBA and Eco-DRR because of the common element of applying sustainable ecosystem management principles approaches and because of the overlapping characteristics between DRR and CCA as discussed above. Indeed, nearly all projects include some form of re-vegetation and reforestation: for example, land rehabilitation, to improve ecosystem functions (and thus services), to prevent or mitigate hazard impacts, such as soil erosion, landslides and floods, to increase water security and to act as windbreaks and storm surge protection. Both EBA and Eco-DRR projects sometimes involved removal or control of invasive/alien species, sand dune re-establishment, agro-foresty, river re-naturalization, and soil conservation techniques.

Yet there are slight differences in implementation between classic Eco-DRR and EBA (and hybrid Eco-DRR/CCA projects). Because EBA and Eco-DRR/CCA projects often take a long-term view, they acknowledge that ecosystems themselves will need to adapt to climate change and that current species within ecosystems may no longer find suitable conditions in situ. This recognition in project implementation leads to the careful selection of species for planting; species that are suitable to the emerging, new conditions. This is most readily seen in the agricultural sector, where for example drought-resistant seeds and species are used. For example, many of the Partnership for Resilience projects include giving communities drought-resistant seeds. However, analysis and action on plant species/climate suitability remains limited to agricultural areas within hybrid Eco-DRR/CCA projects.

Furthermore, because of the uncertainty in the direction of change (indeed different models provide different projections), EBA is more likely to call for adaptive management through time. Adaptive management (also sometimes called "action learning") is a structured, iterative process of decision-making (e.g. in natural resource management) or of policymaking in the face of uncertainty (Stringer et al. 2006; Williams 2011). In EBA, adaptive management aims to reduce uncertainty over time using a monitoring system of the environment and of the outcomes of resource management practices, which in turn feeds into decision-making related to natural resource management. It is based on continuous learning and thus improving long-term management (Salafsky et al. 2002; Palh-Wostl 2007). Active participation and learning from stakeholders in an iterative way is fostered in adaptive management. In practice, adaptive management involves the common setting of goals, strategies and monitoring thereof; goals and strategies are updated following the results of the monitoring (Stringer et al. 2006). Despite the importance of taking into account uncertainty with respect to future climatic change, many EBA projects, however, do not include adaptive management within their plans because projects have a set end-date and limited funding. Finding ways of laying the foundation for adaptive management at the community level would be an added value in EBA, Eco-DRR and hybrid Eco-DRR/CCA projects.

As part of increasing resilience of communities and enabling them to adapt to changes, both Eco-DRR and EBA projects also involve promoting diversified, sustainable livelihoods. These typically involve promoting agroforestry, honey production, eco-tourism, etc. For example, CARE's EBA/Eco-DRR project in Vietnam on mangrove restoration also included establishing alternative livelihoods using the products found in mangrove ecosystems (e.g. honey and fisheries). New alternative livelihoods may arise not only from an ecosystem-based approach but also due to changes in climate, which increase suitability for certain species.

Deciding which approach to use or what on-the-ground activities to undertake for adaptation or disaster risk reduction is not always easy because several options may be available. These options may be ecosystem-based or structural/engineering-based. Decision-making tools, such as multi-criteria decision-making, cost-effectiveness or cost-benefit analyses, are sometimes used to choose the best DRR or CCA option. Cost-benefit analysis is often a tool of choice, though not always appropriate to use in situations where cost cannot be estimated (such as often the case with ecosystem services). Nevertheless, more and more projects are using these to make decisions for adaptation or disaster risk reduction. The UNEP project in Lami town used cost-benefit analyses in comparing ecosystem-based and structural adaptation options (**Case study 7**).

CASE STUDY 7

Applying cost-benefit analysis for adaptation: The case of Lami Town, Fiji

Case study contributor: Jerker Tamelander, UNEP Regional Office of Asia-Pacific

Lami Town is located on the south east coast of Viti Levu, Fiji, west of Fiji's capital Suva. Like many other small island communities in the Pacific, Lami Town is experiencing increasing climate related impacts, including flooding associated with storm surge and high rainfall. This has caused erosion along riverbanks and shorelines, as well as damage to infrastructure and economic activities.

Vulnerable areas were identified based on analysis of data collected and consultations with stakeholders. The major threats identified were flash flooding from the three rivers that flow through Lami, surface flooding from high rainfall, riverbank erosion and upslope erosion as well as coastal flooding and erosion as a result of storm surges related to cyclones, other storms and high tide events. Informal settlements, the Central Business District and the industrial area were among the areas found to be most vulnerable to these threats. The natural shoreline protection services from mangroves, seagrass, mudflats and coral reefs are all threatened by anthropogenic activities (**Figure 1**).

The storm protection actions proposed by the Lami Town Council and the vulnerability assessment report listed storm protection options which could be classified into the following general categories: ecosystem-based adaptation options, social/policy options and engineering options (**Table 1**).

For each of these options, costs over the entire implementation area were estimated, including costs related to installation, maintenance, labor and (associated) opportunity costs.

The cost of inaction was also calculated, including costs of flood damages to health, business and households. Damages result when insufficient actions are taken by the community to reduce disaster risks. However, when action is taken, some proportion of storm damage is reduced, also referred to as "avoided damages".

Four scenarios ranging from EBA options to engineering options to hybrid options for storm protection were developed, with identified actions in each scenario (**Table 2**).

The baseline ecosystem service value of Lami Town's natural assets, namely mangroves, coral reefs, seagrasses, mudflats and upland forests, was estimated. An estimate of the ecosystem service value was calculated for each of these natural systems by using a combination of global and local economic valuation studies.

A cost-benefit analysis of the four scenarios was performed using the estimates of avoided damages and estimate of ecosystem service benefits (**Table 3**).

