We want more! Key gaps in the EbA evidence

While the scientific literature on EbA highlights positive social, environmental and/or economic impacts and provides a strong basis for implementing EbA, there are some key gaps that would improve the evidence base. Some of the gaps may be addressed by those scientists working on biophysical science. This work could significantly add to the body of EbA evidence if reviewed in the context of its implications for human adaptation (currently this is often not explicitly mentioned). For example, this review, which specifically looked for literature making the link to human adaptation, found 11 papers on mangroves. However, much more research has been undertaken on mangroves that could be used to demonstrate their use in adapting to sea level rise and storms. Work in progress by McIvor *et al*.[7] found 53 papers contributing to the evidence base in this way.

Based on the findings above, specific areas needed to expand the evidence base include:

- more **detailed comparisons between EbA and alternative adaptation strategies**, taking into account, social, environmental and economic considerations;
- discussion of **thresholds, boundaries and tipping points** across a range of EbA, in varying climatic zones, in order to give decision-makers clearer indication of which type of EbA is applicable to their situation, to enable them to make informed, comparative decisions between adaptation options;
- more attention to **costs as well as benefits**: the literature tends to highlight positive outcomes with comparatively little attention paid to the potential costs of EbA. This is not just in relation to economic costs (although this gap needs to be addressed more systematically and across a greater range of ecosystems) but also related to adverse actual and potential environmental and social effects;
- more information on whether EbA is being **supported by local/national/international policies** and on the **success of EbA projects regarding instigating policy change**;
- greater consideration of the **temporal and spatial aspects of EbA effectiveness**;
- more **strategic monitoring** of existing EbA projects.

Next steps

This systematic review of peer-reviewed published literature provides a start to improving the evidence base for EbA. A parallel study reviewing the large body of evidence from the grey literature will complement this study and results will be aggregated to provide a more detailed overview of the state of the evidence base on EbA effectiveness. The combined results will be written as a peer-reviewed journal article in 2012.

The 51 partially analysed papers that were not included in this initial full review on EbA, covering the contribution of green infrastructure in urban adaptation and covering traditional conservation agriculture could be added to the evidence-base. Moreover, delving deeper into the literature including pure biophysical science on specific EbA interventions would help improve the knowledge base and provide additional insight into where research should be focused.

Although this study has characterised the state of the evidence and has made recommendations as to what additional research or analysis could be done to start filling knowledge gaps, these gaps will also need to be addressed by policy-makers through adaptation policies (including NAPAs and NAPs) and projects that recognise the importance of ecosystems in order to facilitate 'learning by doing'. Crucially, any existing projects must include strategic monitoring of outcomes. The synthesis of information provided by this study should be used in conjunction with the *Ecosystem-based approaches to adaptation: Compilation of information* conducted by the UNFCCC Secretariat for the Nairobi Work Programme[8], which also contributes to the evidence base, to assist efforts to secure the policy traction at the local, national and international level that EbA merits.

Endnotes

1. CBD (2009) *Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change.* Technical Series No. 41. Secretariat of the CBD, Montreal. [http://www.cbd.int/doc/publications/cbd-ts-41-en.pdf]
2. See Reid, H. (2011) *Improving the evidence for ecosystem-based adaptation*, IIED Opinion, November 2011.
3. The project 'Effectiveness of ecosystem-based approaches to adaptation: Critical review of current evidence' is supported by the Cambridge Conservation Initiative's Collaborative Fund for Conservation, funded by Arcadia [http://www.conservation.cam.ac.uk/CF-3.html#ecoadapt], and the Ecosystem, Livelihoods and Adaptation Network (ELAN).
4. Centre for Evidence-Based Conservation (2010) *Guidelines for Systematic Review in Environmental Management.* Version 4.0. *Environmental Evidence.* [www.environmentalevidence.org/Authors.htm]
5. IPCC (2007) *Climate Change 2007: Synthesis report. Contributions of Working groups I, II and III to the fourth assessment report of the IPCC.* IPCC, Geneva, Switzerland [http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf]
6. Habitats list simplified by BirdLife International for standardised use across all regions for Important Bird Area first-level habitat classifications based on: *IUCN Red List Habitat Classification Scheme (V. 3.0)* [http://www.iucnredlist.org/technical-documents/classification-schemes/habitats-classification-scheme-ver3]
7. McIvor, A., Spalding, M., Möller, I., & Spencer, T. (in prep.) *The potential use of mangroves as a natural coastal protection against sea level rise*.
8. UNFCCC Secretariat (2011) *Ecosystem-based approaches to adaptation: Compilation of information. Note by the secretariat.* FCCC/SBSTA/2011/INF.8. United Nations Office at Geneva, Geneva, Switzerland.

