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Is adaptation finance supporting ecosystems? A review of the Adaptation Fund portfolio

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Contents

Abstract

This paper is interested in how much adaptation practitioners and funders focus on how other species adapt to climate change. We examine one of the major international climate funds, the Adaptation Fund, and analyse the extent of funding that has been allocated for activities that address the needs of, and challenges faced by, other species. Second, we examine whether the activities funded respond to the priorities emphasised by conservation literature for building ecosystem resilience in the face of climate change, including the types of ecosystems prioritised and the scale of interventions. Third, we assess whether ecosystem resilience was the primary focus of the activities funded, or whether instead they were designed to use certain ecosystem elements to improve the resilience of people or reduce risks to people's physical and economic assets. Taken together, these sets of questions enable us to reflect on the level of urgency that adaptation planners and funders are giving to the problem of how other species and ecosystems will cope with and adapt to climate change, and to identify the extent to which ecosystem needs are being pushed aside in the prioritisation of adaptation measures.

Ecosystem outcomes are of limited importance to almost all projects, even those projects that included some ecosystem-related activities

We find the Adaptation Fund has committed relatively little financial support to ecosystem-related activities, at only around 15% of its total allocated funding. Of this, most activities focus on delivering specific ecosystem "services" for people – such as protection against flooding or coastal erosion – rather than for other species. This likely diminishes any positive effects that projects are making towards ecological resilience. The most commonly targeted ecosystem types are forests, mainly through afforestation or reforestation activities; some of these are arguably of dubious benefit from an ecological perspective because they are re-planting exercises, rather than activities intended to re-establish complex ecological systems. None of the project proponents appear to have used regional or global ecological criteria as a basis for targeting particular ecosystems, nor do they explain in project documents the local ecological importance of the ecosystems. Indeed, most activities do not even address ecosystems as whole units, but focus on individual components (e.g. planting of trees). On a geographic scale, most activities are miniscule. The conservation approaches employed are mainly traditional strategies rather than the kinds that conservation literature argues need greater emphasis in the face of climate change. Finally, the ecosystem-related outcome indicators included in projects' results frameworks are, with very few exceptions, only quantitative (e.g. number of hectares of land reforested), offering no evaluation of the quality of the outcomes from the perspective of particular species or overall ecosystem function. The latter reinforces our perception that ecosystem resilience is not a primary focus in most instances.

We thus conclude that ecosystem outcomes are of limited importance to almost all projects, even those projects that included some ecosystem-related activities. Our findings raise serious questions about whether sufficient or meaningful attention and resourcing is given to how other species and natural ecosystems can adapt to climate change. We make recommendations on how climate funds, adaptation planners and project developers can address this.

Keywords

Climate change, adaptation, ecosystems, finance

1. Introduction

1.1 Protecting ecosystems and other species under climate change

Already under stress from myriad human activities, ecosystems globally are now increasingly threatened by climate change. This paper is broadly interested in how much climate funding is used to specifically address the plight of natural ecosystems (or individual species) in the face of climate change, and what kinds of interventions are being implemented.

Climate change will intensify the threats already facing non-human species, such as habitat degradation, landscape fragmentation, human-wildlife conflict, and the pollution of land, air and water. The pace of environmental change is now too fast for many species and ecosystems to adapt quickly enough (Jump and Penuelas 2005), and climate change could thus become the first or second largest driver of global biodiversity loss over the next decade (Sala 2000; Thomas et al. 2004). Poiani et al. (2011) anticipate the most common climate impacts will arise through changes to habitat quantity or quality and to hydrologic regimes. Other impacts include: sea-level rise; direct warming of habitats; increased fire frequency; pest outbreaks; increased spread of diseases, parasites and zoonoses; altered weather and precipitation patterns; glacial recession; increased populations of competitor species; and increased spread of invasive or non-native plants, animals and pathogens (Mawdsley et al. 2009). Further, as the environmental changes cascade, this is likely to create an unstable environment. For many ecosystems, this will increase the likelihood of damage and loss due to extreme events, which are expected to become more intense and more frequent in some regions (European Commission 2013; DEFRA 2008). A changing climate is shifting seasons and habitats, as well as changing life cycles and causing the emergence of new physical traits in species (Thomas et al. 2004; Millennium Ecosystem Assessment (Program) 2005); changing species distribution (Parmesan and Yohe 2003; Gimona et al. 2015; Pacifici et al. 2015; Mawdsley et al. 2009; Rüter et al. 2014; Burrows et al. 2014; Root et al. 2003; Gaston 2009); and changing migratory patterns (Cotton 2003; Otero et al. 2014; Singh et al. 2012). It is also leading to other effects, including the decoupling of co-evolved interactions like plant-pollinator relationships (Mawdsley et al. 2009). A swathe of species extinctions are predicted, in large part because ecosystem fragmentation and human land use means individual species will be unable to follow habitat range shifts (Urban 2015). Many vegetation types and individual species are expected to lose representation in protected areas (Araujo et al. 2004; Burns et al. 2003; Scott et al. 2002). Reserves at high latitudes and high elevations, on low-elevation islands and the coast, and with abrupt land-use boundaries are considered particularly vulnerable (Sala 2000; Shafer 1999). Current trends in biodiversity loss are doubly concerning in the face of climate change, because the capacity of ecosystems to cope with or adapt to environmental changes has been linked with having high levels of biodiversity and ecosystem heterogeneity (Vos et al. 2010; OECD 2003).

The rationales for addressing the plight of other species and natural ecosystems are rooted in morality (Brooke 2008; Thomas et al. 2004) but also in self-interest. Humans depend on other species and on different types of ecosystems for food, water, shelter, health, aesthetic and recreational value, cultural and spiritual value, and to buffer us against natural hazards including extreme storm events (Millennium Ecosystem Assessment (Program) 2005). Some estimate the economic losses associated with the loss of the world's natural capital to be between US$ 2 trillion and US$ 4.5 trillion (Feger and Pirard 2011). Studies on the accumulation of economic costs and benefits from the conversion of "wild nature" to human use landscapes have concluded that implementing an effective global program for conserving the remaining wild nature has a benefit-cost ratio of 100:1 (Balmford 2002).

There is a broad body of literature describing how, as a result of these new and intensifying threats, conservation practitioners may need to change the strategies they employ. The types of conservation strategies needed in the face of climate change have been described along a continuum, from promoting resistance, to enhancing resilience, and facilitating transitions (Millar et al. 2007; Glick, Stein and Edelson 2011; Glick, Chmura and Stein 2011). *Resistance strategies* attempt to maintain the status quo by minimising the exposure of species to climate impacts or by compensating for changes in the environment (such as by rebuilding habitat that might be degraded by climate change). *Resilience strategies* aim to enhance the ability of ecosystems or species to absorb or accommodate disturbances induced or exacerbated by climate change; in other words, the goal is to return ecosystems to a particular functional state, or to maintain some level of functionality despite being in an altered state (Holling 1973; Gunderson and Holling 2002; Heller and Zavaleta 2009). *Transition strategies* introduce the idea of actively managing

for a new functional state, for instance by preparing for changes in ecosystem types as coastal lands are inundated by rising sea levels, or by translocating species beyond current range limits in anticipation of future climatic conditions (Stein et al. 2013). There are expectations that, as climate change intensifies over time, resistance strategies may become more difficult to implement successfully (Millar et al. 2007), and conservation practices may need to shift from a focus on resilience towards managing for change (Chornesky et al. 2015; Lawler et al. 2015; Stein et al. 2013; West et al. 2009).

Various reviews of conservation literature have identified specific strategies that conservation might emphasise in light of climate change (Heller and Zavaleta 2009; Mawdsley et al. 2009; Hannah 2011). These strategies, as summarised in Table 1, include:

- protecting and managing large, intact landscapes and seascapes;
- protecting key geophysical features of the landscape;
- increasing the size and number of protected areas;
- maintaining and increasing landscape connectivity for species and ecological processes, by protecting movement corridors and managing the matrices between protected areas;
- identifying and protecting climate refugia (areas that are likely to become suitable habitats under future climatic conditions);
- ex situ conservation, including establishing captive populations and gene banks;
- re-establishing species that are important ecosystem engineers; and
- reducing other non-climate related threats and stresses such as by tackling invasive species, pollution, and habitat loss due to human encroachment and land use change.

Adaptation policies and projects largely focus on how people's livelihoods and their physical and economic assets are in need of protection

More controversial strategies include translocating species, particularly those at risk of extinction, to more suitable habitats – as well as assisted evolution, as in the example of "super corals" (van Oppen et al. 2015).

