Climate change and Ecosystem-based Adaptation: a new pragmatic approach to buffering climate change impacts

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The changing climate is no longer an abstract issue, and the realities of its impacts are being felt across the globe. Climate change is affecting millions of people, and thwarting their efforts to escape poverty. Against this harsh reality, it will be imperative to speed up the integration of climate risk considerations into policy, in order to ensure that development proceeds along pathways that are resilient to climate change. However, the questions as to the type of strategies, approaches and actions required still generate divergent views on the international policy arena. Closer attention to a broader spectrum of adaptation options is urgently needed. Approaches that go beyond words into actions with potential to informing and guiding policy practices are imperative and urgently needed. In particular Ecosystem-based Adaptation approaches have proved to provide flexible, cost effective and broadly applicable alternatives for reducing the impacts of climate change and as such are a critical tool at adaptation planners disposal for tackling the threats that climate change poses to peoples lives and livelihoods across the globe.

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Introduction
The climate change is happening at an unprecedented rate and impacting a lot of people across the globe [1]. The need for adaptation efforts has never been so urgent. The rising sea levels, longer and more frequent droughts, heightened hurricane activity and floods are increasingly affecting livelihoods. The December 2011 United Nations Framework Convention on Climate Change (UNFCCC) Seventeenth Conference of the Parties (COP17) in Durban, South Africa injected new energy and momentum for advancing adaptation to climate change urging the formulation and implementation of National Adaptation Plans (NAPs) that ‘can enable all developing and developed country Parties to assess their vulnerabilities, to mainstream climate change risks and to address adaptation’. This decision further invites ‘least developed Parties to strive to implement institutional arrangements to facilitate their national adaptation plan process, building on existing institutions and consistent with their national circumstances’. On June 20–22, 2012 global leaders gathered in Rio de Janeiro for the Rio+20 United Nations Conference on Sustainable Development to discuss the future of our planet, society and environment and this resulted in an outcome document entitled The Future We Want. At Rio+20, for the first time governments and businesses explicitly recognized that ecosystems are the core element of addressing climate change impacts and paving the way toward achieving sustainable development as sustainable development has its roots in ecosystem maintenance.

Against this backdrop, this paper reviews the rapidly evolving concept of Ecosystems based approaches to Adaptation to climate change (EbA) and its role in addressing multiple scale risks, vulnerabilities and opportunities. Fundamentally, EbA is the use of natural capital by people to adapt to climate change impacts, which can also have multiple co-benefits for mitigation, protection of livelihoods and poverty alleviation. It is an approach that is applicable across both developed and developing countries. Ecosystem-based approaches address the crucial links between climate change, biodiversity and sustainable resource management and, by preserving and enhancing ecosystems, enable society to better mitigate and adapt to climate change [2]. Hence the key tenet is the need to protect the ecosystems that provide the essential ‘life support systems’ (ecosystem services) that we all depend on.

Healthy, fully functioning ecosystems are more resilient to stressors and therefore better able to support adaptation to impacts [3⁴]. Healthy ecosystems imply a greater element of flexibility in adaptation response options. However, ecosystems continue to be degraded⁴ due to climate change, pollution and unsustainable over exploitation. Restoration of degraded ecosystems as part

of an EbA provides a mechanism for carbon sequestration and hence climate change mitigation, sources of employment and enhancement of resources to support livelihoods [4].

**Ecosystem-based Adaptation (EbA) and its benefits**

Ecosystem based approaches to adaptation harness the capacity of nature to buffer human communities against the adverse impacts of climate change through the sustainable delivery of ecosystems services. Deployed with focus on specific ecosystem services with the potential to reduce climate change exposures, the forms used are targeted management, conservation and restoration activities. For example mangrove forest and coastal marshes buffer storm surges energy and research and practical work have shown that restoring or conserving mangrove ecosystems can therefore help protect coastal communities from current and projected rise in the number of tropical storms due to the changing climate [5**]. Ecosystems deliver services that can help meet adaptation needs across multiple human development sectors including disaster risk reduction (through fold regulation and storm surge protection), food security (from fisheries to agro-forestry), sustainable water management and livelihood diversification (through increasing resource-used options). EbA can also generate significant multiple benefits such as carbon sequestration and other social, economic and cultural benefits. Healthy ecosystems and their services provide opportunities for sustainable economic prosperity while providing defence against the negative effects of climate change (Figure 1).