RESEARCH HIGHLIGHTS

Does EbA Work? A review of the evidence on the effectiveness of ecosystem-based approaches to adaptation

Robert Munroe[a], Nathalie Doswald[b], Dilys Roe[c], Hannah Reid[c], Alessandra Giuliani[c], Ivan Castelli[b], Iris Möller[d]

November 2011

a. BirdLife International, b. UNEP-WCMC, c. IIED; d. Cambridge University

Ecosystem-based approaches to adaptation (EbA) integrate the use of biodiversity and ecosystem services into an overall strategy for helping people adapt to climate change. To date, however, insight into these approaches has often been based on anecdotal case studies of local people's use of ecosystems. Although they are informative, they can provide rather limited insight in terms of measuring and evaluating the effectiveness of EbA, especially compared with technical or structural adaptation measures. A new, systematic review of EbA evidence has been carried out to interrogate the scientific literature and review studies from around the world, from many different ecosystems and adopting a wide range of adaptation approaches utilising ecosystems. We conclude that EbA approaches are effective and deserve greater policy attention and political support to reach their full potential.

Key messages

1. Existing evidence suggests that **EbA is an effective approach** to adaptation that deserves more policy support.
2. **EbA is not a novel approach** – lots can be learnt from traditional practices in natural resource management and agro-ecology that long precedes any political interest in climate change.
3. **More reflexive research is needed** to inform where EbA could be improved, understand what the thresholds and limits for EbA effectiveness are, and get to grips with the financial costs and benefits.
4. While researchers can address research gaps, **policy makers also need to step up to the mark through adaptation policies**, including National Adaptation Programmes of Action and National Adaptation Plans (NAPAs and NAPs), **and projects that recognise the importance of ecosystems and their monitoring** to facilitate 'learning by doing'.

For more information please contact:
Robert Munroe: robert.munroe@birdlife.org
Nathalie Doswald: nathalie.doswald@unep-wcmc.org

Ecosystems – the first line of defence against impacts of climate change

Countries are increasingly taking on board the fact that they must plan for climate change. Many countries, including most of the Least Developed Countries, have drawn up National Adaptation Programmes of Action (NAPAs) while others are working on ways to integrate effective adaptation into their strategic climate change planning. Planned adaptation to climate change may be achieved in many different ways. One typical response is investment in hard infrastructure, such as flood barriers. However, these engineered solutions can end up working *against* nature, particularly when they aim to constrain ecologically important processes, such as annual river flooding and coastal sediment transport. An alternative is to consider EbA, which works with, rather than against, ecosystems and biodiversity.

Examples of EbA include:

- coastal defence through the maintenance and/or restoration of coastal vegetation. The vegetation reduces the strength of waves before they reach the shore and therefore reduces coastal flooding and coastal erosion;
- sustainable management of wetlands and floodplains for maintenance of water flow and quality, acting as floodwater reservoirs and providing important stores of water in times of drought;
- conservation and restoration of forests and natural vegetation to stabilise slopes and regulate water flows, preventing flash flooding and landslides as rainfall levels and intensity increases;
- establishment of healthy and diverse agroforestry systems (the integration of food production into forests) to cope with changed climatic conditions.

EbA is gaining increasing attention as an effective mechanism for tackling climate change in a way that can bring a multiplicity of benefits beyond direct disaster risk reduction or reduction in vulnerability. As such it is being promoted by both conservation and development organizations. To date, however, the promotion of EbA has often been based on anecdotal case studies, displaying the ways local people are using ecosystems to adapt. No thorough review of the state of the evidence on its effectiveness has been undertaken[2]. This briefing describes the first efforts to address that gap, conducted by BirdLife International, UNEP-WCMC, IIED and the University of Cambridge[3]. Here we present the first results from a systematic review[4] of evidence from peer-reviewed published literature for the effectiveness of EbA. The review was specifically focused on literature making the link to human adaptation to climate change, variability, extremes or other natural hazards that could be linked to climate, which included synthesis of:

- the spread of the evidence (both in terms of fields of study and location);
- which climatic hazards/impacts EbA is tackling;
- which ecosystems are being used;
- the intervention's success and limitations;
- comparison with alternative approaches and associated social, environmental and economic costs and benefits.