In our analysis, we refer to these types of conservation strategies as "adaptation", to denote their particular responsiveness to climate change (see "strategy type" in Table 1). These encompass the entire continuum mentioned above: promoting resistance, enhancing resilience, and facilitating transitions. They are distinguished in our descriptive analysis from what we refer to as "traditional conservation" approaches that focus either on restoration of degraded ecosystems or protection from current stresses such as pollution or human encroachment.

1.2 The role of climate finance

At the international level, there is agreement in multiple forums on the need for urgent action to address these myriad threats to biodiversity, including in the Aichi Biodiversity Targets of the United Nations Framework Convention on Biological Diversity (CBD) (United Nations 1992a; Secretariat of the Convention on Biological Diversity 2012), and in various Sustainable Development Goals under the United Nations Agenda 2030 (such as goals 13 on climate change, 14 on conservation of oceans, and 15 on forests and biodiversity) (UN General Assembly 2015).

Addressing the needs of ecosystems and other species is also recognised as a key element of the climate adaptation agenda. The importance of accounting for climate change in the management of vulnerable ecosystems is explicitly mentioned in the strategic goals of the CBD (UNCBD 2016). Ecosystems are mentioned in Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC), which explicitly states that countries need to reduce greenhouse gas emissions to the atmosphere "*at a level that would prevent dangerous anthropogenic interference with the climate system… within a time frame sufficient to allow ecosystems to adapt naturally to climate change*" (United Nations 1992b, p.4). This formulation seems increasingly outdated, however, as the conservation community has since been at pains to highlight that the rate of change is already so fast that many species are unlikely to be able to adapt "naturally".

Yet in the evolving climate policy discourse, we observe that adaptation policies and projects largely focus on how people's livelihoods and their physical and economic assets are in need of protection. Far less emphasis is put on how to provide natural ecosystems and other species with targeted support to ensure their survival. This is evident even with increased attention to the concept of ecosystem-based adaptation

Table 1. Ecosystem strategies needing emphasis under climate change

Conservation parameter	Needs / approaches	References	Strategy type (as used in our analysis)
Sites of conservation	Focus not only on areas where target species occur today, but also areas with high potential for suitable habitats in the future (i.e. where species have high probabilities of persistence over the long term); identify important areas to protect in advance; create new protected areas.	(Hannah 2011; Donaldson et al. 2017; Oliver et al. 2012; Game, Lipsett-Moore, Saxon, et al. 2011; Ashcroft et al. 2009; Hodgson et al. 2009; Kareiva et al. 2008; Schmitz et al. 2015; Lawler et al. 2015; Nuñez et al. 2013; Hannah et al. 2007; Hannah 2015)	**ADAPTATION**
	Improve/maximise connectivity between habitat patches; facilitate movement of organisms, by building habitat networks, cross-environment connectivity, creating corridors across climatic gradients to enable range shifts, increasing landscape permeability to species movement, ecological networks; reduce fragmentation; conserve connectivity between climatically diverse areas.	(Heller and Zavaleta 2009; van Bodegom et al. 2013; Hannah 2011; Cross et al. 2012; Game, Lipsett-Moore, Saxon, et al. 2011; Hunter Jr. et al. 2010; Jones et al. 2016; Brooke 2008; Mawdsley et al. 2009; Poiani, Goldman, Hobson, et al. 2011; Ashcroft et al. 2009; Hodgson et al. 2009; Vos et al. 2008; Environmental Defenders Office 2009; Heller et al. 2015; Hannah et al. 2008; Wilson and Piper 2008; Theobald et al. 2015; Groves et al. 2012; Morecroft et al. 2012; Krosby et al. 2010; Hulme 2005; Kareiva et al. 2008; Bonn et al. 2014; Tischendorf and Fahrig 2000; Schmitz et al. 2015; Stein et al. 2013; Lawler et al. 2015; Hannah et al. 2002; Vos et al. 2010; Nuñez et al. 2013; Halpin 1997; Noss 2001; Lawton et al. 2010; Alagador et al. 2016; Johnson and Welch 2009; Settele et al. 2014; Townsend and Masters 2015)	
Scale	Shift from site-scale to landscape-scale conservation, protect and manage large landscapes; expand remit from nature reserves and patch-based management to the wider landscape.	(Hannah et al. 2008; Heller and Zavaleta 2009; Clews 2012; van Bodegom et al. 2013; Vos et al. 2010; Stein et al. 2013; Theobald et al. 2015; Ackerly et al. 2010; Mawdsley et al. 2009; 2017; Lindenmayer et al. 2007; Lawton et al. 2010)	
Choice of species and managing diversity	Representation: protecting a portfolio of variant forms of a species or ecosystem so that, regardless of the climatic changes that occur, there will be areas that survive and provide a source for recovery; focus on maintaining diversity, structure and function, rather than attempt to preserve current species composition; rethink the mix of species to be planted and potentially focus on ecosystem function rather than particular assemblages of species; manage keystone species or species at risk of extinction; increase heterogeneity of landscapes.	(Hannah et al. 2008; Harris et al. 2015; Starzomski 2013; Mawdsley et al. 2009; Shoo et al. 2013)	
	Emphasise high level of biodiversity, as an important prerequisite for the adaptive capacity of ecosystems	(Vos et al. 2010; 1996; Hopper 2007; Brooke 2008)	
Translocation	Assisted migration, assisted colonisation, translocation of species that will not survive in situ	(Harris et al. 2006; Hoegh-Guldberg et al. 2008; Thomas 2011; Hole, Huntley, Arinaitwe, et al. 2011; Hannah 2011; Environmental Defenders Office 2009; Clews 2012; Gallagher et al. 2015; Lunt et al. 2013; Poiani, Goldman, Hobson, et al. 2011; Mawdsley et al. 2009; Hulme 2005; Kareiva et al. 2008; Krosby et al. 2010; Stein et al. 2013; Lawler et al. 2015; Hannah et al. 2007; McClanahan et al. 2008; Pearson and Dawson 2005)	
	"Ex situ" conservation: gene and seed banks, establishment of captive populations of species at risk of extinction, captive breeding	(Heller and Zavaleta 2009; Mawdsley et al. 2009; Hannah 2011; Tingley et al. 2014; Hunter Jr. et al. 2010; Settele et al. 2014; Department of Environment, Climate Change and Water 2010; Stein et al. 2013)	
Fostering or working with ecosystem change	Convert one type of ecosystem to another; prepare an ecosystem to function differently in a future climate, rather than restoring a historical condition	(Wilson and Piper 2008; Keppel et al. 2012; Game, Lipsett-Moore, Saxon, et al. 2011)	
	Establishment of climate refugia: conserving representative examples of geophysical settings will protect representative ecological communities under both current and future climates	(Beier and Brost 2010; Stein et al. 2013; Mawdsley et al. 2009; Theobald et al. 2015; Jones et al. 2016; Game, Lipsett-Moore, Saxon, et al. 2011; Morecroft et al. 2012; Groves et al. 2012; Schmitz et al. 2015)	
Managing for extreme events	Measures to diminish the likely impacts of extreme storm events on ecosystems	(Bonn et al. 2014; European Commission 2013)	
"Traditional" conservation	Ecosystem protection: Reducing existing threats not related to climate change (e.g. land use change, fragmentation of habitat, pollution, human conflict, invasive species)	(Poiani, Goldman, Hobson, et al. 2011; Mawdsley et al. 2009; Hulme 2005; Kareiva et al. 2008; Krosby et al. 2010; European Commission 2013; Convention on Biological Diversity 2016; Bonn et al. 2014; Morecroft et al. 2012; Stein et al. 2013)	**PROTECTION**
	Habitat restoration or rehabilitation	(Maciver and Wheaton 2005; Harris et al. 2006; Millar et al. 2007; Environmental Defenders Office 2009; Clews 2012; Poiani, Goldman, Hobson, et al. 2011; Mawdsley et al. 2009; Hulme 2005; Kareiva et al. 2008; Krosby et al. 2010)	**RESTORATION**

(EBA), where the main focus is ensuring the resilience of people rather than other species (Martin 2011). While EBA projects can materially improve the prospects for some other species, EBA proponents usually pick and choose which ecosystem "services" to strengthen on the basis of targeted outcomes for *people*, while ignoring other elements that may be critical to broader ecological health.

As part of the global response to climate change, it is critical that as project developers identify and design adaptation projects – and conduct dialogue with funders – they give explicit attention to the needs and vulnerabilities of other species, and of whole ecosystems. This does not mean every project needs to focus on ecosystems. However, we argue that sufficient support is needed at the portfolio level to purposefully address the vulnerabilities and adaptation needs of other species.