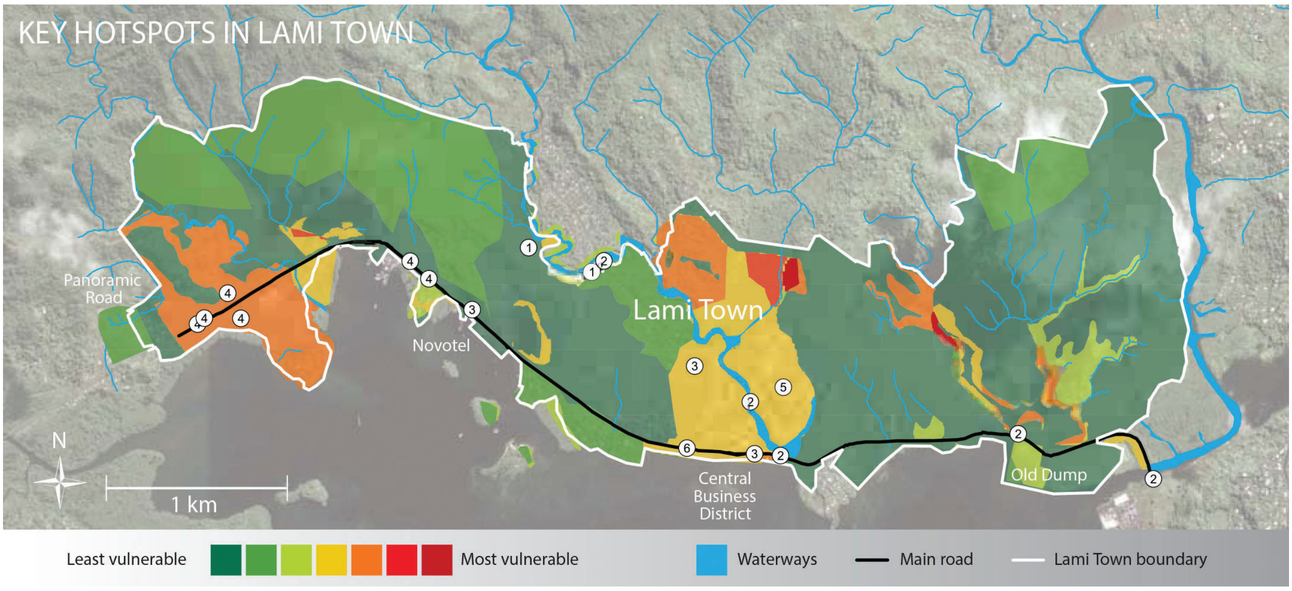


Figure 1. Vulnerability hotspots in Lami Town: river bank erosion, vulnerable bridges, coastal erosion, coastal flooding, as well as the Lami Town business district and industrial area.

This pilot project found that ecosystem-based approaches are often the most cost-effective, requiring only modest long-term investment while providing a number of additional benefits from ecosystem services, whereas engineering options may be useful e.g. in protecting high value infrastructure that cannot be moved. Lami Town decided to implement mangrove reforestation on selected portions of the coastline and stabilization of riverbanks through vetiver grass planting to provide protection to industrial and residential areas. Lami Town has also reinforced some seawalls protecting the central parts of the town, including the business district.

As a result of their participation and engagement in the project, communities, private sector and local business operators now have a greater understanding of climate change and ecosystem-based adaptation options. The project has given Lami Town the experience and methodology for running cost-benefit analyses to guide budgetary and planning processes. By integrating climate vulnerability assessment and adaptation planning into existing processes, the project has ensured that adaptation actions are mainstreamed into future development planning. These experiences are used to inform national climate change strategies through knowledge management and outreach. This provides a model for adaptation that is locally appropriate in the Pacific SIDS context and can be replicated by countries and towns across the region. However, there are limitations to the study, including data quality and availability, and ways to improve future assessments are suggested.

A second phase is currently underway (2014), to identify and analyse costs and benefits associated with adaptation options in the Lami Town watershed. A monitoring and evaluation system is also being developed to track effectiveness of ecosystem-based adaptation in the longer term and guide further integration of ecosystem-based and 'conventional' adaptation actions.

Reference:

Rao N.S., Carruthers T.J.B., Anderson P., Sivo L., Saxby T., Durbin, T., Jungblut V., Hills T.,Chape S. 2013. "An economic analysis of ecosystem-based adaptation and engineering options for climate change adaptation in Lami Town, Republic of the Fiji Islands." A technical report by the Secretariat of the Pacific Regional Environment Programme. – Apia, Samoa : SPREP 2013

http://www.ebaflagship.org/images/ContentsForEcosystems/LamiTownProject.pdf

CASE STUDY 7

Applying cost-benefit analysis for adaptation: The case of Lami Town, Fiji

Case study contributor: Jerker Tamelander, UNEP Regional Office of Asia-Pacific

Table 1. Possible adaptations options identified

ECOSYSTEM-BASED ADAPTATION ACTIONS	SOCIAL/POLICY ACTIONS	ENGINEERING ACTIONS
• Coastal revegetation – replanting mangroves and other vegetation (e.g. along river banks and stream lines) • Conservation of mangroves, seagrasses, coral reefs, forests, river buffer areas – through monitoring and enforcement to limit extractive activities	• Rezoning areas • Regulating land tenure of informal settlements • Coastal relocation (i.e. relocation of vulnerable coastal settlements to higher, drier areas) • River relocation (i.e. relocation of vulnerable riverine settlements to drier areas) • Flood warning systems	• Bridge improvements • Reinforcement of rivers • Dredging of rivers • Improving draining • Building seawalls • Beach nourishment • Storm surge barriers • Flood proofing built structures • Managed realignment of the shoreline

Table 2. Four scenarios of adaptation options

ECOSYSTEM-BASED ADAPTATION OPTIONS Focusing on maintaining the current natural protective effects of mangrove forest, coral reefs, mud flats and forest, working to preserve and re-establish these habitats to reduce the vulnerability of the community	HYBRID 2: EMPHASIS ON ENGINEERING OPTIONS While including a wide range of adaptation options, the predominant choices are for engineering rather than ecosystem-based adaptation options
HYBRID 1: EMPHASIS ON ECOSYSTEM-BASED ADAPTATION OPTIONS While including a wide range of adaptation options, the predominant choices are for ecosystem-based adaptation options rather than engineering options	ENGINEERING OPTIONS Focusing on engineering actions targeted to improve current infrastructure, taking actions to limit the effects of severe weather on that infrastructure and the building of protective barriers in streams and along the shoreline.

Table 3. cost-benefit analysis of the four scenarios

Scenario	Benefit to cost ratio (FDJ) ($)	Assumed damage avoidance (%)
Ecosystem maintenance	19.5	10-15
Hybrid 1: Emphasis on ecosystem maintenance	15	25
Hybrid 2: Emphasis on engineering actions	8	25
Engineering actions	9	25-50

4.5 Monitoring and evaluation

Onley fifteen projects (39%), equally spread over EBA, Eco-DRR and EBA/Eco-DRR, had some information on monitoring project outcomes. With the information provided in the projects, it is impossible to say whether there are any differences or commonalities between EBA and Eco-DRR in terms of M&E. Projects included monitoring of water (quality and quantity), forest, and coastal ecosystem characteristics (e.g. species, sea-temperature, and erosion), as well as gathering socio-economic indicators, alongside M&E of project outputs, such as number of workshops undertaken, etc.