The main advantages that EbA has over others adaptation approaches are that it can deliver multiple co-benefits (Table 1), it can help avoid maladaptation and contributes to a ‘no regrets’ approach to address climate change.

EbA achieves multiple policy objectives for society and the environment in the face of climate change by providing:

- A win for climate change adaptation and mitigation.
- A win for socio-economic development.
- A win for the environmental protection and biodiversity conservation.
- A win for contributing to sustainable economic development.

EbA provides a lasting and sustainable set of solutions in a cost effective manner to cope with climate change and sustainable development challenges, especially when used in combination with other methods and approaches. However, the potential of EbA is not being fully recognized or exploited by national governments despite the growing evidence of these benefits.

**Economy and EbA**

Beyond mitigation and adaptation, EbA provides a third ‘win’, by providing the basis for new economic growth. The Economics of Ecosystems and Biodiversity studies
show that an annual global investment of $45 billion in protecting ecosystems could deliver an estimated $5 trillion a year in benefits, a cost–benefit ratio of over 100:1. Deforestation contributes close to 20% of global greenhouse gas (GHG) emissions; an annual investment of $20 billion could halve these emissions, while securing livelihoods and reducing poverty in tropical countries. EbA can complement, or substitute for, more expensive infrastructure investments to protect coastal settlements [6**]. Strengthening and protecting ecosystems can be likened to a long-term investment that ensures an array of environmental, social and financial benefits well into the future. Studies and practical work on EbA show that it constitutes a cost-effective adaptation approach. In Maldives where ~80% of the islands are about 1 m above sea level, coral reefs and other coastal ecosystems provide critical protection to coastal communities from storms and erosion, substantially reducing storm-related damages and saving lives [5**]. Climate change is expected to increase the frequency of the most powerful tropical storms, rendering the protective role of the reefs and their conservation more critical in the coming years. If they were lost, the cost of building hard infrastructure such as seawalls, breakwaters and other forms of coastal protection to replace the natural reefs has been estimated at US$1.6 billion–2.7 billion [7**]. In contrast, conserving the reefs to prevent their on-going degradation as a result of pressures ranging from overfishing to coral mining, through establishment of marine protected areas (MPAs), would cost ~US$34 million in start-up and ~US$47 million annually. This investment would maintain their critical protection service and could generate ~US$10 billion per year in co-benefits through tourism and sustainable fisheries [8**]. Adaptation programme whose overarching goal is to help vulnerable communities adapt to climate change through good ecosystem management practices, and their integration into global, regional, national and local climate change strategies and action plans. The EbA programme is delivering specific products and services responding to country needs to support EBA mainstreaming through three main overarching components. These are:

(I) Assessments and knowledge support. Countries are supported in conducting impact and vulnerability assessments, taking into consideration and building on existing assessments. This component is undertaking analysis of ecosystem services for adaptation and their economic value, and helps convert these results into a knowledge base with which decision-makers can design and implement priority EBA policies and projects.

(II) Capacity building and demonstration. This component is helping create the enabling conditions for implementing EBA options in developing countries, including technology development and diffusion, piloting and demonstration and capacity building. Through technology development and diffusion, participating countries can access viable technologies for restoration and ecological engineering for adaptation and disaster risk reduction. Through piloting EBA approaches on the ground, and applying the results of the assessments and knowledge support, countries and communities will be demonstrated with a combination of models including those building on community-based adaptation and micro-credit, making ecological, economic and financial laws work for adaptation.