Large volumes of finance are needed to implement national biodiversity strategies and the objectives of the CBD, as well as to foster the mainstreaming of biodiversity considerations into other sectors like agriculture and trade (Richerzhagen et al. 2016) and to support adaptation in the face of new threats arising from climate change. There are significant methodological challenges in trying to assess how much funding is needed to achieve international goals (Feger and Pirard 2011). In one estimate, McCarthy et al. (2012) suggest that conservation funding needs to increase by an order of magnitude over present levels. In 2014, Parties to the CBD agreed to double financial resources to biodiversity protection, to flow particularly to the least developed countries, small island developing states, and economies in transition (UNCBD 2014). There have also been calls to increase finance for conservation and biodiversity in the Addis Ababa Action Agenda, in the 2015 Finance for Development Conference, and in Agenda 2030 to promote the Sustainable Development Goals.

The burden for financing ecosystem protection and adaptation does not fall solely on the actors involved in programming "climate finance".[1] However given the imperative of supporting ecosystems as part of the global response to climate change, the climate finance providers need to ensure there is sufficient support made available for measures that improve the resilience and adaptive capacity of different ecosystems and other species. There are few estimates of the likely costs of achieving biodiversity protection specifically in the context of climate change, including adaptation needs. Those that exist are mostly at the level of individual species in particular countries. A 2007 report to the UNFCCC (Berry 2007) estimates the adaptation of natural ecosystems to climate change could cost US$ 385 billion per year globally, under a business-as-usual emissions scenario and including further investments to expand terrestrial and marine protected areas by 10%. However, these figures are highly uncertain.

Under the UNFCCC, Parties have committed to mobilise financial support specifically to help developing countries tackle the impacts of climate change. Many of the world's most biodiverse and ecologically threatened regions are in developing countries, and many developing countries are highly dependent on international financial support, so how these flows of climate finance are used is likely to have a crucial bearing on the resilience of ecosystems and other species to the impacts of climate change.

1.3 Research outline

To date, there has been little analysis of whether adequate funding is being mobilised for global conservation efforts broadly (Hannah 2011), or, more specifically, how extensively the funding being mobilised for climate change is supporting the adaptation needs of non-human species.

In this paper, therefore, we examine the scale and character of financial support given to ecosystems by the Adaptation Fund. The Fund began financing projects in 2010 and is the first major fund set up specifically to support adaptation to the impacts of climate change. It has not only a thematic focus on adaptation to climate change, its Results Framework includes a clear mandate that the fund should strengthen the resilience of ecosystems. One of its two impact-level results is "increased ecosystem resilience in response to climate change induced stresses" (the second is the "increased adaptive capacity of communities to respond to the impacts on climate change"). One of the Adaptation Fund's five core indicators is "natural assets protected or rehabilitated". Outcome 5 of the Fund's Results

1 Climate finance is not a clearly defined concept. Usually it refers to the financial commitments that countries under the UNFCCC have committed to provide to developing countries for the purposes of tackling both mitigation of greenhouse gas emissions and adapting to the impacts of climate change. It consists of funds mobilised by "donor" countries and channeled either bilaterally to developing countries or through multilateral development finance institutions and funds.

Framework is "increased ecosystem resilience in response to climate change and variability-induced stress." The indicator for that outcome is that "ecosystem services and natural assets [are] maintained or improved under climate change and variability-induced stress" (Adaptation Fund 2011). Thus, the Fund has an unambiguous mandate and obligation to support ecosystems with adaptation.

In our analysis, we first calculate how much of the finance committed by the Adaptation Fund has been used for ecosystem-related activities. Second, we examine whether the funded ecosystem activities reflect, in design, the strategies prioritised by conservation literature for building ecosystem resilience to climate change (as opposed to applying traditional conservation measures). Specifically, we examine: the type of ecosystems targeted, the physical scale of the interventions, and the type of conservation strategy. Third, we look at whether ecosystem outcomes are in fact important to the primary logic or objective of the projects. In other words, we ask: Is ecosystem resilience the main objective of the activities?

By answering these questions, we are able to reflect more deeply about whether adaptation planners and funders are giving sufficient attention to the plight of ecosystems in the face of climate change.

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2. Methodology

The Adaptation Fund began operation in 2010. As of September 2016, it had approved support for 53 projects. The first step in our analysis is identifying ecosystem-related activities within these 53 projects and delineating their budgets.

First, we review all of the relevant project approval documents available on the Adaptation Fund's website.[2] For each project, we classify as "ecosystem-related" any activities that (i) directly intervene with one or more ecosystem elements (or focus on a particular species) and (ii) suggest an ambition to materially improve the health or functioning of these ecosystems (or species). Our focus is on *natural ecosystems*, which we acknowledge is a problematic concept to clearly define. The main distinction we make is between landscapes that are not under intensive human use ("natural ecosystems") and those that are (e.g. agricultural or urban biomes). For highly disturbed landscapes, such as some grasslands included in several projects, we include it as a "natural ecosystem" if the intention of project activities was to recover the natural grasslands ecosystem (in other words, if it is designed from the perspective of non-livestock species). However, the project is excluded if it rehabilitates grasslands to improve livestock grazing prospects.

We then extract budgets for these activities, to the extent these are delineated in overall project budgets. We exclude general project management fees that are often included in project budgets. Although there are costs to be borne when implementing projects, these are only reported in project documents on a lump-sum basis, rather than broken down into individual activities; they also are related to the transaction costs of project-based funding modalities, rather than the costs of undertaking the ecosystem-related activities.

Our next step is to qualitatively examine these activities by reviewing the project-, component- and activity-level descriptions, in order to answer the research questions related to the design of ecosystem-related activities. Again using the project documents, we manually code the following information about each of the ecosystem-related activities:

i. what kinds of ecosystems are targeted, noting not only physical type but also any indications of whether the ecosystem was selected on the basis of any ecological criteria;
ii. what physical scale the intervention has; and
iii. what specific conservation strategies are proposed.

2 https://www.adaptation-fund.org/

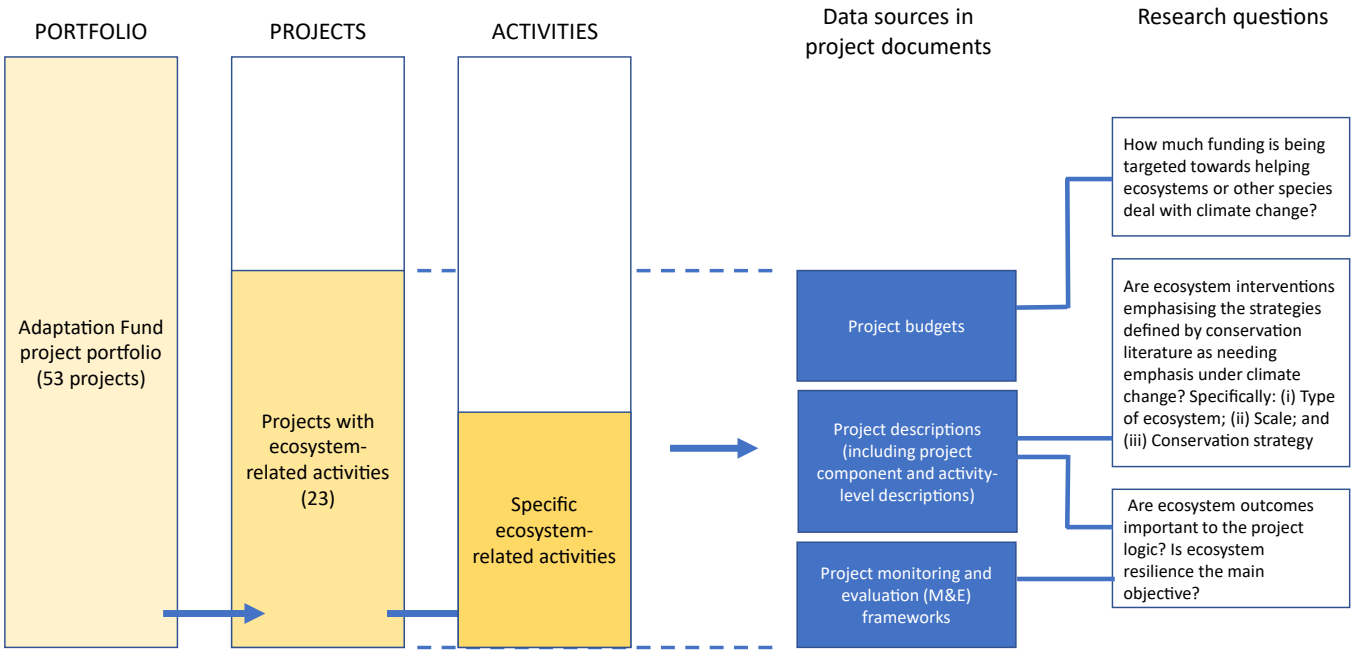
We classify the latter strategies (iii) against the spectrum of conservation strategies described in Section 1, namely whether they explicitly include any measures that match those given emphasis by conservation literature as important in the face of climate change (what we refer to as "adaptation" measures), or whether they adopt more traditional restoration or protection measures.