What is EbA?

Ecosystem-based approaches to adaptation (EbA) are defined by the Convention on Biological Diversity (CBD)[1] as "the use of biodiversity and ecosystem services to help people adapt to the adverse effects of climate change". This definition was elaborated by the CBD COP 10 Decision X/33 on Climate Change and Biodiversity as including "sustainable management, conservation and restoration of ecosystems, as part of an overall adaptation strategy that takes into account the multiple social, economic and cultural co-benefits for local communities".

Our findings help clarify what is known about the effectiveness of EbA and, crucially, what are the major knowledge gaps that need to be addressed in order to maximize the full potential of this approach.

What does the EbA evidence base tell us?

Finding 1: Just because it's not called EbA doesn't mean that it isn't!

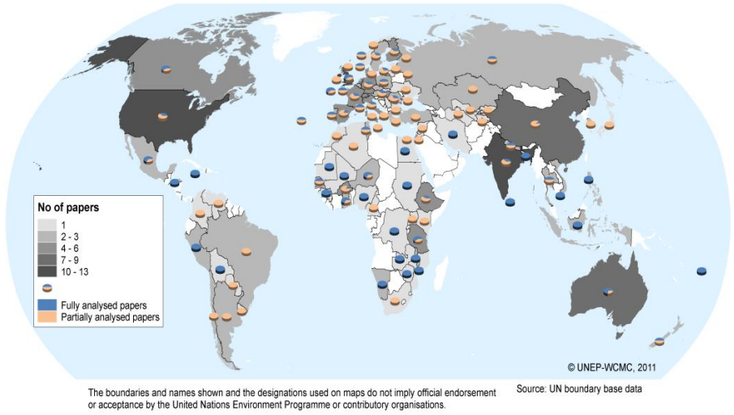
Concern about climate change – and how to adapt to it – has only received international political attention in the last two decades. However, people have been adapting and managing their environment and natural resource use in response to climatic variability and change for centuries and these practices have been documented. Much of the information about EbA is not therefore labeled as EbA but instead falls under categories such as ecosystem restoration, soil and water conservation, and disaster risk reduction. This knowledge base should not be dismissed as being irrelevant. Indeed, the IPCC[5] acknowledges that many of the changes we can expect to see because of climate change will be increases in the frequency and strength of climate disasters, changes in the quantity and timing of rainfall, and other climatic impacts that many of these papers, even if they do not make links to global warming, are tackling.

Altogether we identified 132 relevant studies in the peer-reviewed published literature, of which 81 were selected for more detailed analysis. Only basic information, such as climatic hazards/impacts, location and ecosystem, was extracted from the remaining 51 (hereafter called "partially analysed papers") because of time restrictions. These 51 studies were focused on:

- traditional farming practices/soil and water conservation; they provide important evidence for the effectiveness of EbA and are well-studied approaches, but they often lack detailed consideration of the ecosystem services that they are using;
- EbA in urban areas, such as green roofs and green spaces.

Finding 2: There is an even spread of EbA evidence from developing and developed countries.

Roughly half of the evidence reviewed on EbA was from developing countries (45%), with 23% of the evidence from Asia and 11% from Africa. The region with the most evidence was from Europe (44%). The balance of evidence across continents remained constant between fully analysed and partially analysed studies. 66% of the findings from the fully analysed studies were site specific, potentially making generalisations on EbA difficult and dependent on certain conditions.



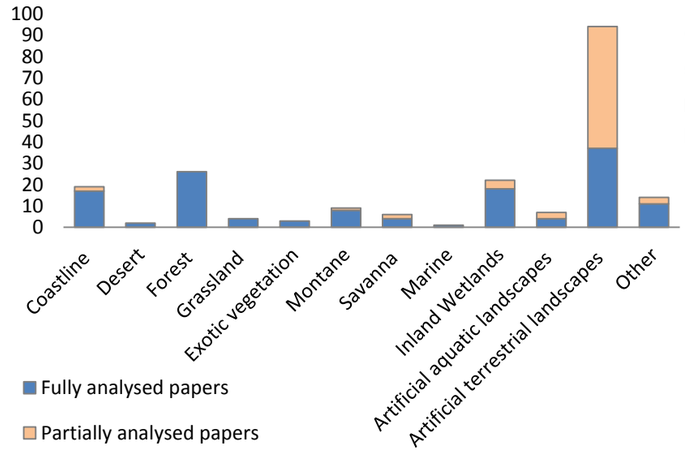
Geographic distribution and concentration of studies providing evidence for EbA

Finding 3: EbA has been used to address a broad range of climate change hazards and impacts.