Creating indicators for EBA and Eco-DRR is as complex as creating biodiversity indicators because the outcomes of these interventions are contingent upon multiple factors. A diversity of indicators encompassing environmental, social, political and economical factors would be necessary to cover expected project outcomes such as reduction of vulnerability and risk reduction. Assigning attribution linking project interventions and outcomes therefore poses a major challenge.

Some projects show an emphasis on learning. For example, UNEP/UNDP/IUCN 'Mountain EBA' projects use a learning approach in conjunction with a logical framework. The learning framework poses a series of questions around the different project outcomes to assess their performance and learn from the experience. Results are usually more qualitative than quantitative and also descriptive. However, indicators (quantitative and qualitative) could be used to answer the questions.

Monitoring of outcomes in such a way that generates learning is crucial especially under the uncertainty surrounding how to adapt/become resilient to climate change. All discussion papers on M&E for adaptation stress the need for M&E to generate learning on what works and what doesn't work, and why (see Bours et al. 2013). As such, any project that includes adaptive management would facilitate having robust internal M&E processes. M&E for EBA and Eco-DRR is in its infancy, not only because of the relative novelty of stand-alone ecosystem-based approaches for CCA and DRR but also because M&E for these elements is in development.

With the rise in CCA projects and programmes, many organisations are in the process of questioning how to best monitor for CCA (for a discussion on challenges involved in M&E for CCA see Villanueva 2011; Spearman & McGray 2011; Bours et al. 2013) and are developing frameworks and guidelines. Bours et al. (2013) give a comprehensive overview of this emerging field of practice.

Limited attention has been given to M&E for DRR (CDKN, n.d.; Villanueva 2011). However, this has instigated some of the DRR community to develop integrated M&E for both DRR and CCA. Sanahuja (2011) for example, provides a conceptual overview for practitioners. There is increasing demand for greater accountability to demonstrate progress towards DRR globally and at the country level; therefore, M&E work in the DRR arena will likely mature once the post-2015 global framework on DRR is endorsed.

Logical framework and results-based management approaches are by far the most common frameworks for M&E of projects (Bours et al. 2013). This seems also to be the case in the projects surveyed for this paper, although some have participatory monitoring put in place. Recent useful resources for community-based adaptation/resilience M&E are from CARE (Ayers et al. 2012) and UNDP (2013). The literature highlights that logical framework and results-based management approaches may not necessarily provide the insights needed for learning and adaptive management because it is generally confined to tracking delivery of project outputs, and that including process-based evaluations is necessary, especially given the limited timeframes and geographical spread of most field-based projects. In a process-based methodology key stages towards an optimal end point are set without specifying what that end point looks like. It then measures progress towards these benchmarks and not outcomes (Villanueva 2011). This allows for some uncertainty on what an outcome should look like. Furthermore, it allows assessments to be made on progress toward long-term goals where impact is hard/not yet possible to detect. Process-based evaluations tend to focus on measuring "how results are achieved" rather than the results themselves, such as looking at changes in perception of risk, changes in understanding and changes in adaptive capacity (Villanueva 2011). From the literature, it is also clear that M&E needs to be tailored to each project and that there is no one size fits all.

Eco-DRR and EBA pose perhaps more challenges for M&E because monitoring ecosystem services, biodiversity and environmental health, and developing meaningful indicators that capture the complexities of ecosystems, are challenging (Dale and Beyeler 2001; Feld et al. 2009). Aside from guidance relevant to developing biodiversity indicators, little attention has been given to developing indicators for EBA and Eco-DRR. But interest in this area is growing. UNEP and IUCN are working to develop M&E and learning frameworks for their respective Eco-DRR field projects (**Case studies 8 and 9**).

CASE STUDY 8

Integrating Monitoring, Evaluation and Learning in UNEP's Eco-DRR field projects

Case study contributor: Marisol Estrella, Disaster Risk Reduction Programme Coordinator, UNEP

UNEP's Monitoring, Evaluation and Learning (MEL) framework for its Eco-DRR projects in Sudan, Afghanistan, Haiti and DR Congo focuses on four key result areas, which is illustrated by Figure 1.

Each key result area is viewed to be inter-linked and mutually-supporting, with the overall aim (expected outcome) of leveraging field project interventions and capacity building activities towards influencing and mainstreaming Eco-DRR into development policy and programming. The MEL framework provides each country flexibility on reporting against each key result area, without use of a common set of indicators. Given that field interventions have a timeframe of only 3 years and implemented at small geographical scales, it is even more critical to measure the "building blocks" and enabling conditions that will support replication and scaling-up of Eco-DRR over the long-term. Keeping the MEL framework flexible allows for more process-oriented results to be captured that also contribute towards the key result areas.

Table 1 provides a snapshot of MEL reporting from Eco-DRR projects in DR Congo and Haiti. The MEL framework further seeks to capture lessons learned (e.g. what worked/ what didn't work, identifying best approaches or strategies to use to inform and influence) during project implementation. There is also constant assessment of identifying and managing potential risks to the project, which can include natural hazards, conflict, heightened security, etc. Project monitoring and knowledge exchange takes place on a bi-annual basis, through an annual project team retreat involving all field project coordinators from the four countries. The annual retreat offers an opportunity to reflect on key achievements, challenges and lessons but also promote peer-to-peer learning amongst field coordinators.

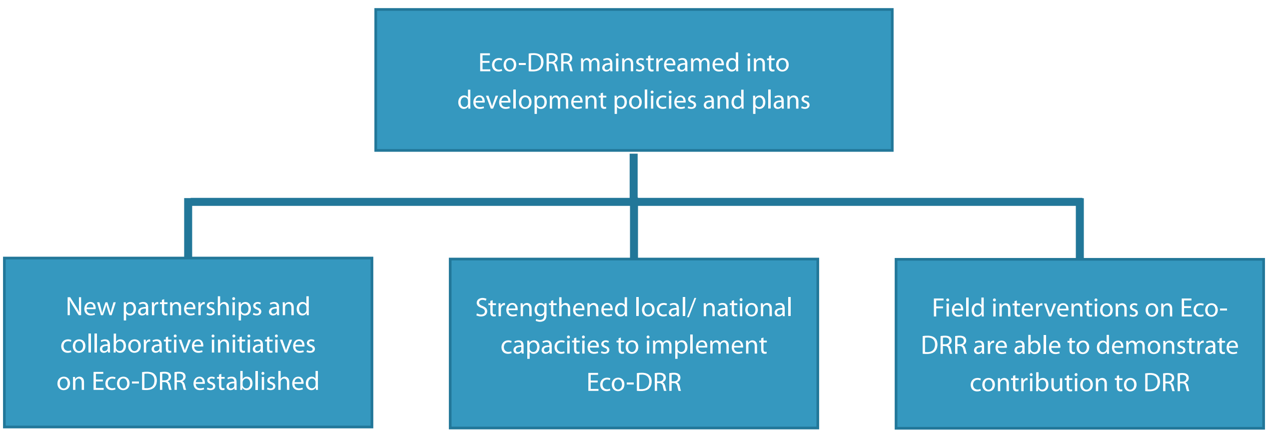


Figure 1. UNEP's MEL framework for its Eco-DRR projects in the four countries

CASE STUDY 8 (continued)
Integrating Monitoring, Evaluation and Learning in UNEP's Eco-DRR field projects