We classify as "adaptation" strategies those listed in the literature summary in Section 1. These include, for example, improving connectivity between ecosystem fragments and enabling migration, protecting climate refugia, and protecting key geophysical landscape features. "Restoration" strategies are activities designed primarily to rehabilitate or restore ecosystems that have been degraded or destroyed, such as through reforestation or tackling pollution sources. "Protection" strategies are those that aim to reduce current stresses on ecosystems, for instance by establishing conservation areas.

Finally, to address our third research question we manually code from project descriptions how the narrative relates to ecosystems versus other potential project beneficiaries. We also code from project monitoring and evaluation (M&E) frameworks what specific indicators of ecosystem outcomes have been included.

Figure 1 summarises our methodology and explains the link with each of the research questions.

Figure 1. Methodology for analysing the Adaptation Fund portfolio



Overall, our findings probably overestimate the number of ecosystem-related activities that have been supported by the Adaptation Fund, and the budgets for these. We give the benefit of the doubt and include some projects where the relevance to ecosystems is inferred but not entirely clear. Project budgets are not always sufficiently disaggregated to allow us to isolate ecosystem-related activities from other project activities, and sometimes budgets combine several different activities together. Where we are unable to delineate budgets for ecosystem-related activities specifically, we include the larger component budgets in our finance estimates and thus overestimate the level of financial support.

3. Findings: Is adaptation finance supporting ecosystems?

3.1 How much finance is targeted at helping ecosystems deal with climate change?

The total volume of finance committed by the Adaptation Fund to its first 53 projects in developing countries is US$ 346.2 million. Commitments for individual projects range from US$ 690 000 up to US$ 10 million, with an average of around US$ 6.5 million per project.

Across this portfolio, we identify ecosystem-related activities in 23 projects, or 43% of the total projects funded. These are summarised in Table 2. In most cases, these activities are not the primary focus but are a relatively small part of a larger project. Their aggregated budget (US$ 52.3 million) accounts for approximately 15% of total Adaptation Fund commitments. Note that the finance figures represent approved amounts rather than actual disbursed expenditure.

As illustrated in Figure 2, projects with ecosystem-related activities allocate a relatively small portion of the project's total financial commitment to such activities; this allocation averages 33% for the twenty-three projects. In seven projects, the relevant budget is more than 50% of the total project budget, while in another seven projects the allocation for ecosystems makes up less than 10% of the total budget. The average amount of funding for ecosystem-related activities was US$ 2.3 million. Four projects include a budget of more than US$ 5 million, the largest amount being in Peru (US$ 5.58 million). At the other end of the scale, nine projects budgeted less than US$ 1 million for ecosystem activities.

In at least nine projects, some of the activities we categorise as ecosystem-related focus on capacity building or the strengthening of legal or policy frameworks, rather than on implementing conservation activities on the ground. In several cases, such as Mongolia, these are the main relevant actions of the project.

Figure 2. Ecosystem-related activities identified in the 53 projects of the Adaptation Fund portfolio as of September 2016. This includes the project country, total amount of funding for ecosystem-related activities, and percent of total project budget allocated for ecosystem-related activities.

