Resource requirements for Aichi Targets 11 – Protected Areas

Progress report for the High Level Panel Meeting

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1 Summary

- This report estimates the cost of implementing Target 11, including the costs of a) creating new protected areas; b) establishing connectivity corridors; c) effectively managing new and existing protected areas; d) strengthening protected area enabling environments and sustainable finance; and e) conducting key protected area assessments.

- A reasonable estimate for creating new protected areas is **$130 billion** for terrestrial and **$5 billion** for marine, although the estimates range between 44 to 259 billion (for terrestrial) and 243 million to 19 billion (for marine). Indigenous and community conserved areas will likely play a key role in the growth of new protected areas. The average GDP per capita in the 25 largest countries with the least protection is under $6,000, and under $8,500 for the 25 largest countries composing the top 21 biodiversity hotspots.

- A reasonable estimate of the cost of creating connectivity corridors is **$106 billion** for terrestrial and **$4 billion** for marine, although estimates range between $21 to $317 billion for terrestrial and $192 million and $27.5 billion for marine.

- A reasonable estimate of the cost of effectively managing new and existing protected areas is **5.1 billion annually** by 2020, or a total of **23 billion** from 2013 to 2020, although estimates range from $920 million to $30 billion annually for effectively managing *existing* protected areas and $364 million to $5 billion annually for effectively managing *new* protected areas.

- A reasonable estimate of the cost of improving protected area enabling policies and sustainable finance is **1.4 billion**, although estimates range from $480 million to $2.9 billion.

- A reasonable estimate of the cost of completing key assessments globally is **$53 million**.

- A reasonable estimate for the **total cost** of achieving Target 11 is **$270 billion,** or **$33.75 billion annually**.

- Although this figure may appear daunting, it represents only .**000472**% of the world's GDP, and only .**0013**% of the GDP of the **top 20 wealthiest nations**. This figure also represents about 2% of the world's annual environmentally harmful subsidies, 1.4% of annual global tourism revenues, and less than 10% of the total cost of soda consumed by only 15 countries.

- The global cost of protected areas can be reduced through a variety of strategies, including a) more focused design of the network; b) the inclusion of indigenous and community conserved areas and forest reserves; and c) the implementation of diverse sustainable finance mechanisms.

- The benefits of protected area investments beyond biodiversity conservation include water security, food security, hazard mitigation, health and climate change mitigation and adaptation, among many others. Investments in protected areas have been calculated at yielding a return on investment of between **25:1** to **100:1**.

- A comprehensive, representative, effectively managed network of protected areas, if solidly embedded in a country's National Strategies and Action Plans (NBSAPs), will provide an efficient, cost-effective means of achieving many of the other Aichi Targets, particularly Targets 5, 10, 12, 13, 14 and 15.

2 Introduction

This report presents an assessment of the resources required to meet Target 11 of the Aichi Biodiversity Targets, which states:

> **By 2020, at least 17 percent of terrestrial and inland water, and 10 percent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.**

This report, which has been prepared by UNDP and CBD for consideration by the High Level Panel, outlines the actions required, describes the methods applied, and presents an initial draft assessment of resource required to achieve Target 11. Note that the figures included in this estimate should be considered as indicative. Rather than attempt to outline exact costs, this report outlines low, medium and high scenarios, and identifies the assumptions inherent in these scenarios. This approach allows decision makers to manipulate and adjust the assumptions, and then apply these to new scenarios as more accurate information becomes available.

2.1 Description of terms and key issues

Target 11 addresses two major aspects of protected areas – coverage (which includes representativeness, connectivity, and ecological importance) and management (which includes effective management, sound governance sustainable finance and an enabling policy environment). Any estimates of resource requirements must address both sets of elements. The following definitions of protected areas are used in this assessment:

- ***CBD Definition***: “a geographically defined area, which is designated or regulated and managed to achieve specific conservation objectives.” (CBD, 1992)
- ***IUCN Definition***: “ a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values.” (IUCN, 2012)

In addition, this assessment includes the term “indigenous and community conserved areas,” or ICCAs, using the following definition:

- ***ICCA Definition***: “ICCAs are natural and/or modified ecosystems containing significant biodiversity values, ecological services and cultural values, voluntarily conserved by Indigenous peoples and local communities, both sedentary and mobile, through customary laws or other effective means.” (ICCA Forum, 2012)

2.2 Links to the CBD and CoP decisions

Protected areas are recognized as essential and effective instruments for achieving the objectives of the Convention on Biological Diversity (CBD). The CBD Conference of the Parties in decision X/2 adopted the Strategic Plan for Biodiversity 2011-2020, comprised of strategic goals and 20 targets, collectively known as the Aichi Targets (http://www.cbd.int/sp/targets/).

COP 10 decisions X/31 on protected areas, especially section A (strategies for strengthening implementation) and section B (issues that need greater attention) and decisions X/29 on marine and coastal biodiversity, provide impetus for undertaking activities for achieving the target.