SAMPLE DATA FROM M&E REPORTING	DR CONGO	HAITI
Planned target / milestone	Under capacity building component: • 2 major workshops have been held, with several follow-up mini-workshops, on Integrated Water Resources Management (IWRM) designed for the Lukaya river basin • Established the IWRM structure and road map for implementing IWRM	Under the field intervention component to reduce coastal hazard impacts: • Coastal nursery established in Port Salut, with 137,000 seedlings (of fruit, forest, mangrove and seagrape tree species), as the only site for native coastal seedlings production in Haiti • Re-vegetation and reforestation activities carried out with community residents, covering a total area of 141 hectares.
What worked	• Involved local river users (upstream and downstream), local and national government authorities, facilitated exchange of information and ideas, high interest generated • Inviting an external IWRM expert brought credibility (as IWRM is nascent in DR Congo)	• Ministry of Environment directly involved, building national capacities for coastal tree nursery management and re-vegetation, which remain limited in the country • Involvement of community-based organizations to re-vegetate exposed river banks and shorelines • Interested private land owners also enlisted to re-vegetate/re-forest on their exposed properties
What didn't go according to plan or expectations	It was expected that in between workshops, the established river user committees would meet among themselves without UNEP presence, but this did not happen. River users waited for UNEP to initiate meetings.	Not all of trees planted survived. Loss of trees were attributed to several factors, including poor rainfall, uncontrolled animal grazing, children playing on newly planted areas, and limited knowledge of proper planting of specific coastal tree species.
What would you change if this activity were to be repeated	• Clarify expectation of roles and responsibilities together with committee members • Design small funding component to facilitate initial set of meetings, but with provision of making it progressively self-sustaining e.g. upstream and downstream users take turns hosting meetings	Once key barriers to re-vegetation were identified, UNEP took corrective measures, including (among others): 1) public awareness-raising targeting cattle owners and school children on the importance of "green coastal barriers", and 2) targeted training for the Ministry of Environment and communities on coastal native tree species management – selection, where/when to collect the seeds, how to manage the nursery, and where/how/when to plant the seedlings. Coastal nursery management will be supported in future phases of UNEP's work in Haiti, informed by local / national capacities being built and lessons learned from this project.

CASE STUDY 9
IUCN Learning Framework in practice

Case study contributor: Karen Sudmeier-Rieux, University of Lausanne / IUCN Commission on Ecosystem Management


©Karen Sudmeier-Rieux

Bioengineering for slope stabilization in Nepal

IUCN's EBA Learning Framework is a mechanism to gather information from IUCN's work on Eco-DRR and EBA, as part of a process to generate evidence-based knowledge for nature-based solutions. It is also intended to be a useful tool that can be applied to mainstream risk reduction elements in EBA related work. Thus, the overall purpose of this learning framework is to document the value addition and effectiveness of risk reduction initiatives for human resilience enhancement.

In so far as is possible, this learning framework is intended to monitor project results over time, i.e. beyond the confines of short-term projects. While learning over shorter project timeframes is important (short term benefits to conservation and livelihoods for example), it may be over the longer term that the benefits of Eco-DRR or EBA interventions can be entrenched and sustained. This is one reason for keeping the framework simple – so that the learning questions can be repeated over time and beyond project cycles.

The three Core Learning Questions are:

1. How do pressures on ecosystems and their services contribute to diminished human well-being and vice-versa, and how does climate change/natural hazards act as pressures and as multipliers?

2. How do ecosystem functions and benefits return (and what are the costs – environmental, social, economic and at what scale), how are the effects of climate change mitigated and disaster risks reduced?

3. How cost effective (in terms of social, economic and environmental costs and benefits) is EBA/Eco DRR, in comparison to other types of interventions?

This learning framework has been applied to the Ecosystems Protecting Infrastructure and Communities (EPIC) project in Nepal being implemented by IUCN and the University of Lausanne, which focuses on reducing economic and physical damages from rural road construction. Three sites have been established in the Panchase area of Western Nepal to demonstrate the effectiveness of low-cost and community-based, bioengineering for "eco-safe roads". The learning framework was adapted to the project context and is regularly updated through focus group discussions with the community to understand the community learning process, the extent to which the ecosystem solutions are being taken up by the community and the extent to which they are beneficial and effective in reducing environmental and economic damages.

CASE STUDY 10
Ecosystem-based Adaptation in South Africa

Case study contributor: Amanda Bourne, Conservation South Africa

The Conservation International (CI) led project entitled, "Ecosystem-based Adaptation in marine, terrestrial and coastal regions as a means of improving livelihoods and conserving biodiversity in the face of climate change", is aiming to increase the resilience and adaptive capacity of vulnerable people to climate change, through:

- Assessing the potential for Ecosystem-based Adaptation (EbA) solutions in the Philippines, South Africa and Brazil;
- Implementing pilot EbA solutions;
- Providing capacity building and linking lessons learned to local, national and international climate adaptation planning and policy.

Namakwa District Municipality workshop, South Africa

In South Africa, the project is being undertaken by the CI affiliate, Conservation South Africa (CSA), in the Namakwa District Municipality and working with local small stock farmers and government officials. Results and lessons are amplified through CI's national and international networks to ensure broader application and two-way learning.

The Namakwa District Municipality is home to large portions of the Succulent Karoo biome, a semi-arid area of exceptional biodiversity. The main economic activities in this region are mining, livestock production, and tourism. The mountainous areas dotted throughout the region are locally-important water catchments. Research has indicated that local biodiversity and ecosystem services are likely to be sensitive to impacts of climate change, related to increases in temperature and reductions in rainfall.