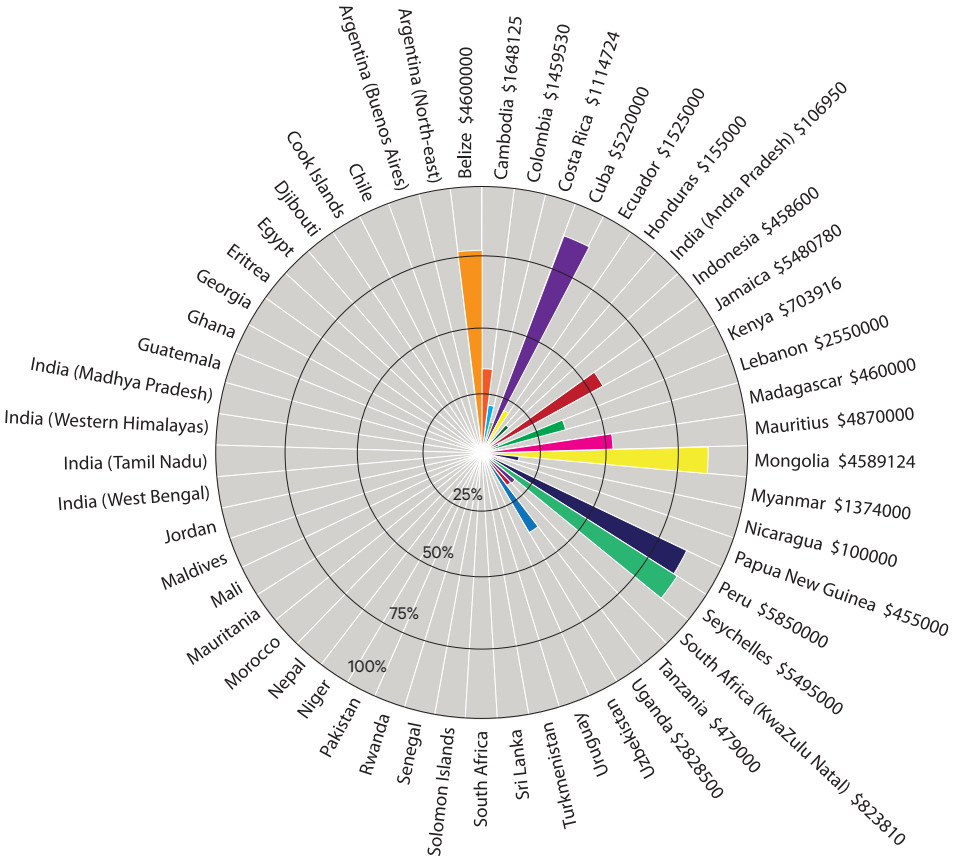


Table 2. Summary of ecosystem-related activities within Adaptation Fund projects

Project country	Ecosystem-related activities	Budget of ecosystem related activities (US$)	Total project budget (US$)	Ecosystem type(s)
Belize	Component 1: Improving protection regime of marine and coastal ecosystems; Component 2: Alternative livelihoods to reduce vulnerability to reef decay and/or protect the reef from further degradation; Component 3: Awareness raising and building local capacity.	4 600 000	6 000 000	Coral reef, mangroves
Cambodia	Output 1.3: Forest restoration protocols developed for CPA intervention sites; Output 2.2: Restoration of degraded forest to multi-use forest.	1 648 125	4 954 273	Forest
Colombia	Component 2: Rehabilitation of wetlands and their hydrology in the target area as a means to reduce risk to flooding and drought associated with climate change and variability; Specifically, Output 2.2: rehabilitation of ecosystems associated with hydrodynamics of the target areas.	1 459 530	8 518 307	Wetlands
Costa Rica	Components 2.1 and 2.3 include relevant activities. Activity 2.2.1 indicates (for example) "reforestation at aquifer recharge areas". Output 2.3, Activities 2.3.1, 2.3.2 and 2.3.3 involve coastal environment management plans and mangrove replanting and conservation.	1 114 724	9 970 000	Mangroves
Cuba	Component 1: Recovery of coastal ecosystems; Components 2 and 3: Participatory management and enabling environments relating to ecosystem-based adaptation (EBA).	5 220 000	6 067 320	Mangroves, coastal wetlands
Ecuador	Output 2.1.3: Natural resource assets created, improved or maintained	1 525 000	7 449 468	Forest
Honduras	Output 2.1: Enhance connectivity in protected forests	155 000	5 620 300	Forest
India (Andhra Pradesh)	Outcome 3: Restore mangroves to overcome salinisation and other impacts due to sea level rise, including nursery establishment.	106 950	689 264	Mangroves
Indonesia	Outcome 1.2: Village conservation agreements; Outcome 2.3 reforestation and afforestation.	458 600	5 995 666	Forest
Jamaica	Component 1: Install hard engineering breakwaters, allowing regeneration of seagrass beds.	5 480 780	9 995 000	Seagrass beds
Kenya	Component 3: Integrated shoreline and mangrove ecosystem management; Outputs 3.2 (mangroves) and 3.3 (coral reefs)	703 916	9 998 302	Coral reef, mangroves
Lebanon	Output 3.1: Community-based sustainable rangeland management plan; Output 3.2: Restore degraded rangeland areas and reduce flood risks.	2 550 000	7 860 825	Grasslands
Madagascar	Output 2.2: Watershed rehabilitation including reforestation (also includes other activities not related to ecosystems);	460 000	5 104 925	Forest
Mauritius	Output 1: Includes hard engineering structures that will improve ecosystem outcomes (new habitat, improved biodiversity compared with baseline); 1.3 includes mangrove plantation.	4 870 000	9 119 240	Mangroves, coastal ecosystems
Mongolia	Component 1: Landscape-level integrated land use and water resources monitoring and planning system; Output 2.1: Local level climate change adaptation assessment and monitoring; Output 2.2: Integrated landscape level, ecosystem-based adaptation management action plans; Output 2.3: Physical techniques to improve ecosystem resilience; Output 2.4; Component 3: Institutional and policy capacity strengthened to support ecosystem-based adaptation replication, monitoring, and enforcement for critical watersheds.	4 589 124	5 500 000	Forest
Myanmar	Output 1.2: Micro-watersheds protected and rehabilitated through Farmer-Managed Natural Regeneration (FMNR) to increase natural water retention and reduce erosion. Relevant activities include 1.2.5, 1.2.6, and 1.2.7, as well as capacity building and preparatory work.	1 374 000	7 909 026	Forest
Nicaragua	Component 2: Sub-activity on protecting small area of forests around recharge areas and riparian zones.	100 000	5 500 950	Forest
Papua New Guinea	Output 1.3: Support system for community-led mangrove reforestation and conservation projects.	455 000	6 530 373	Mangroves
Peru	Component 1: Introduction of sustainable fishing methods; Restoration and co-management of natural banks; Introduction of sustainable aquaculture; production of bio-fertilisers from fishery and aquaculture residue (reducing marine pollution); Component 2: Coastal marine environmental surveillance; Component 3: Capacity building and knowledge management for EBA; Component 4: Management and regulation for coastal ecosystem resilience.	5 850 000	6 950 239	Marine ecosystems (fisheries)
Seychelles	Component 1 Reforestation and removal of invasive species; Component 2 Rehabilitation of tidal wetlands and coral reefs; Component 3 Policy framework and training in EBA.	5 495 000	6 455 750	Forest, wetlands, coral reefs
South Africa (KwaZulu-Natal)	Component 2: Climate-proof settlements through "ecological and engineering solutions"; Output 2.2: Restored and protected critical ecosystems that maintain ecosystem resilience, provide buffering from climate change impacts and provide freshwater to local communities downstream. Activity 2.2.1: Restore and rehabilitate critical ecological infrastructure to improve its capacity to mitigate effects of climate induced disasters.	823 810	7 495 055	Grasslands, wetlands
Tanzania	Component 2: Coastal ecosystems rehabilitated and Integrated Coastal Area Management implemented; Introduces efficient cookstoves to reduce fuelwood demand and effects on mangrove forests; Component 3 includes as one output: "One Ecosystem Based Integrated Area Management (EBICAM) plan for the coastal region approved".	479 000	5 008 564	Coral reef, mangroves
Uganda	Activity 2.1.1: Identifying most degraded forest areas vulnerable to rainfall; Activity 2.1.2: Afforestation; Activity 2.1.4: Rehabilitation of degraded wetlands; Activity 2.1.5: Restoration of degraded riverbanks.	2 828 500	7 751 000	Forest, wetlands
Total		**52 347 059**	**156 443 847**	

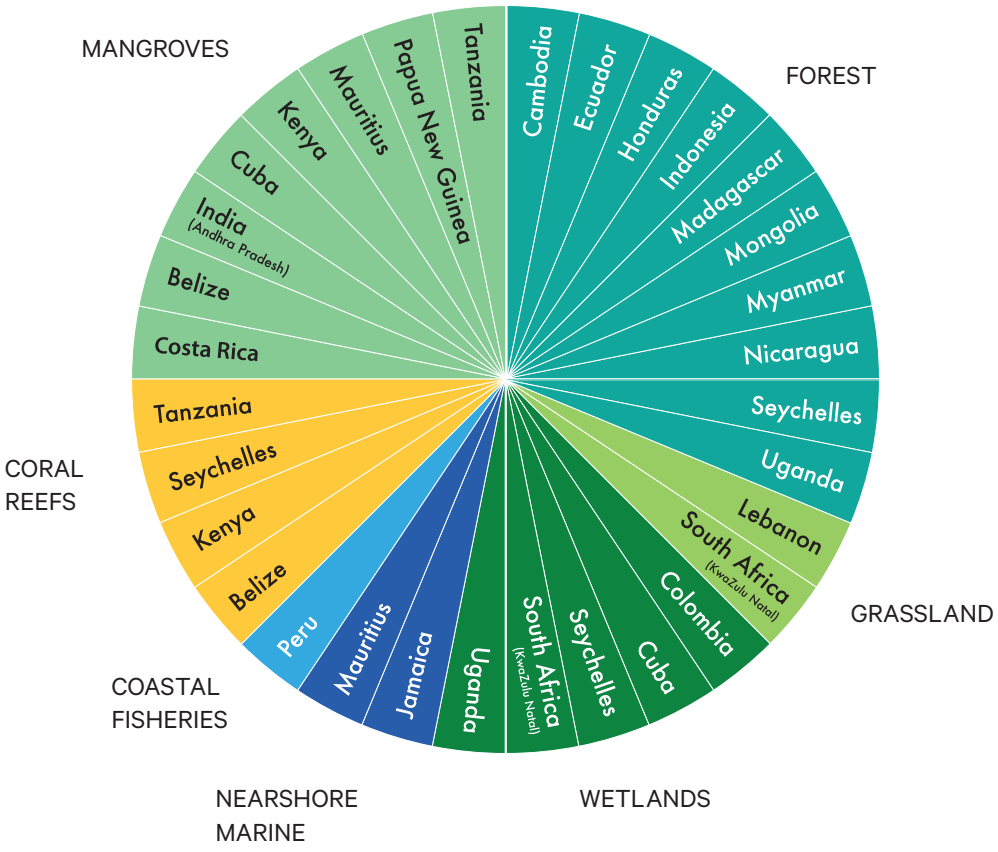
3.2 Are ecosystem interventions emphasizing adaptation strategies or traditional conservation measures?

Types of ecosystems or species that projects are targeting

The ecosystem-related activities identified in Adaptation Fund projects focus on various ecosystems. As shown in Figure 3, the most common are forests, which are included in 10 different projects. These are mostly reforestation or afforestation activities. However, the ecosystems are almost always described in vague terms and usually without specifying forest type or quality, the mix of trees to be planted, the ecological outcomes for different species, how the land will be used or managed after being reforested, or any clear outcomes for biodiversity or the forest ecosystems themselves. Based on the language of project documents, many of these activities are probably actually tree plantations – often "multi-use" trees for food and timber, with the main purpose of preventing soil erosion and thus improving water supply or reducing flooding in human settlements – rather than the regeneration of complex ecological systems.

The next most common ecosystem type is mangroves, in eight projects. The relevant activities typically involve planting mangrove shrubs as a shoreline stabilisation device and/or to provide storm protection for coastal settlements and infrastructure. Wetlands are included in five projects, while coral reefs are targeted in four. Coastal projects, including activities targeting nearshore marine environments or coral reefs, usually involve some form of "hard" engineering, including in the nearshore marine environment, to provide protection and allow degraded inshore ecosystems (e.g. seagrass beds) to recover. Two projects targeted the recovery of "rangelands", grasslands that have been severely degraded due to human use and livestock grazing. Although these will remain in human use, we included the projects in Lebanon and South Africa on the basis that the measures proposed are described in terms of improving biodiversity outcomes and reducing intensity of landscape use.

Figure 3. Types of ecosystems funded in projects.



Note: Several projects include activities that target more than one ecosystem type, in which case both ecosystems are included here. This explains why the total number of ecosystems categorised (32) exceeds the total number of projects (23). It is not possible to separate total funding by ecosystem, since several projects intervene in more than one ecosystem type but usually do not break down the project budgets for different ecosystems separately.