2.3 Synergies and overlaps with other targets

The successful achievement of the Strategic Plan for Biodiversity 2011-2020 not only relies on the attainment of Target 11, it also relies on the contribution of comprehensive and effectively managed protected area systems to other Aichi Targets, including mainstreaming of biodiversity into development sectors (Target 2), protection of natural habitats (Target 5), protection of coral reefs (Target 10), protection of threatened species (Target 12), maintenance of ecosystem services (Target 14), restoration of degraded areas (Target 15), effective national biodiversity policies (Target 17), participation and respect of indigenous and local communities rights (Target 18) and sustainable finance (Target 20).

2.4 Challenges in estimating the resource needs for achieving Target 11

There are many inherent challenges in estimating the resources required to achieve Target 11. Some of these include:

- ***Establishing costs of indigenous and community conserved areas and private reserves***: There is a wide variation in cost between establishing vs. legally recognizing indigenous and community conserved area and private reserves.
- ***Disaggregating overlapping costs***: Several of the actions involved in protected areas can achieve multiple objectives – new transboundary areas can improve connectivity, representativeness and the protection of key ecosystem services, for example. Yet the degree of overlap is unknown, and it is very difficult to disentangle overlapping costs.
- ***Identifying optimal levels***: This report identifies several different scenarios for coverage, connectivity and management effectiveness. Given the degree of potential overlap of costs, these levels are somewhat speculative, and should be considered indicative.
- ***Scaling up costs from limited data sets and literature review***: Many of the estimates in this report relied upon estimations based on relatively small data sets, especially considering that they are applied to a very large extent and number of protected areas globally.
- ***Assessing the highly variable costs of creating new protected areas***: The actual costs of establishing a new protected area are very difficult to ascertain. Some sub-actions, such as gazettement and management planning costs, are relatively easy to estimate, while the actual cost of purchase, compensation and/or opportunity costs of land acquisition are highly site-specific and vary tremendously, even within a single country. For example, an estimate for expanding 12 million hectares in Queensland, for example, ranged from $214 million to $2.9 billion (Adams *et al*., 2011). Instead, this report offers low, medium and high scenarios, allowing for decision makers to decide how to best apply these figures.
- ***Challenges in estimating the cost of policy environments and sustainable finance***: There are inherit limitations in the ability to accurately estimate the costs of strengthening national enabling policy environments and fostering sustainable finance, as many of the costs are not easily quantifiable, tracked or reported. The GEF figures used in this report should be considered as indicative only.
- ***Distinguishing between certain costs***: There is some overlap between certain costs, such as establishing a new protected area, and establishing effective management on a new protected area, and these are not always clearly differentiated in literature reviews of reports on protected area costs.

3 Actions required to achieve Target 11

The CBD's Programme of Work on Protected Areas outlines 16 broad goals and 92 actions on protected areas, including the establishment of new protected areas, sectoral and landscape integration, transboundary cooperation, management planning, capacity, monitoring and assessments, among others.[1] Target 11 focuses on a limited number of these actions, described below.

3.1 Create new protected areas

Target 11 focuses on the creation of at least 17 percent of terrestrial and inland water, and 10 percent of coastal and marine areas. The targ*et al*so includes some terms that help to qualify the type and location of protected areas to be created. In this assessment, the creation of new protected areas includes four qualifiers embedded within Target 11, as described below.

- ***Areas of particular importance for biodiversity***: These areas occur at site- and landscape-scales, and include key biodiversity areas, important bird areas, and areas important to avoid extinctions (Butchart *et al*., 2012), among others.
- ***Areas of particular importance for ecosystem services***: These include areas important for ecosystems services considered critical at national and global levels, including areas important for water, carbon sequestration and fisheries production, among others (see Berghöfer and Dudley, 2010).
- ***Ecologically representative***: Although ecological representativeness can be measured at a variety of scales, including at an ecoregional, landscape and site scale (Poiani *et al*., 2000), this assessment focuses on the creation of a global ecologically representative network using ecoregions as a basic unit of analysis. In assessing their own protected area systems, national governments would likely use much finer-scale units, such as ecosystems, watersheds and species, to assess representativeness.
- ***Other effective area-based conservation measures***: Embedded within both the CBD Programme of Work on Protected Areas[2] and Target 11 is the notion that protected areas include not only formally designated, state-owned protected areas, but also private reserves, as well as indigenous and community conserved areas (ICCAs).

3.2 Create new connectivity corridors

Target 11 also specifies that protected areas should not be created in isolation, but should be connected to one another and be well integrated into the landscape and seascape. In this assessment, both sectoral and spatial integration are included under the action of creating new connectivity corridors, as described below.[3]

- ***Well-connected systems of protected areas:*** This refers to the creation of corridors between protected areas, to maintain key ecological functions and processes, such as migration, and to enable climate change adaptation.

[1] See http://www.cbd.int/protected/pow/learnmore/intro/ for the full set of PoWPA actions.