A comprehensive vulnerability assessment (VA), using biome-scale climatic envelope modelling and the identification of ecosystem service delivery priority areas alongside an assessment of ecological, socio-economic and institutional vulnerability, was undertaken. One of the products from the VA was a vulnerability index made up of indicators of exposure, sensitivity and adaptive capacity for each of the ecological, socio-economic and institutional vulnerability categories. A first assessment of the area indicated a 'medium-high' vulnerability status. A second product was a priority areas map for EBA interventions, based on a combination of modelled biome resilience to climate change and priority areas for ecosystem-based adaptation. The map provided the District Municipality with a useful spatial planning tool that, when used in the development of Municipal Integrated Development Plans, Spatial Development Frameworks and Disaster Risk Management Strategies, can guide the implementation of nature-based activities to reduce the vulnerability of people and of ecosystems to the impacts of climate change.

The main recommendation from the vulnerability assessment was to focus on reducing socio-economic and institutional vulnerabilities as the primary method for building local resilience to climate change. In this area, rural livelihoods are intricately entwined with and dependent on healthy, functioning ecosystems so ecosystem-based adaptation approaches are among the core recommendations for action planning to adapt to climate change and reduce disaster risk. Thus, the priority areas map was used to identify two pilot adaptation projects at sites in the Namakwa District. Resilience-building activities focused on the restoration and management of key resource areas, such as wetlands and rangelands, and focused on preparing for and adapting to expected climate change impacts on water and grazing ecosystem services.

However, because appropriate indicators for Eco-DRR or EBA are likely to be context specific, establishing key guiding questions will be useful, as done in publications such as the United Kingdom Climate Change Impact Programme's (UKCIP) AdaptME Toolkit (Pringle 2011) or the Biodiversity Partnership' s (BIP) Guidance for national biodiversity indicator development and use (Bubb et al. 2010). Including participatory approaches that engage different stakeholders in the development of indicators and monitoring would also be beneficial in order to select indicators that are more meaningful and relevant for decision-making and for adjusting project implementation.

In developing an M&E approach for EBA or Eco-DRR projects, it would be useful to examine what other monitoring is being undertaken in the country and for the project site to avoid duplication and create synergies. Other schemes, such as REDD+ for example, may be setting up relevant monitoring. Indeed, many REDD+ programmes and projects are aiming to achieve multiple benefits including those related to DRR and CCA. For example, in an effort to track these benefits, REDD+ projects might monitor stream flow, monitoring that is highly relevant for M&E of DRR and CCA in relation to water resources. Clear synergies therefore could be made.

4.6 Policy and institutional contexts

Almost all of the projects (with two exceptions) reviewed for this discussion paper involve field interventions at a small or pilot scale, covering a limited geographic area or implemented at a local or community-based level. Hence, it is understandable that many of the projects, whether Eco-DRR, EBA or Eco-DRR/CCA, seek to leverage project activities in order to influence policies and decision-making at national (or sub-national) level. Mainstreaming ecosystem-based approaches into DRR and CCA policy and decision-making processes helps to support project sustainability as well as support the potential scaling-up of Eco-DRR and EBA approaches through replication in other locations or implementation at a larger geographic scale. In this section, we touch on the policy and institutional dimensions of Eco-DRR, EBA and Eco-DRR/CCA.

Fostering collaborative, cross-sectoral partnerships

Both Eco-DRR and EBA projects almost always involve implementation by environmental agencies or environmental/conservation NGOs, given their clear emphasis on the environment sector. Increasingly, Eco-DRR and EBA projects seek to work across other development sectors, such as agriculture, water, and urban development. Both recognize the importance of mainstreaming Eco-DRR and EBA into national and local development policies, programmes and plans. Hence, Eco-DRR, EBA and hybrid Eco-DRR/CCA projects all recognize the importance of bringing together and working with different government ministries and other stakeholders, including civil society, universities, and businesses and the private sector.

One major difference between EBA and Eco-DRR (and hybrid Eco-DRR/CCA projects) is that EBA rarely involves working on DRR related policies or with humanitarian agencies and disaster management-related NGOs. EBA projects often work with national governments on the national adaptation strategy, either helping to develop it (e.g. CI-Brazil through the EBA project) or working with the current strategy (e.g. UNEP/UNDP/IUCN 'Mountain EBA' project in Nepal works in accordance with the countries National Adaptation Programme of Action (NAPA) and especially Local Adaptation Plans of Action (LAPA)). EBA projects also work within specific development policies. For example in Europe, some EBA projects are undertaken under the EU water framework directive. EBA projects are also working to develop guidelines/policies for land management and population (e.g. CI's EBA project in South Africa and the GEF-funded project in Colombia). An exception is perhaps the case of CI's EBA project in South Africa, which is working to have EBA as an integral part of the disaster risk reduction strategy locally and is working nationally to influence policy (see Case study 10). Aside from this one example in South Africa, there is not enough information on the projects to know whether EBA projects generally try to work with national DRR policy.

Eco-DRR projects, on the other hand, aim to work and influence both DRR and environmental policies. For example, the UNEP Eco-DRR project in the Democratic Republic of Congo has been working closely with the Ministry of Interior and (former) Ministry of Social and Humanitarian Affairs to ensure that environment is part of their disaster management framework and strategies. However, this remains challenging given the marginal roles played by environmental ministries within DRR.

Moreover, both Eco-DRR and hybrid Eco-DRR/CCA projects reviewed also have a tendency to work towards mainstreaming ecosystem-based approaches and DRR into national adaptation policies, programmes and plans, or at least involve or engage with national climate change adaptation focal points. For instance, the EPIC (Ecosystems Protecting Infrastructure and Communities) project seeks to influence both DRR and climate change policies at national levels in the countries where it is implementing Eco-DRR field interventions. The EU funded project 'Climate Change Adaptation and Disaster Risk Reduction in Jamaica', implemented by UNEP and the Government of Jamaica, aimed to develop a National Climate Change Policy Framework and Action Plan working with environmental ministries.

Some of the national mechanisms for bringing together different stakeholders around Eco-DRR/EBA issues may include National Platforms or Committees on Disaster Risk Reduction or Climate Change Adaptation (where they exist and/or are functional), humanitarian clusters, working groups, devolved municipal or local-level adaptation planning committees, etc. The challenge remains in ensuring that such national mechanisms or platforms integrate ecosystem-based considerations in their DRR or CCA agendas. However, there are also important opportunities for bringing together different actors and sectors at sub-national or local levels, for instance working with provincial or municipal governments, as illustrated in the case of UNEP's Eco-DRR project in Bamyan Province, Afghanistan, in the case of PfR's Eco-DRR/CCA project in Orissa, India, or in CI's EBA project in South Africa.