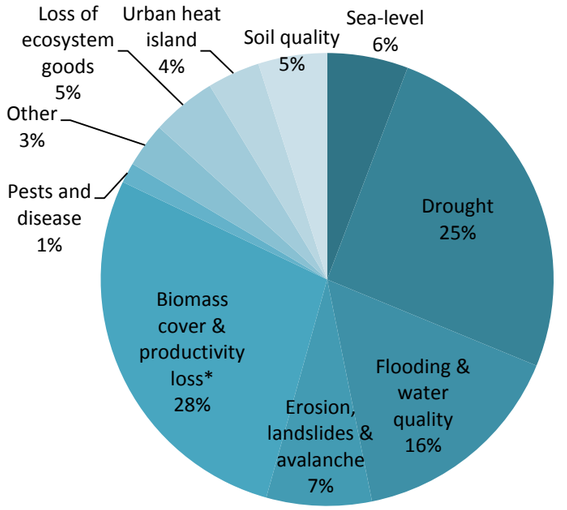
The main climatic hazards addressed by the evidence base focused on changing rainfall patterns (contributing to droughts, flooding and reduced agricultural productivity, with relatively little attention paid to sea level rise and increasing sea surface temperature).

Finding 4: "Artificial" landscapes have been studied far more than natural ecosystems.

The vast majority of papers reviewed explored EbA in "artificial terrestrial ecosystems"[6] i.e. converted land, particularly arable farmland and pasturelands, but also plantations, rural gardens and urban areas. Approaches included leaving weed and moss cover below the crop cover in Nepal to reduce soil erosion and regulate run-off, through to planting native trees and shrubs to stabilise dunes, reduce erosion and increase infiltration in Iran to combat desertification.



Major habitats from which evidence for EbA was found in the literature



Main impacts addressed in the evidence for EbA effectiveness
(*Loss of productivity of agriculture, fisheries, husbandry and forestry)

Finding 5: There is some discussion of alternatives, thresholds and tipping points.

More than 50% of the fully analysed studies covered at least one of the following:

- the costs and benefits of alternative adaptation approaches;
- biophysical thresholds (limit of climatic impact to which the approach can still provide adaptation benefits);
- boundary conditions (on the minimum size or the state of ecosystem necessary to provide the adaptation benefits);
- tipping points (degree of disturbance – climatic, but degradation, pollution – that an ecosystem can cope with and still provide the ecosystem services that provide adaptation benefits).

Finding 6: The majority of fully analysed studies concluded that EbA was an effective approach.

The fully analysed studies employed a very wide range of measures to demonstrate the direct effectiveness of EbA in reducing vulnerability to climatic hazards/impacts. These included cost-benefit analyses, multi-criteria scoring, measurable physical parameters, and community perceptions based on experience. Overall they highlighted more successes of EbA than failures.

In relation to the social, environmental and economic benefits and costs of the approaches, far more social and environmental benefits were recorded compared to costs. Social benefits include secure and adequate access to goods, environmental benefits relate to carbon sequestration and to broader biodiversity conservation, and economic costs and benefits include the monetary cost of implementation, and the value of assets protected or co-benefits of the approach. Likewise, highlighting synergies between ecosystem services that boost adaptive capacity and other ecosystem services and/or other possible land use options was more common than investigating actual/possible trade-offs. Fewer studies considered economic effectiveness and even fewer really got to grips with economic costs. Many studies related the relevance of their results to current policy, but few studies investigated the institutional effectiveness of EbA. Overall, however, the weight of current evidence, when combined with the social, environmental and economic costs and benefits, points to EbA being an effective approach to adaptation. Some 66% of studies tended to provide a snapshot in time with little consideration as to whether the adaptation approach would still work in 1, 10 or 100 years. The time when the adaptation approach is effective and benefits start to materialize may not always coincide with the time when costs are felt and some interim measures may be necessary. The evidence associated with the distribution of the costs and benefits varied widely in detail. More studies than not consider whether project interventions support groups that lack equitable access and entitlement to key resources. However, many studies lacked consideration of 'downstream' impacts at the landscape/ecosystem/watershed scale.