Based on project documents, we see no evidence that the selection of ecosystems was based on any ecological criteria, such as the presence of threatened or iconic species, the area's vulnerability to climate change, or the locations of biodiversity hotspots. None of the projects propose activities in sites of declared ecological importance (e.g. home to endangered species) or under current protection status. Almost all the environments targeted by these projects have previously been significantly degraded.

What is the physical scale of ecosystem activities?

Also noteworthy is that the scale of ecosystem interventions is sometimes very small in area. For example, in Nicaragua, forest restoration efforts target 50 hectares around water recharge areas. In Jamaica, major engineering works aim to rehabilitate nearshore seagrass beds along a one-kilometre stretch. Such small interventions have a correspondingly small benefit for biodiversity, and in some cases it is questionable whether there is any significant benefit at all. Some activities do cover larger areas – such as those in Cuba (about 7300 hectares of mangroves), Colombia (700 hectares of wetlands) and Myanmar (4200 hectares of micro-watersheds) – but the relevant activities tend to cover only part of the specified areas, and it is not always clear how much will actually be restored.

Almost none of the projects describe how the particular activities will fit into the wider landscape, such as whether they link up separate fragments of intact natural habitat (Honduras is an exception here).

What kind of conservation approaches are being used?

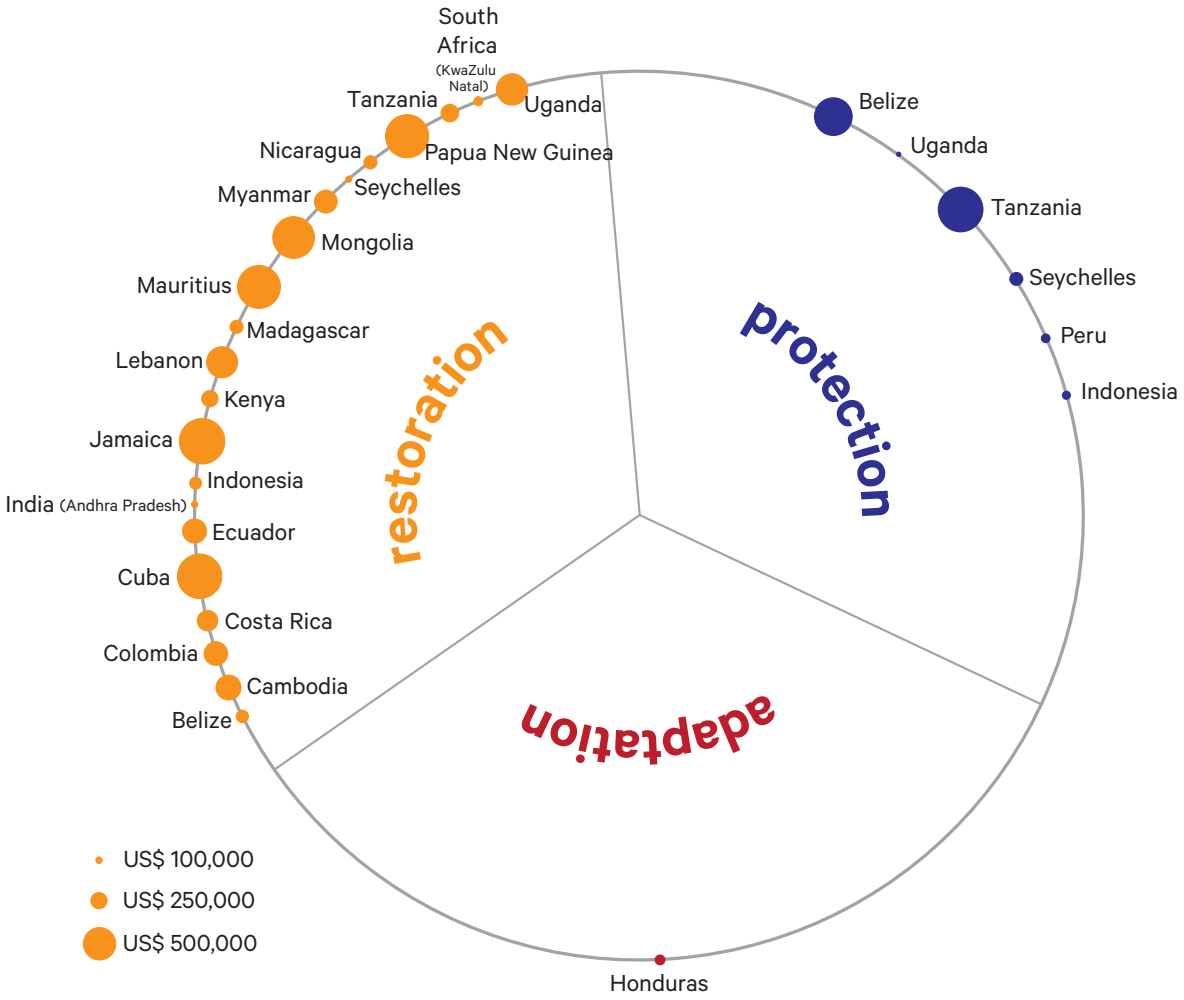
As mentioned in Section 1, a swathe of conservation literature has highlighted the kinds of conservation strategies that will likely need more emphasis in the context of climate change. Here, we examine whether the ecosystem-related activities supported by the Adaptation Fund reflect these recommendations in their design (what we refer to in shorthand as "adaptation"), or whether they adopt a more traditional mix of conservation strategies (what we refer to as "restoration" and "protection").

As shown in Figure 4, we identify only one project, in Honduras, that includes activities in our "adaptation" category. This project document describes a focus on establishing connectivity in forest ecosystems. It is, however, a very small component (US$ 155 000) of a much larger project, and the larger project includes no other ecosystem-related activities, so the likely impacts are small. Two other projects reference "landscape" approaches that align with our adaptation category. The Seychelles project document specifically mentions that the project aims to improve landscape connectivity, between different ecosystem types and within the same ecosystem type. However, since we are not able to identify which activities achieve this in the project description or budget, the relevant project activities are categorised predominantly in the "restoration" category. The Uzbekistan project document mentions the adoption of a landscape-wide approach and discusses the interconnectedness of different parts of the patchwork landscape. However, the target landscapes are and will continue to be under intensive human use, meaning we identified no ecosystem-related activities within the project.

Most activities (19) focus on restoration to improve the condition of degraded ecosystems. Relatively few (6) are designed primarily to protect ecosystems from current stresses like pollution. Five projects – in Belize, Indonesia, Seychelles, Tanzania, and Uganda – contain elements of both restoration and protection, and in Figure 4 we have delineated budgets to separately categorise each strategy (which explains why there are 28 coded results for 23 projects). In some other cases, there are suggestions of both types of activities within an overall project. However, the delineation between these is not clear and/or separate budgets cannot be extracted from project documents; in such cases, the entire project was categorised in Figure 4 according to the larger strategy.

Overall, we find approximately US$ 41 million in funding is committed to restoration activities (equivalent to 12% of the Adaptation Fund's total portfolio), and US$ 11.2 million is committed to protection activities (3% of the total portfolio). Only a very minor amount of US$ 155 000 supports the "adaptation" category.

Figure 4. Conservation approaches in projects with ecosystem-related activities.



Is ecosystem resilience the main objective?