Despite clear efforts within Eco-DRR, EBA and Eco-DRR/CCA projects to bring together and work with different stakeholders across different sectors, there remains a general tendency to work in separate tracks at the policy level, depending on whether the project is more oriented towards DRR or CCA. Significant opportunities exist in focusing advocacy efforts towards more integrated Eco-DRR / EBA policies, with an emphasis on ecosystem-based approaches and solutions in order to overcome the policy divide between DRR and climate change communities. In this regard, the role of environmental ministries in government as well as environmental/conservation national NGOs become all the more critical in promoting ecosystem-based approaches to bridge the gap between DRR and CCA.

Incentivizing Eco-DRR and EBA

One of the key challenges of implementing Eco-DRR and EBA projects is that the expected DRR and CCA benefits are not always tangible; benefits may either take time to be fully demonstrated or are mostly shared as a common good (i.e. avoided flood damage on coastlines or downstream), or both. Hence, both Eco-DRR and EBA projects usually provide incentives to obtain individual or community support or "buy-in" for undertaking field interventions. Incentives generally pertain to increasing livelihood incomes (e.g. cash for work) or creating new livelihoods (e.g. eco-tourism, selling of new products obtained from project work such as honey, etc.), creating employment, improving access to and quality of food, water or other natural resources on which livelihoods depend, or subsidies. Other types of incentives include creating opportunities for individuals to articulate their own needs and priorities, i.e. giving people "a voice", when determining DRR or adaptation measures. It may also include establishing new or strengthening existing institutional arrangements for the use of and access to common resources, where the sharing of benefits, roles and responsibilities are clearly articulated.

In this regard, Eco-DRR and EBA projects can potentially offer important incentives to sustain DRR and CCA efforts because of the direct benefits from ecosystem services obtained by local communities. Developing incentives, that provide direct local benefits (e.g. for livelihoods) but also strengthen environmental governance and natural resource management institutions (especially at the local/community level) which contribute towards DRR and CCA, are an added value of Eco-DRR and EBA projects. Providing incentives fosters increased community or individual participation in implementing field interventions, and are therefore a critical element for consideration when designing Eco-DRR/EBA projects. The challenge is getting the right mix of incentives (both financial and non-financial) in place to ensure project sustainability of Eco-DRR/EBA approaches over the long-term, beyond the project's lifespan (**Case study 11**). Based on the review, there seems to be no difference between EBA and Eco-DRR in the types of incentives used for implementation of projects.

CASE STUDY 11

Protected water recharge areas to improve ecosystem services and local communities' resilience

Case study contributor: Oscar Paz and Eveline Studer, Helvetas Swiss Intercooperation

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Excavation work by the community members for the water tank installation

IMPROVING ECOSYSTEM SERVICES AND LOCAL RESILIENCE

Under the project entitled, "Territorial risk governance and collective risk management efforts to adapt to climate change", funded by the Swiss Development Cooperation (SDC) and supported by Helvetas Swiss Intercooperation, different community initiatives with potential for scaling up were carried out in the region of Chaco Chuquisaqueño, in southern Bolivia. The initiative was developed and implemented by the Association of Municipalities of Chaco Chuquisaqueño, in close collaboration with the municipality of Monteagudo and the beneficiary community of Pucahuasi, consisting of 60 families.

The most relevant hazard in the area are repeated droughts, which have increased in recent years due to varying rainfall patterns induced by climate change. The local economy at household level relies mainly on agriculture (maize and cassava) and animal breeding (pigs and cows) for self-sufficiency. The area is considered extremely vulnerable to changes in climatic conditions and characterized by low resilience to disasters, linked to high levels of poverty and limited access to basic services and infrastructure (water storage and supply, preventive measures). Additional vulnerability factors are the expansion of crops and grazing areas, which have led to soil degradation and reduced water availability. Each year, disaster losses in agriculture and livestock are reported, affecting people's livelihoods and health, threatening the local economy and food security and fuelling outmigration and loss of social networks.

CASE STUDY 11 (continued)

Protected water recharge areas to improve ecosystem services and local communities' resilience

The project included the establishment of protected water recharge areas to protect water resources for agricultural production, human and animal consumption, but also to re-establish ecosystem services and restore soil fertility, with the long-term view of increasing local resilience to disasters and climate change impacts. Local alliances fenced an area of 35 ha and implemented infrastructure for the protection of the water source, water collection, storage and distribution. The organizational part consisted in defining rules and regulations for the water use of the newly protected area. To ensure the initiative's sustainability, the protected area was officially recognized through formal institutional mechanisms.

The storage and distribution system contributed to increase water quantity and quality for local livelihoods especially during the most critical dry season. Over the longer term, the measure helps to rehabilitate ecosystem services through increased water recharge and the restoration of degraded agriculture and grazing areas, and provide habitat for native plants, animals, birds and other wildlife. Furthermore, the initiative strengthened capacities of community organizations and the local administration through effective cooperation and field activity implementation.

The positive experience increased local communities' resilience, and served as a convincing example for replication in communities in other municipalities, which resulted in the protection of over 1,000 hectares of land.

ROLE OF INCENTIVES FOR SUCCESSFUL PROJECT IMPLEMENTATION

The role of Helvetas Swiss Intercooperation in close collaboration with the association of municipalities was to define locally adapted measures, to provide support through additional incentives and to mobilize the community's own resources through the understanding of the expected benefits, which represents an incentive in itself.

Helvetas Swiss Intercooperation opened a competition for innovative DRR/CCA initiatives and set clear eligibility criteria in terms of contribution to local risks and needs, innovation and potential for up-scaling. The initiatives were then developed by the beneficiaries themselves supported by the association of municipalities. The competition contributed to identifying high quality proposals and innovative measures, which were also suitable to the local context.

The role of Helvetas Swiss Intercooperation was mainly to provide technical guidance and advice for improved project quality and cooperation and to facilitate linkages with government at regional and national levels. Through the project fund, the NGO provided financial incentives only as a supplement to resources brought forward by the beneficiaries themselves. An important factor of success was to provide sufficient flexibility to accommodate and respond to the real needs that community residents articulated during the process of the project elaboration.

CHALLENGES OF INTEGRATING INCENTIVES IN PROJECT PLANNING AND IMPLEMENTATION

Identifying incentives that are attractive to all key actors and that ensure their commitment and collaboration is key. It is crucial that all participating actors have a clear understanding of the initiative and the potential range of social, environmental and economic benefits which could be derived at an individual, household and community level. Communicating and understanding project benefits is critical, because the benefits serve as attractive incentives, enhancing commitment of key actors.

Short project durations make it often difficult to measure the effectiveness of the incentive and of the intervention itself. In terms of the experience in Pucahuasi community, the commitment of key actors for project implementation and the subsequent inclusion of a budget line for DRR initiatives as part of the municipality's planning process are both indicators of project sustainability.