[2] See for example PoWPA Goal 2.1.2, emphasizing diverse governance types of protected areas, including indigenous and community conserved areas and private reserves.

[3] See see Ervin *et al*., 2010 for more information on protected area connectivity and integration.

- ***Integrated into the wider landscape and seascape***: Not only should a protected area network include conservation corridors to promote linkages, but the entire layout and design of protected areas and corridors should be compatible with key development and natural resource sectors.

3.3 Strengthen management effectiveness

Target 11 specifies that lands and waters should be "conserved through effectively and equitably managed…systems of protected areas." The issue of management effectiveness has been well researched over the past 20 years, and numerous tools exist to quantify and measure this concept. In this report, the following parameters are included in the concept of effective and equitable management:

- ***Effective management***: According to the IUCN framework for assessing management effectiveness, the basic elements include protected area context (e.g., threats), planning (e.g., protected area objectives), inputs (e.g., resources, staffing); processes (e.g., visitor management, site restoration); outputs (e.g., number of poachers caught) and outcomes (e.g., ecological integrity) (Hockings *et al*., 2009).
- ***Effective governance***: Some key principles of effective governance of protected areas include: a) legitimacy and voice; b) direction and vision; c) performance and responsiveness; d) accountability; e) transparency; f) avoidance of harm; g) fairness; and h) respect of human rights (Borrini-Feyerabend *et al*., 2012).
- ***Equitable sharing of costs and benefits***: A disproportionate number of poor people critically depend upon protected areas for their food and livelihoods, and the preponderance of biodiversity is located in countries least able to pay for conservation, yet the benefits of biodiversity protection accrue disproportionately to wealthy nations (Balmford and Witten, 2003).

3.4 Strengthen enabling policy environments and sustainable finance

Although Target 11 does not clearly specify that protected areas require an enabling policy environment and sustainable finance, it is implied by the phrase "integrated into the wider landscapes and seascapes." Furthermore, effective policy environments and financial sustainability are crucial components of the Programme of Work on Protected Areas. In this report, the following parameters are included:

- ***Enabling policy environment***: A policy environment is defined as the full suite of laws, policies, practices, incentives and attitudes that govern the system within which protected areas are based, and that collectively determine the extent to which overall protected area objective can be achieved. (CBD, 2012b)
- ***Sustainable finance***: A sustainably financed protected area system is one that is able to meet the existing and anticipated future costs of effectively managing the entire protected area system, usually through a range of financial instruments (Bovarnick *et al*., 2010).

3.5 Conduct key assessments

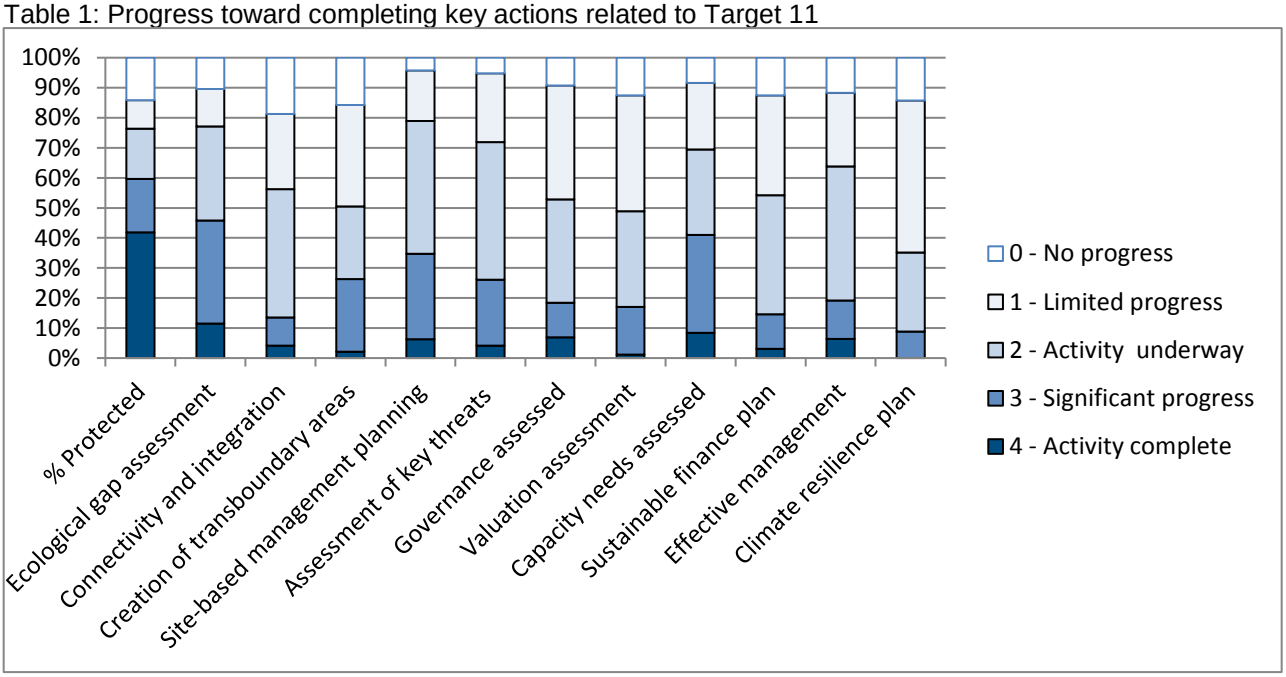
The CBD Programme of Work on Protected Areas identifies numerous assessments that must be completed in order to fully implement the program. Although Target 11 does not explicitly identify required assessments, the key actions included in this target imply that a limited number of key assessments must be undertaken, described below.