(III) Integration of EBA options into national adaptation plans. This component is helping pave the way for the integration of EBA into national adaptation plans. A coordinated and integrated approach with institutional structures that are capable of mobilizing different stakeholders will be established through modifying the frameworks

### Table 1

<table>
<thead>
<tr>
<th>Benefits resulting from EbA.</th>
<th>Benefits</th>
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<tbody>
<tr>
<td>Ecosystem-based Adaptation</td>
<td></td>
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<tr>
<td>Restoring fragmented or degraded natural areas</td>
<td>Enhances critical ecosystem services, such as water flow or</td>
</tr>
<tr>
<td>Protected groundwater recharge zones or</td>
<td>food and fisheries provision</td>
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<td>restoration of floodplains</td>
<td>Secures water resources so that entire communities can cope</td>
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<tr>
<td>Connecting expanses of forests, grasslands,</td>
<td>with drought and flooding</td>
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<tr>
<td>reefs or other habitats</td>
<td>Enables people and biodiversity to move better to more viable</td>
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<tr>
<td>Protecting or restoring natural infrastructure</td>
<td>habitats as the climate changes</td>
</tr>
<tr>
<td>such as barrier beaches, mangroves, coral reefs</td>
<td>Buffers human communities from natural hazards, erosion and flooding</td>
</tr>
<tr>
<td>and forests</td>
<td></td>
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Adapted from TNC (2009)*

* Adapting to Climate Change: Ecosystem-based Approaches for People and Nature. The Nature Conservancy.
4 Terrestrial systems

Places in policy and strategy
The term EbA and association with ecosystem services is increasingly being used in reports [9], discussion papers [10] and policy documents and strategies tied to climate change legislation [11]. Arguments have been presented to place ecosystems approaches, including EbA, at the heart of the development of the Green Economy [12–14]. Ecosystem based approaches are increasingly being seen to be central to national strategies, for example, in the United States.

National adaptation planning started in 2009, with the Interagency Climate Change Adaptation Task Force have been established (made up of senior representatives from more than 20 departments and agencies and co-chaired by representatives of the Council on Environmental Quality, the Office of Science and Technology Policy, and the National Oceanic and Atmospheric Administration) to provide Federal support and coordination for adaptation planning at federal, state, local, and tribal levels of government [15]. Their work is conducted in accordance with a set of goals and guiding principles that foster locally focused, participatory, ecosystem-based approaches to planning, integrated assessment and effective decision-making, and international collaboration. Similarly, under the UNFCCC requirements, least developed countries (47 as of July 2012) have produced National Adaptation Plans of Action (NAPAs) (UNFCCC 2012), which while not always explicitly containing or describing EbA, have content with strong EbA aspects.

Conclusion
Climate change is increasingly threatening lives and livelihoods and maximizing adaptation opportunities will minimize its potentially catastrophic effects. Ecosystem-based (Approaches for Adaptation) (EbA) is a cost-effective, robust and flexible strategy that can cope with the magnitude, speed and uncertainty of climate change. EbA has already proven its worth in many situations and evidence is emerging of its success in helping people adapt to climate variability and change. Harnessing the adaptive forces of nature is economically viable and effective to combat the impacts of climate change. Its potential for synergies with other adaptation options, climate mitigation strategies and development goals warrants EbA having a prominent place in both the national and international funding mechanisms now taking shape to fuel global adaptation efforts and in the adaptation decision-makers toolbox. With the impacts of climate change increasingly being felt across the world, it is important to scale up the approach to increase society resilience to climate change as well as to achieve more sustainable economic development. Indeed, though EbA still remains under-utilized by policymakers and associated stakeholders, it provides a viable strategy for pursuing development goals simultaneously with climate change adaptation and mitigation targets.

References and recommended reading
Papers of particular interest, published within the period of review, have been highlighted as:

- of special interest
- of outstanding interest