5. CONCLUSIONS: FINDINGS, SYNERGIES AND KEY INTEGRATION POINTS

This paper has examined the differences and similarities between Eco-DRR and EBA. While there exist differences in overall approach and implementation especially at the theoretical level, practice shows that often it is a question of differences in discourse than a real difference. Indeed, in many cases, one can substitute "risk reduction" by "adaptation" and vice-versa (though not always). This is seen especially at the level of project implementation, where for all intent and purposes EBA and Eco-DRR activities can be virtually indistinguishable. Indeed, in practice, Eco-DRR and EBA have much more in common than they are different, primarily because of the sustainable ecosystem management approach that is central to both Eco-DRR and EBA projects. Applying a sustainable ecosystem management approach can therefore help bridge the gap between CCA and DRR practice.

Nevertheless, EBA and Eco-DRR are generally undertaken by very separate communities due to different policy and funding tracks. Hybrid Eco-DRR/CCA projects are emerging as each community converges towards each other, especially as common ecosystem-based approaches and tools are increasingly used to reduce disaster risk and adapt to climate change. However, hybrid projects tend to be still more recognisable as either Eco-DRR or EBA depending on who is involved in the project as well as depending on factors such as data availability and outcomes sought (i.e. whether hazards or extreme events play more of a role than general climatic change).

Given that negotiations for the post-2015 global framework on DRR (successor to the HFA) and post-2015 climate change agreement are taking place almost in parallel, this period also provides a key opportunity for greater integration between DRR and CCA practice. Synergies between both DRR and CCA communities should be maximized, in order to avoid maladaptation and/or increase risk, as well as avoid duplication in efforts. Because policy, institutional and funding tracks are likely to stay separate, integration is more likely to be achievable at the project level. EBA is still growing and could benefit from Eco-DRR knowledge. Potentially, Eco-DRR could help EBA in decision-making in the face of uncertainty of climate change impacts through its focus on reducing disaster risk. EBA in turn could help provide more adaptive management that is sensitive to climatic and environmental changes and thus ensure long-term sustainability of Eco-DRR projects. A summary of key integration points between Eco-DRR and EBA are outlined within **Box 5**.

Fostering collaboration at the project level would provide good lessons for future practice and facilitate integration of CCA and DRR through ecosystem-based approaches (i.e. EBA and Eco-DRR). This would then promote the development of much needed, integrated multi-level governance tools for CCA and DRR, integrated multi-hazard and climate change assessments, as well as community-based approaches for both strategies. Gaps in knowledge in both communities should be filled through dedicated research, appropriate M&E frameworks that support learning and knowledge exchange platforms.

BOX 5. KEY INTEGRATION POINTS AT THE PROJECT LEVEL

When planning and implementing projects, there are a number of points where EBA and Eco-DRR communities could beneficially work together to ensure good adaptation and risk reduction:

Aims: Understanding future change taking into account all drivers and hazards

It is essential to lay out what the project is trying to achieve and construct future scenarios under the project (i.e. climate, development trends and multiple hazards), and establish how the sustainable management, conservation and restoration of ecosystems could help to both reduce disaster risk and adapt to climate change. This will help indicate who would need to be involved. Ensuring that climate change and multiple hazards are taken into account, and understanding what the role of ecosystems could be in DRR and CCA in a particular context will result in more integrated Eco-DRR/CCA practice. Key points for consideration:

- Construct future change scenario
- Account for all drivers and hazards
- Articulate how sustainable ecosystems management, conservation or restoration would help achieve DRR and CCA

Assessments: Exchange of knowledge and tools

Both the EBA and Eco-DRR have much to offer each other in terms of knowledge and tools. However, it will be key to ensure a common language in relation to terms and conceptual frameworks used when working together. Key points for consideration:
Agree on using/applying a common set of terms and definitions

- Utilize existing data on past and current risks, and draw from available climate change projections (at regional or national scale)
- Identify most appropriate VA or DRA assessment tool for the project and integrate ecosystem and environmental information as part of the vulnerability and risk assessment
- Involve local communities and stakeholders and experts from different sectors (including from environment, disaster management and climate change communities)

Implementation: Multi-hazard and climate-proof approaches making use of adaptive management

It is important to ensure that interventions are climate-proof and multi-hazard proof. Depending on EBA project focus, drawing from Eco-DRR or involving relevant institutions in response, recovery and reconstruction could be beneficial. Eco-DRR projects would benefit from taking into account that ecosystems are likely to need to adapt to climate change as well. Adaptive management should be considered for both EBA and Eco-DRR to effectively deal with uncertainty over the long-term and ensure sustainability. Key points for consideration:

BOX 5. **KEY INTEGRATION POINTS AT THE PROJECT LEVEL (continued)**

- Identify the most appropriate, feasible and effective ecosystem-based approach (e.g. IWRM, ICZM, protected area management, etc) to be adopted which could achieve both DRR and CCA objectives.
- Involve the right mix of stakeholders (e.g. ecologists, engineers, local residents, government, private sector, etc) to help design and implement the project
- Embed adaptive management to account for climate variability and uncertainty as well as other emerging development trends
- Identify other disaster management or adaptation strategies needed to address multiple hazards and uncertainty linked to climate change (e.g. early warning, contingency planning) and identify other actors/partners who could take on these priorities if the project has limited capacities and resources

Monitoring and Evaluation: Foster information sharing and learning

Under uncertainty of climate change and evolution of disaster risk, it will be important to foster information sharing and learning. Integrating monitoring schemes of DRR and CCA will facilitate more effective decision making and support adaptive management, because monitored information would anticipate current and future changes and uncertainties as well as utilize more locally relevant data. EBA and Eco-DRR could co-develop guidelines and training on M&E. However, development of M&E needs to be context specific. Key points for consideration:

- Identify guiding questions that help define and track changes that the project wants to achieve
- Embed learning as part of assessing progress and impacts
- Involve project implementing partners in the M&E process

Policy and institutional context: Work across sectors and disciplines

Both Eco-DRR and EBA could work to bring together different actors and expertise across sectors and encourage multi-disciplinary approaches within project implementation and at policy level. This will create greater coherence and effectiveness, avoid duplication and missed opportunities, reduce the possibility of maladaptation and increasing risk. Key points for consideration:

- Identify policy and institutional entry points for promoting Eco-DRR/CCA principles, approaches and strategies
- Work across sectors and disciplines and develop partnerships that seek to achieve multiple priorities (i.e. sustainable development, CCA and DRR)
- Develop incentives that yield direct benefits to local communities and at the same time strengthen environmental governance and natural resource management institutions (at local and national levels) which contribute towards DRR and CCA