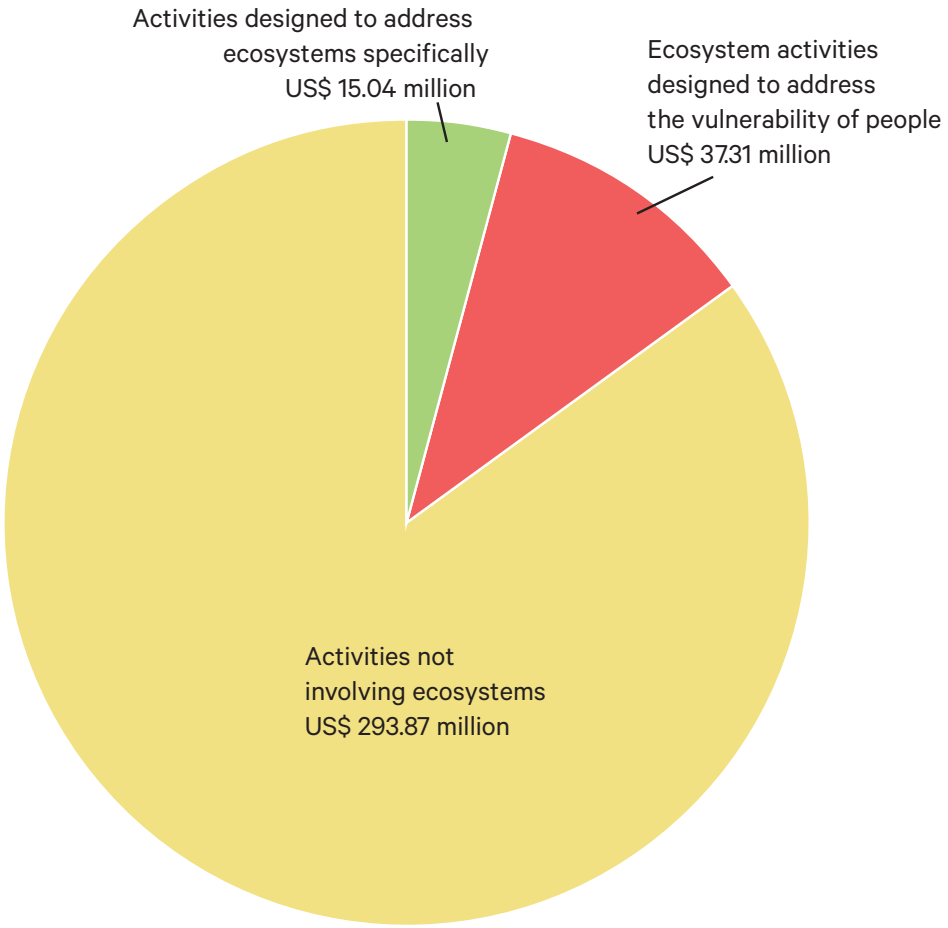
The inclusion of ecosystem-related activities does not necessarily mean the activities were designed specifically to improve the resilience of ecosystems or other species. Figure 5 shows the breakdown of funding across the whole Adaptation Fund portfolio, between (i) activities that are designed to address ecosystems specifically, (ii) activities that intervene in ecosystems but are designed mainly to deliver resilience outcomes for people or infrastructure, and (iii) activities that are not related to ecosystems. Just US$ 15 million, or 4% of the total Adaptation Fund portfolio, is designed primarily for ecosystem resilience. This amounts to less than one third of the ecosystem-related budgets.

The budget targeting ecosystem outcomes consists of the funding for projects in Belize, Peru and Mongolia. The Belize project aims to strengthen the climate resilience of coral reefs; improving ecological health is stressed as a key purpose of the overall project. The Peru project targets two marine ecosystems, and highlights climate (and other) risks to these, and their importance as fisheries. The activities in Peru also clearly aim to provide benefits for people, in terms of improved fisheries resources; however, since the project document identifies specific target species, and biodiversity, as key project outcomes, we determine ecosystem outcomes to be a clear purpose and focus. The Mongolia case is less clear but does specifically describe habitat restoration in its results framework, and we give it the benefit of the doubt.

Across the remaining projects with ecosystem-related activities, the focus – and hence choice of ecosystem and design of intervention – is on increasing resilience of vulnerable people rather than on

specific ecological outcomes. This includes projects that use the term "ecosystem-based adaptation" but typically focus on the provision of benefits for human well-being while providing little or no explanation of how other species will benefit from the intervention. In such cases, it is not clear whether other species do benefit – or might even be made worse off – because the description of the local ecosystem and how it functions is superficial in project documents.

Figure 5. Value of Adaptation Fund commitments according to intended main beneficiaries (i.e. ecosystems or people)



A further means of examining whether ecosystems are central to a project's logic is to look at how the intended ecosystem *outcomes* have been defined by proponents in project monitoring and evaluation frameworks. Only two of the 23 projects we classified as having relevant activities include any indicators that are related to the quality of the ecosystem, such as to the resilience or survivability of species. The Cuba project proposes to develop a range of indices, including some that may help to gauge the state of the ecosystem (e.g. canopy density). The Peru project includes the design of an ecosystem resilience monitoring program, which is not in itself an indicator of ecosystem quality but at least suggests ecosystem health might be monitored. All other projects include indicators based only on numbers of activities or on physical areas (e.g. the size of the area of mangroves planted or of coral reef rehabilitated or of forests placed under conservation agreement). The India project includes an indicator related to growth and survival rate of trees, which is not a measure of the ecosystem per se but at least is one step advanced from simply measuring the number of hectares planted. The Jamaica project, which we classified as designating a large budget towards ecosystem-related activities, in fact had no indicators at all relating to ecosystem outcomes. Overall, based on the projects' results frameworks, we conclude that ecosystem outcomes are actually of limited importance to almost all projects.

Exclusions

Many project documents make at least passing references to benefits for ecosystems, but rather fewer actually describe and allocate funding for activities that might materially improve the health and resilience of ecosystems. Overall, while we are generous in our decision of which activities to include or exclude as ecosystem-related (meaning we tended to include rather than exclude), we exclude some projects that refer to ecosystems in their project documents but did not seem to include tangible activities. An example is the Cook Islands; the project document describes conservation of coastal, inland and reef ecosystems under the heading "environmental benefits" but does not describe any ecosystem-related activities in its work plan nor contain any monitoring and evaluation indicators that relate to these outcomes.

Several projects are particularly difficult to classify. The Guatemala project document clearly describes the impacts climate change will have on natural ecosystems in the project areas, and the specified objective of one of its four components is "development and implementation of climate change resilient ecosystem management". However, closer review of the activities show that they focus on introducing agro-silvo-pastoral practices, by planting native trees and protecting soil degradation in cropping areas. A small subset of activities is listed as "climate resilient forest restoration activities that are more suited to high risk areas – berms, bunds, terraces, gully plugs, etc. – in order to increase landscape resilience as a whole under emerging long-term climate conditions. This includes lands designated for reforestation, conservation of existing ecosystems (and their ecosystem services), and promotion of small forest enterprises." However, from the detailed description of project activities, we cannot ascertain any clear investments in ecosystems. The Uruguay project document describes the expected results in terms of protection and restoration of natural grassland biodiversity and talks about enhancing ecosystem services – mainly water provision for farmers and livestock – but then does not specify how this will be achieved in practice, other than through "adaptation interventions". Moreover, the interventions target the maximisation of livestock productivity on the grasslands, while no clear biodiversity outcomes are defined and there seem to be no measures that are likely to improve the grasslands ecosystem from an ecological perspective.

Many projects have budgets for vegetation planting, referred to under various names including reforestation or afforestation. Vegetation planting by itself is not automatically classified as ecosystem-related; we include it only when the project document describes some semblance of a natural ecosystem or refers to addressing the needs of specific species. As mentioned, virtually none of the project documents define how reforestation activities will strengthen the resilience of particular species or ecosystems, how ecosystem functions and structures are being restored, or even whether the tree species being planted are native. Among those activities that we do not consider as ecosystem-related are those focusing on the planting of multi-purpose tree species for human use and harvesting (Ghana, India, Mali) and the planting of "vegetative buffers" along coasts or floodways that are essentially a thin strip of trees (Georgia). Several projects – in Uzbekistan, Mauritania, Pakistan, Rwanda and Nepal – include the planting of trees and shrubs to reduce soil erosion but do not mention any natural ecosystem; these activities do not describe whether this stabilisation work improves or disturbs the natural ecosystem, nor how it changes conditions for other species. Consequently, we also do not consider these activities as ecosystem-related.

A number of projects are structured around community-based activities and/or the use of small grants, where part of the project itself is to identify and plan activities with local communities. For example, the Cook Islands project may contain small grants for community programs, and similarly, the Small Grants Facility of the South African National Biodiversity Institute (SANBI) mentions "ecosystem resilience." But both are at the project approval stage and have not yet defined specific activities. In these cases, it is not possible for us to identify specific activities that are targeting ecosystems, even if the proposals mentioned that activities might eventually include reforestation or other relevant activities.

4. Discussion

4.1 More finance and more focus needed on the new challenges of managing ecosystems under climate change

Our analysis reveals that natural ecosystems appear not to be receiving much attention by the Adaptation Fund, or by the many different project developers involved in preparing projects. Having reviewed only one of the international funds, it is not possible to say whether this is part of a broader pattern. However, given that the results framework of the Adaptation Fund specifically mandates a focus on ecosystems, we feel concerned that it might be.