- ***Ecological gap assessment***: An ecological gap assessment identifies how well a protected area system represents the full suite of biodiversity within a given area. A gap assessment primarily focuses on representativeness (measured by species and ecosystems), and key biodiversity areas. These assessments increasingly include the degree of connectivity, areas of importance for ecosystem services, and the range of governance types of protected and other conserved areas to develop a robust protected area network. The results of the gap assessment how much of which types of habitats and ecosystems are required to create a representative protected area network.
- ***Management effectiveness and capacity needs assessment***: A management effectiveness assessment typically identifies key threats, major management weaknesses and policy constraints, including effective governance, at both site- and system-levels. Typically these assessments also identify specific capacity needs required to improve management effectiveness.
- ***Policy environment*****:** A policy environment assessment includes an analysis of protected area incentives, legal frameworks, laws and policies, and identifies specific recommendations for improving the overall policy environment.
- ***Sustainable finance assessment***: A sustainable finance assessment identifies the existing and anticipated future costs of a protected area system, identifies major gaps for basic and optimal funding scenarios, and identifies potential finance mechanisms.

3.6 National actions to achieve Target 11 – Summary table

Table 1, compiled from a series of meetings that CBD convened in 2011 and 2012 and from WDPA statistics, shows progress toward completing key actions required to achieve Target 11. Note that for the percent protected, the following parameters are used: 0-2% = no progress; 2-5% = limited progress; 5-10% = activity underway; 10-17% = significant progress, and ≥17% = complete.

Table 1: Progress toward completing key actions related to Target 11



4 Methods of Assessment and Data Used

The cost estimates included in this assessment utilized several different methods and data sets, described below. The same general approach and types of data sets were used consistently for each of the actions required to achieve Target 11; specific methods and data sets for each action are further elaborated in Section 4.

4.1 General method used

The general method for calculating the costs of achieving Target 11 was to first calculate the estimated area of land and water, in km^2, needed to achieve the 17% terrestrial and 10% marine goals. The second step was to estimate the average cost per km^2 for undertaking each action (e.g., create new protected areas, establish new corridors, etc.). The third step was simply to multiply these figures together to get an overall estimate of costs required to complete each action.

4.2 Data sets used

- ***Gaps in global and ecoregional protection:*** The main data set used for estimating gaps in existing protected area coverage was the World Database on Protected Areas, January 2011, which was also used by the MDG 2011 report[4]. This report translated these figures into km^2 needed to fill coverage gaps in order to achieve 17% terrestrial and 10% marine coverage, both globally and ecoregionally.
- ***Cost of creating new protected areas and improving management effectiveness***: To estimate the cost of creating new protected areas and improving management effectiveness on new and existing areas, this report used estimates by Bruner *et al*., (2004), James *et al*. (2001) and by Butchart *et al*. (2012) for terrestrial areas and by McCrae-Strub *et al*. (2011) for marine areas, as well as GEF Council documents to determine a range of potential costs for creating new protected areas and improving management effectiveness per km^2.[5]
- ***Cost of creating new corridors***: This assessment used case studies of comprehensive, well-connected networks[6] to estimate how much area would be required to create new corridors. The estimates from Bruner *et al*. (2004), Butchart *et al*. (2012) for terrestrial areas and by McCrae-Strub *et al*. (2011) for marine areas, were used to determine potential costs of creating new corridors on a km^2 basis.
- ***Conducting key assessments***: This assessment used data from 125 assessments across 46 countries in the UNDP/GEF Early Action Grant project[7] to determine average costs of assessments.

[4] http://unstats.un.org/unsd/mdg/Data.aspx.

[5] Note that the cost estimate for GEF Council data and Bruner *et al*. are exclusively from developing countries.

[6] Primarily from GEF national funding proposals and from Bennett and Molongoy, 2006.

[7] See www.protectedareas.org

5 Assessment of resources required to achieve Target 11

This section presents estimated costs required to achieve Target 11, structured by the four main actions required: creating new protected areas, creating new connectivity corridors, improving management effectiveness on new and existing protected areas, and undertaking key assessments.

5.1 Resources required to create new protected areas

This section outlines the factors needed to determine the cost of creating new protected areas to achieve both terrestrial and marine goals within Target 11.