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Project	Country	Ecosystems	Hazards addressed	EBA/Eco-DRR	Main Partners
Integrated approach towards community resilience	Ethiopia	Drylands	Floods; drought	EBA	The Partners for Resilience: Netherlands Red Cross, CARE Netherlands, Cordaid, the Red Cross/Red Crescent Climate Centre, and Wetlands International.
Integrated approach towards community resilience	Guatemala	Mountain	Floods; drought; land-slides; storms; fires	Eco-DRR	The Partners for Resilience
Integrated approach towards community resilience	India	Coastal wetland	Floods; storms; erosion	EBA/DRR	The Partners for Resilience
Integrated approach towards community resilience	Indonesia	Coastal	Floods; storms; erosion; landslides tsunami	Eco-DRR	The Partners for Resilience
Integrated approach towards community resilience	Kenya	Drylands	Floods; drought	EBA/DRR	The Partners for Resilience
Integrated approach towards community resilience	Mali	Drylands	Floods; drought	Eco-DRR	The Partners for Resilience
Integrated approach towards community resilience	Nicaragua	Inland waters	Floods; drought; land-slides; storms	EBA/DRR	The Partners for Resilience
Integrated approach towards community resilience	Uganda	Drylands	Floods; drought; land-slides	Eco-DRR	The Partners for Resilience
Mountain EBA	Nepal	Mountain	Drought; floods; landslides	EBA	UNEP; UNDP; IUCN
Mountain EBA	Peru	Mountain	Floods; changes in climate	EBA	UNEP; UNDP; IUCN
Mountain EBA	Uganda	Mountain	Drought; floods; landslides	EBA/Eco-DRR	UNEP; UNDP; IUCN
Integrated National Adaptation project	Colombia	Mountain; inland waters; Marine	Increased temperatures; changes in rainfall pat-terns; sea-level rise	EBA	GEF/World Bank; Conservation International
Natural Resources Management in a Changing Climate in Mali	Mali	Drylands; agricultural	Drought; floods	EBA	GEF/World Bank; Environment and Sustain-able Development Agency (government of Mali)
Ecosystem-based Adaptation in marine, terrestrial and coastal regions as a means of improving livelihoods and conserving biodiversity in the face of climate change	South Africa	Drylands	Increased temperatures; changes in rainfall pat-terns	EBA	Conservation International

Ecosystem-based Adaptation in marine, terrestrial and coastal regions as a means of improving livelihoods and conserving biodiversity in the face of climate change	Philippines	Marine	Increased sea surface temperatures; changes in rainfall patterns; storms;	EBA	Conservation International
Ecosystem-based Adaptation in marine, terrestrial and coastal regions as a means of improving livelihoods and conserving biodiversity in the face of climate change	Brazil	Coastal; forest	Increased temperatures; changes in rainfall patterns; floods; fires; sea level rise;	EBA	Conservation International
Promoting Improved Ecosystem Management in Vulnerable Countries for Sustainable and Disaster-Resilient Development	Afghanistan	Mountain	Floods; avalanche	Eco-DRR	UNEP
Promoting Improved Ecosystem Management in Vulnerable Countries for Sustainable and Disaster-Resilient Development	Haiti	Coastal; marine	Floods; storms; erosion	Eco-DRR	UNEP
Promoting Improved Ecosystem Management in Vulnerable Countries for Sustainable and Disaster-Resilient Development	Sudan	Drylands	drought	Eco-DRR	UNEP
Promoting Improved Ecosystem Management in Vulnerable Countries for Sustainable and Disaster-Resilient Development	DRC	Forest; inland waters	Floods; erosion	Eco-DRR	UNEP
Building Resilience to Climate Change through Farmer-managed Natural Regeneration in Niger and Land Rehabilitation in Burkina Faso	Burkina Faso; Niger	Drylands; agricultural	Drought; erosion	EBA	WRI; IFPRI
Community-based Rangeland Rehabilitation for Adaptation to Climate Change and for Carbon Sequestration	Sudan	Drylands; agricultural	Drought	EBA/Eco-DRR	GEF/World Bank; UNEP
Community-based Mangrove Reforestation and Management in Da Loc, Vietnam	Vietnam	Coastal	Storms; sea-level rise	EBA/Eco-DRR	CARE
Fiji climate change adaptation project	Fiji	Coastal	Storms; sea-level rise; erosion	EBA	WWF
Combating desertification in Iran	Iran	Drylands	Desertification; dust storms	Eco-DRR	Government of Iran; others

NAIS	Switzerland	Mountain	Avalanches; landslides	Eco-DRR	Government of Switzerland
The Great Fen project	UK	wetlands	Floods; drought	EBA	Wildlife Trust
WAVE project	Netherlands, UK, France, Belgium and Germany	Inland waters	Drought; flood	EBA	WAVE project partners
Climate buffers project	Netherlands	Inland waters	Floods; sea level rise	EBA	Natuurmonumenten; State Forest Service; Birdlife Netherlands; ARK Nature; Nature Landscape Heritage; Wadden Sea Society; World Wildlife Foundation
The Humber project	UK	Coastal	Floods; sea level rise	EBA/Eco-DRR	UK Environment Agency
Green and Blue Space Adaptation for Urban Areas and Eco Towns (GRaBS)	Global	Urban	Floods; heat waves; water quality; landslides	EBA	Local authorities
Building capacity for coastal Ecosystem-based Adaptation in Small Island Developing States	Seychelles & Grenada	Coastal	Storms, flooding; erosion	EBA	UNEP
Lami Town Project	Fiji	Coastal; urban	Storms, flooding; erosion	EBA	UNEP, UN-Habitat, CI, SPREP, Lami Town Council, and the Integration & Application Network, University of Maryland Center for Environmental Science
Territorial risk governance and collective risk management efforts to adapt to climate change	Bolivia	Dryland; agricultural	drought	EBA/Eco-DRR	Swiss Development Cooperation (SDC); Helvetas Swiss Intercooperation; Association of Municipalities of Chuquisaqueño Chaco
Ecosystems Protecting Infrastructure and Communities (EPIC)	Nepal	Mountain	landslides	Eco-DRR	IUCN, Univeristy of Lausanne
Climate Change Adaptation and Disaster Risk Reduction	Jamaica	Inland waters; coastal	Storms; sea-level rise; erosion	EBA/Eco-DRR	Government of Jamaica; European Union; UNEP
Reducing climate change-induced glacial lake outburst floods (GLOF) risk in Punakha-Wangdue and Chamkhar valleys	Bhutan	Mountain	Glacial lake outburst	EBA/Eco-DRR	UNDP

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