Overall, the *scale* and *quality* of interventions that we classified as ecosystem-related appear highly questionable from the perspective of addressing the needs and vulnerabilities of other species. Even with our generous approach to classification, only 15% of total finance allocated by the Adaptation Fund has been for ecosystem-related activities. These amounts are spread into mostly small activities across different projects, with very few large, dedicated interventions – either in physical size or scope of financial support. The physical area of ecosystems included is sometimes miniscule in size, such that it is difficult to imagine any meaningful impact on overall ecosystem resilience or the survivability of other species. This contrasts with the recommendations of conservation literature to move beyond small conservation efforts and focus instead on landscape-scale interventions (see Table 1). The results also highlight that high conservation value ecosystems are not included in projects, as is recommended in conservation literature. Instead, most of the activities propose to work within highly degraded environments. This perhaps explains why we classified almost all of the activities as “restoration”, and only one very small activity as “adaptation”.

Even though project documents often allude to ecosystem benefits, for the most part these are not reflected in monitoring and evaluation frameworks, leading us to conclude they are not important to the project’s purpose or logic. As a result, it is possible that even among the project activities we classified as ecosystem-related, in reality many may deliver little or no tangible benefit to other species.

Indeed, even among those projects that included ecosystem-related activities, most have not been designed with the resilience of ecosystems in mind; we estimate only 4% of total funding commitments from the Adaptation Fund were directed to activities specifically targeting ecosystem resilience. Instead, projects include specific ecosystem components in order to improve the resilience of vulnerable people or reduce risks to people’s physical and economic assets. This does not mean the activities generate no benefits for ecosystems, but the selection of what to do and how to approach the conservation effort was likely not made based on the needs of other species. An example here are some of the “reforestation” activities, which appear to be designed as tree planting exercises rather than ecological restoration.

Even among those projects that included ecosystem-related activities, most have not been designed with the resilience of ecosystems in mind

Going further, projects usually define ecosystems in vague and simplistic terms. Project documents tend to describe only generic features of an ecosystem, if any at all (many forest-related projects do not), and leave ecological characteristics poorly defined. There is rarely discussion of specific species, or the inter-relationship between species, or of important ecosystem properties, as opposed to ecosystem “services”. Most of the ecosystems included in projects are significantly degraded, and none were selected by proponents on the basis of high ecological merit – though we recognise that some, such as coral reefs or wetlands, may in fact be ecologically important in a local sense. Project documents often make no explicit statements about what kinds of ecosystem outcomes might be expected, in terms of biodiversity, population size, habitat heterogeneity, or changes relative to the current condition of the landscape. This in itself suggests that ecosystem outcomes are not being treated with great importance.

Most of the project documents provide no clear description of the suitability of the chosen interventions, their likely effectiveness (vis-à-vis alternative strategies, for example), what changes they will actually produce for biodiversity, or what contribution they might make to conservation goals or ecosystem adaptation. This lack of clarity is surprising, because project documents are the primary basis upon which the Adaptation Fund Board makes its funding decisions. We would have expected the Adaptation Fund Secretariat and Board to have demanded more clarity on these important questions before approving funding.

With one very small exception, our results also suggest that ecosystem interventions are not applying strategies that reflect those emphasised in conservation literature as critical for protecting other species in the face of climate change. Most activities we identified involve traditional restoration strategies at a very local scale and are not contextualised in the wider landscape; they have not been designed to maximise conservation or biodiversity outcomes or to address the future vulnerabilities and needs of other species as the impacts of climate change intensify. This may be partly related to the fact, highlighted above, that ecosystems are rarely the main intended beneficiaries of the interventions. Most instead seek to generate discrete ecosystem "services", like soil stability, water provision, or protection against coastal erosion and storm surges.

In practice, conservation of ecosystems and individual species will need to work with a mix of these "restoration", "protection" and "adaptation" strategies. What our findings suggest is that at present, adaptation practitioners are still thinking overwhelmingly in terms of traditional conservation practices, and have yet to embrace the recommendations from a wide body of conservation literature that climate change necessitates a different emphasis and new approaches.

4.2 Implications for climate funds and project developers

These observations raise concerns about whether the Adaptation Fund – and by association other multilateral climate funds – is fulfilling its duty. Outcome 5 of the Adaptation Fund specifically emphasises ecosystem resilience, but this rhetoric does not appear to be translating into action. The Outputs and Indicators related to Outcome 5 in the Fund's log frame include not only natural but also physical and social assets; perhaps this has given leeway for project developers to claim they are responding to Outcome 5 even where there are no ecosystem-related activities in the project. We notice project proponents significantly overstating the contribution projects are making to ecosystems, suggesting potential benefits for other species that seem disconnected from the project activities and are rarely verified by project monitoring and evaluation (M&E) frameworks. Almost all project documents mention ecosystems or biodiversity, and many claim the project will deliver an indirect benefit for ecosystems – even where there are no substantive activities that seem to address ecosystem health. While the project documents are prepared by adaptation planners and project developers, rather than the fund, the Fund still has an important role to play in communicating expectations to project proponents and countries, and in reviewing funding applications.

To address these gaps in both scale and quality of funding, the major climate funds targeting adaptation could consider a number of measures. First, they could set dedicated finance targets for ecosystem expenditures, ensuring a greater portion of the funds' finance goes to projects that specifically improve the resilience of natural ecosystems and the survival prospects of other species. Second, they could appoint dedicated ecosystems specialists to their technical committees and boards; these specialists could review all proposals, provide expert advice on the likely impacts and potential benefits of project activities, and contribute to further elaboration of how ecosystem resilience will be improved. Third, funds should be requiring project developers to include, in their M&E frameworks, indicators relating to changes in ecosystem *quality*. Fourth, the climate funds – and bilateral donors – should make deliberate efforts to report on these questions, not only tagging expenditures against biodiversity objectives but also conducting robust, qualitative assessments of whether and how projects are specifically targeting improvements in ecosystem resilience and supporting adaptation of animals and plants to climate change. Finally, there is a need for more large-scale projects, instead of the often small-scale projects funded to date, if resilience of other species is to be meaningfully supported.

Many of these same issues and recommendations apply to adaptation planners and project developers, including recipient country governments who are bringing forward funding proposals. These findings might suggest that the conservation community has been slow in interacting with climate finance opportunities. If so, effort is needed to bring in this expertise sooner rather than later. At the country level, limited funding opportunities may have understandably led to the prioritisation of adaptation projects with a strong socio-economic development angle. However, as argued in Section 1, socio-economic outcomes around the world depend heavily on ecosystem health in the long-term. The way ecosystems are considered in sustainable development agendas might need to be discussed with this longer-term view in mind. Otherwise, we may continue to see a major gap in funding the climate resiliency of other species, and the ecosystems on which they and we depend.

4.3 Concluding remarks

This paper's exploratory analysis of the Adaptation Fund offers only a limited view of what is happening across the landscape of climate funds and bilateral development cooperation on climate adaptation. Further analysis of other funding flows – in other climate funds such as the Green Climate Fund, Global Environment Facility and World Bank's Climate Investment Funds, as well as other biodiversity funding channels – would therefore help to improve our understanding of whether the needs and vulnerabilities of other species are being given priority as the world prepares for the impacts of climate change.

To turn around these trends, major investments are needed, as is a change in how people prioritise other species in their pursuit of social and economic development.

As climate change puts both environments and financial resources under greater stress, we might expect there will be even greater competition and conflict between the needs of humans and of other species. In the contest for limited financial resources, our findings highlight the risk that people may find it easy to neglect the needs and vulnerabilities of other species, and of ecosystems broadly, and instead prioritise funding for interventions that address the physical assets and economic vulnerabilities of people. Our findings seem to confirm a trend, observed in the conservation literature, of a shift away from "naturalness" in conservation and towards the protection or prioritisation of ecosystems that are deemed of ecological service on the basis of their contribution to human welfare and enjoyment (Starzomski 2013). If conservation interventions are designed to maximise the benefits nature provides people – meaning species and ecosystems are prioritised for protection on the basis of their assessable utility for humans – this will make life for other species even more precarious.

Addressing the needs and vulnerabilities of other species is urgent. Hannah et al (2011) argue that there is a narrow time window in some places in which populations can persist as the climate changes, and that after a certain time it will become impossible to salvage natural systems or save certain species. In the meantime, continued patterns of ecosystem degradation and land use change will have further limited the options for establishing protected areas or connections between discrete habitat patches.

To turn around these trends, major investments are needed, as is a change in how people prioritise other species in their pursuit of social and economic development. In light of the broad, overwhelming trend of ecosystem devastation globally, small adaptation projects may seem of miniscule importance. Yet the persistent degradation and fragmentation of natural ecosystems makes effective use of adaptation funding even more critical, to ensure the natural world can cope with and adapt to climate change.

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