- ***How much area is required to achieve the 17% terrestrial goal globally?*** According to the WDPA[8], approximately 12.85% of the Earth's terrestrial area is under some form of protection. This means that approximately 4.15% of the Earth's terrestrial surface,[9] or **5.5 million km^2**, of new protected areas would be required to achieve the 17% goal of Target 11.
- ***How much land is required to achieve protection of 17% of each terrestrial ecoregion?*** If the phrase "ecologically representative" is considered, however, a fuller account of representativeness must be factored into the amount of land required to achieve the goal. There are 823 terrestrial ecoregions, defined as large areas with characteristic combinations of habitats, species, soils and landforms (Olsen *et al*., 2001). Table 2 shows a summary of the 550 terrestrial ecoregions with protection levels of less than 17%. Protecting 17% of each of these terrestrial ecoregion would require **10.8 million km^2** of new protected areas, or 20.5% of the world's terrestrial area. This figure would also certainly cover the 4.7 million km^2 of important bird areas and key biodiversity areas that are currently unprotected (Butchart *et al*., 2012).

Table 2: Levels of ecoregional protection globally, and amount required to protect 17% of each terrestrial ecoregion

Percent of existing level of protection	Terrestrial ecoregions protected (total area in km^2)[10]	Number of terrestrial ecoregions	Area (in km^2) needed to protect 17% of each terrestrial ecoregion[11]
0 to<1	44,580	84	1,471,164
1 to <2	131,319	46	1,356,968
2 to <3	235,361	34	1,365,095
3 to <4	270,961	50	1,045,138
4 to <5	412,821	46	1,146,726
5 to <6	425,086	31	888,817
6 to <7	386,238	31	623,923

[8] Database available at http://mdgs.un.org/unsd/mdg/default.aspx

[9] The WDPA lists the world's terrestrial surface, not including Antarctica, as 132,223,591 km^2.

[10] Note that this table only shows ecoregions with protection levels of 17% or lower; there are 273 ecoregions with protection levels higher than 17%, totaling approximately 5.4 million km^2. Note also that this does not include level of threat, which would be a factor when prioritizing protection levels, and is embedded in the concept of biodiversity hotspots.

[11] This figure is the product of the total size of the ecoregions within the protection level, and the difference between 17% and the average level of protection.

7 to <8	633,526	30	802,467
8 to <9	534,299	27	534,299
9 to <10	521,020	30	411,331
10 to <11	819,878	29	507,543
11 to <12	852,736	32	407,830
12 to <13	174,449	11	62,801
13 to <14	450,346	18	116,756
14 to <15	276,650	22	47,698
15 to <16	304,338	14	29,452
16 to <17	296,011	15	8,970
TOTAL	6,769,628.25	550	10,826,985

- ***How much does it cost to establish a new terrestrial protected area?*** Determining the cost of establishing new terrestrial protected area involves many variables. Establishing a new protected area may require the purchase of land at full market value, or it may simply require a change in land use on government or community-owned land. This report used a literature review as the basis for determining the cost of establishing new terrestrial protected areas.
    - Bruner *et al.* (2004) reported that the cost of land acquisition, compensation payments, infrastructure and equipment, applied to an expansion of 3.5 million km^2, could cost as much as $US 9 billion per year for a decade, if all areas require either purchase or compensation equivalent to purchase value. Given the level of uncertainty in ascertaining compensation, a mid-point of $US 4.5 billion per year for the expansion of 3.5 million km^2 is considered in this report. From this figure, the cost of establishing new protected areas per km^2, adjusted to 2012 inflation, is $15,590/$km^2$.
    - James *et al*. (2001) used approximations of regional land costs of conservation areas at fair market values, and estimated that the cost of new protected areas would range from $17,064 to $22,133 per km^2. Adjusted for 2012 inflation rates produces a range of between $22,087 and $28,648 per km^2.
    - Given the uncertainties in global market prices for conservation land, the uncertainties regarding the degree to which land acquisition and/or compensation is required, and the extent to which existing indigenous and community conserved areas can contribute to protected area expansion at relatively low cost, the following ranges for establishing new terrestrial protected areas are considered in this report: a) a low scenario of **$8,000/$km^2$**; b) a medium scenario of **$16,000/$km^2$**; and c) a high scenario of **$24,000/$km^2$.**

- ***How much marine area is required to achieve the 10% marine goal globally?*** Based on figures from the WDPA (2011), Bertzky *et al*. (2012) and Spalding *et al*. (2007), Table 3 shows a summary of the area and percent of marine and coastal protection within different national jurisdictions. The language of Target 11 regarding how the 10% is calculated is vague (at least…10 percent of coastal and marine areas…are conserved). Therefore 3 different scenarios are shown in Table 3.

Table 3: Summary of the area and percent of existing protection of marine and coastal areas

	Total area (km^2)	Total km^2 protected	% protected	Total km^2 required to meet 10%
All coastal and marine area	361,132,000 km^2	5,778,112 km^2	1.6%	30,335,088 km^2
Area of global marine ecoregions within 200 nautical miles	137,562,301 km^2	5,337,893 km^2	3.88%	8,418,337 km^2
Marine and coastal area within 0-12 miles (territorial waters)	19,166,400 km^2	1,430,486 km^2	7.46%	486,154 km^2

- ***How much marine area is required to achieve protection of 10% of each marine ecoregion?*** There are 232 coastal marine ecoregions (Spalding *et al*. 2007). As with terrestrial ecoregions, the level of protection of each marine ecoregion is highly variable. Table 4 shows a summary of the 202 marine ecoregions with protection levels of less than 10%. Protecting 10% of each of these marine ecoregions would require **9.7 million km^2** of new marine protected areas.

Table 4: ***Levels of ecoregional protection globally, and amount required in order to protect 10% of each marine ecoregion within 200 nautical miles (EEZs)***

Percent of existing level of protection	Marine ecoregions protected (total area in km^2)	Number of marine ecoregions	Area (in km^2) needed to protect 10% of each marine ecoregion[12]
0 to<1	160,088.38	137	7,116,656.16
1 to <2	217,175.28	26	1,312,228.10
2 to <3	188,916.69	14	646,997.86
3 to <4	84,525.34	8	353,947.36
4 to <5	82,850.54	4	98,839.24
5 to <6	85,204.98	4	76,781.68
6 to <7	35,825.25	2	19,205.86
7 to <8	152,386.61	4	52,709.77
9 to <10	236,629.57	3	14,303.17
TOTAL	1,243,602.64	202	9,691,669.19

- ***How much does it cost to establish a new marine protected area?*** This report used a literature review to determine the cost of establishing a new marine protected area:
    - McCrea-Strub *et al.* (2011) studied 13 MPAs from Asia, Africa, Latin America and North America and described the various components and establishment costs of MPAs. The estimated range of costs per km^2 for establishing new MPAs are shown in Table 5.[13]

[12] The same methodology was used as for Table 2.

[13] Estimates for the smallest MPAs (.5 km^2) for \$63,752/km^2 and the largest MPAs (1,000,000 km^2) for \$60/km^2 are considered anomalies and not included in this report.

Table 5: Range of costs associated with establishing new marine protected areas

MPA size	Cost of MPA establishment /km^2
5	21,110
50	6,990
500	2,315
5,000	766
50,000	254
500,000	84

- Given the sharp differences in costs per km^2, the following ranges are considered in this report: a) a low scenario of **$500/km^2**; b) a medium scenario of **$1000/km^2**; and c) a high scenario of **$2000/km^2** for establishing new marine protected areas. These scenarios would depend in part on whether the bulk of new marine protected areas are primarily large MPAs (e.g., such as the recently created Phoenix Islands Protected Area of 410,500 km^2 , the British Indian Ocean Territory no take marine area of 500,000 km^2, and the recent establishment of a 1.5 million km^2 MPA in the Cook Islands). The relatively low figure assigned to the high cost scenario assumes that the higher cost of establishing smaller MPAs would be offset by the cost of establishing numerous larger MPAs.

Table 6 shows the variation in costs of creating new protected areas to achieve Target 11 both for terrestrial and marine, and using both global and ecoregional goals. Although there is a wide range of costs for both terrestrial and marine, a reasonable figure for creating new terrestrial protected areas could be considered as **$130 billion for terrestrial** (average of the two medium scenarios) and **$5 billion for marine** (an average of the lowest and highest medium scenarios.

Table 6: Estimated range of costs of establishing new terrestrial and marine protected areas

Protection goal	Low scenario ($8,000/km^2 for terrestrial, $500/km^2 for marine)	Medium scenario ($16,000/km^2 for terrestrial, $1,000/km^2 for marine)	High scenario ($24,000/km^2 for terrestrial, $2,000/km^2 for marine)
Cost of achieving 17% of Earth's terrestrial area (adding 5.5 million km^2 in new protected areas)	$44,000 million (or $5,500 million annually for 8 years)	$88,000 million (or $11,00 million annually for 8 years)	$132,000 million (or $16,500 million annually for 8 years)
Cost of achieving 17% of *each* of the Earth's 823 ecoregions (adding 10.8 million km^2 in new terrestrial protected areas)	$86,400 million (or $10,800 million annually for 8 years)	$172,800 million (or $21,600 million annually for 8 years)	$259,200 million (or $32,400 million annually for 8 years)
Cost of achieving 10% of Earth's marine and coastal areas within 12	$243 million (or $30 million	$486 million (or 61 million annually for	$729 million (or $91 million

nautical miles (adding 486,154 km^2 in new marine protected areas)[14]	annually for 8 years)	8 years)	annually for 8 years)
Cost of achieving 10% of Earth's marine and coastal area within 200 nautical miles (adding 8.4 million km^2 in new marine protected areas)	$4,200 million (or $525 million annually for 8 years)	$8,400 million (or $1,050 million annually for 8 years)	$16,800 million (or $2,100 million annually for 8 years)
Cost of achieving 10% of *each* of the Earth's 223 marine ecoregions within 200 nautical miles (adding 9.7million km^2 in new marine protected areas)	$4,850 million (or $606 million annually for 8 years)	$9,700 million (or $1,212 million annually for 8 years)	$19,400 million (or $2,425 million annually for 8 years)

Cost of establishing new protected areas – three key issues

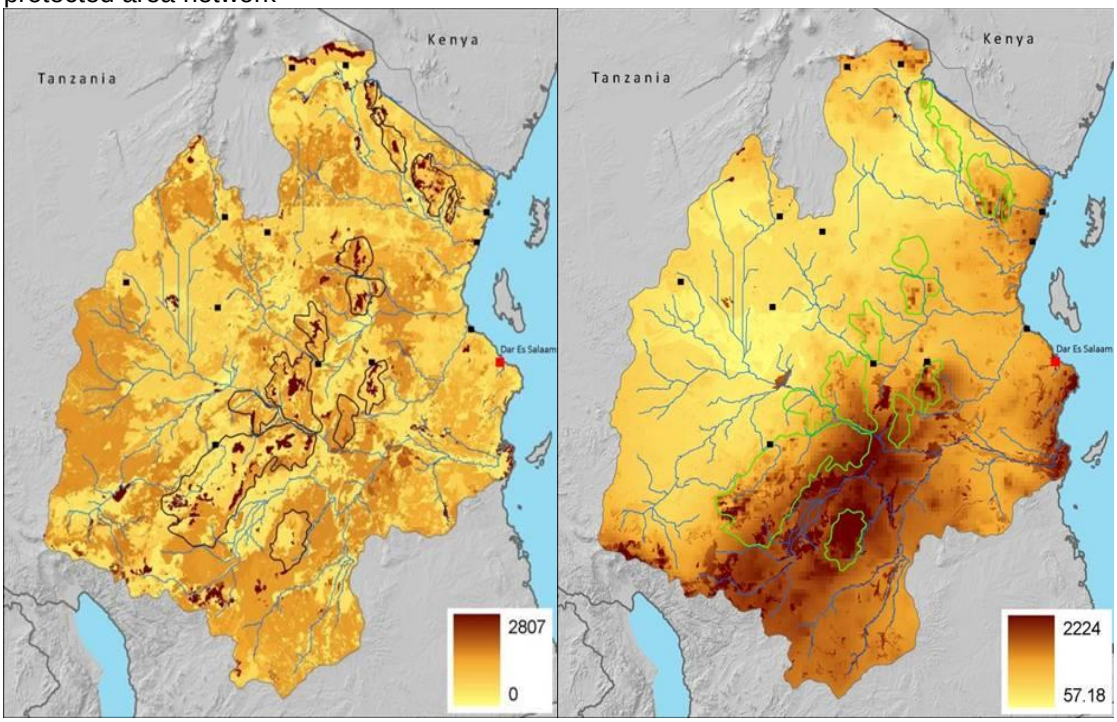
- ***Protection of key biodiversity areas, important bird areas and zero-extinction areas***: As noted earlier, national gap assessments will focus less on protecting ecoregions, and more on protecting key biodiversity areas, such as important bird areas and 'zero-extinction' areas. Butchart *et al*., (2012) assessed all of the existing key biodiversity areas globally (9,825 sites covering 9.1 million km^2, and found that half (4,514 sites, covering 4.7 million km^2) are currently unprotected. It is reasonable to assume that if governments can target these key biodiversity areas for filling protection gaps, they can protected key biodiversity areas within the 17% goal of protection.

- ***Key ecosystem services***: One of the qualifying terms in protected area coverage within Target 11 is protecting areas important for "key ecosystem services." While protected areas convey enormous societal benefits, the most frequently cited key ecosystem services include water storage, filtration and recharge; fisheries production; carbon sequestration; disaster prevention such as flood control and storm surge protection; and climate adaptation (Berghöfer and Dudley, 2010; Stolton and Dudley, 2010).

  A thorough review of the extent to which areas important for key ecosystem services are protected, and an accurate estimation of protection gaps, is beyond the scope of this report. The extent to which important sites for ecosystem services are protected has not been globally assessed, primarily due to a lack of adequate spatial datasets (Bertzky *et al*., 2012). However, preliminary research suggests that conserving critical sites for biodiversity, especially sites of key ecosystem services, provides disproportionate benefits to society (Larsen *et al*., 2012). An indicative example from Tanzania (Figure 1), for example, shows an overlay of carbon-related and water-related ecosystem services with Tanzania's protected area network (Burgess *et al*., 2009). These maps show that a modest increase in Tanzania's existing protected area network would capture a high percentage of the areas most important for carbon sequestration and water storage. For the purposes of this report, it is assumed that Target 14 will account for areas of key ecosystem services, and that these areas will be accounted for mostly through increases in new protected areas and new connectivity corridors.

[14] This report does not factor in the scenario of protecting 10% of the world's entire oceans, but instead focuses on 3 possible scenarios: a) protection of 10% of territorial waters (within 12 nautical miles); b) protection of 10% of exclusive economic zones (areas within 200 nautical miles); and c) protection of 10% of each of the Earth's marine ecoregions within 200 nautical miles.

Figure 1: An overlay of carbon-related and water-related ecosystem services with Tanzania's protected area network[15]



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- ***Indigenous and community conserved areas***: Indigenous peoples' territories and community conserved areas (ICCAs) help conserve critical ecosystems and threatened species, maintain essential ecosystem functions, and provide corridors and linkages for animal and gene movement between formally designated protected areas. Many ICCAS meet the definition of a protected area, and they fall under the term "other effective area-based conservation measures" of Target 11. By 2010, the WDPA included some 700 ICCAs, covering over 1.1 million km^2. Some studies indicate that this represents only a small fraction of the total area of these sites. For example, it has been estimated that at least 3.7 million square kilometres of the total forest area in Latin America, Africa, East and South Asia fall under community conservation, suggesting that in some parts of the world, ICCAs cover as much forest area as formally designated and state-owned or managed protected areas. It is likely that countries with a high number of unrecognized ICCAs may find that recognizing these areas, and including them within the protected area system estate, would help achieve national coverage goals while significantly reducing the cost of creating new state-owned protected areas.

- ***Likely distribution of protection gains:*** As noted earlier, the cost estimates are largely skewed toward developing countries. However, it is in countries with a GDP of less than $18,000 that the largest gains will likely occur. Table 7 shows that the 25 largest countries with less than 7 percent of their territory in terrestrial protection have an average GDP of less than $6,000, and the 25 largest countries falling within the top 21 biodiversity hotspots have an average GDP of less than $8,500.

[15] Source: Burgess *et al*., 2009.

Table 7: Gross Domestic Product in countries with low levels of protection and within biodiversity hotspots

25 largest countries with <7% in protected areas	Size of country in km^2	% in terrestrial protected area	GDP [16] for the 25 largest countries with <7% protection[17]	25 largest countries falling within top 21 global biodiversity hotspots	Size of country in km^2	GDP for the 25 largest countries falling within top 21 global biodiversity hotspots[18]
Average GDP of top 10 countries, for comparison[19]			$71,648	Average GDP of top 10 countries, for comparison		$71,648
India	3,166,414	5.03	$3,650	China	9,706,961	$8,442
Argentina	2,780,400	5.47	$17,674	Brazil	8,514,877	$11,719
Kazakhstan	2,724,900	2.52	$13,189	India	3,166,414	$3,650
Sudan	1,861,484	4.22	$2,141	Argentina	2,780,400	$17,674
Algeria	2,381,741	6.31	$8,715	Algeria	2,381,741	$8,715
Libya	1,759,540	0.11	$16,855	Mexico	1,964,375	$15,340
Mali	1,240,192	2.43	$1,099	Indonesia	1,904,569	$4,668
South Africa	1,221,037	6.90	$11,035	Libya	1,759,540	$16,855
Mauritania	1,025,520	0.54	$2,571	Iran	1,648,195	$11,470
Egypt	1,002,000	5.89	$6,324	Peru	1,285,216	$10,318
Turkey	783,562	1.89	$16,885	South Africa	1,221,037	$11,035
Myanmar	676,578	6.33	$1,325	Colombia	1,141,748	$10,103
Afghanistan	652,230	0.37	$1,038	Bolivia	1,098,581	$5,130
Somalia	637,657	0.58	$600	Egypt	1,002,000	$6,324
Ukraine	603,500	3.51	$7,251	Tanzania	945,087	$1,521
Madagascar	587,041	3.06	$972	Venezuela	912,050	$12,836
Turkmenistan	488,100	2.99	$9,184	Namibia	824,268	$6,826
PNG	462,840	3.07	$2,695	Mozambique	801,590	$982
Yemen	527,968	0.52	$2,349	Turkey	783,562	$16,885
Iraq	438,317	0.05	$3,890	Chile	756,102	$17,125
Uzbekistan	447,400	2.26	$3,310	Myanmar	676,578	$1,325
Morocco	446,550	1.55	$4,986	Somalia	637,657	$600
Paraguay	406,752	5.44	$5,419	Madagascar	587,041	$972
Vietnam	331,212	6.24	$3,435	Kenya	580,367	$1,718
Guinea	245,857	6.78	$1,128	Thailand	513,120	$8,703
AVERAGE			**$5,909**	AVERAGE		**$8,437**

5.2 Costs and resources required to create new connectivity corridors

This section outlines the two factors required to determine the cost of creating new corridors to achieve both terrestrial and marine goals of connectivity within Target 11.

[16] Average GDP Power Purchase Parity per Capita, as indicated at http://en.wikipedia.org/wiki/List_of_countries_by_GDP_(PPP)_per_capita

[17] This analysis is only for terrestrial protection

[18] This list of countries comes from a list of 25 global hotspots, at http://en.wikipedia.org/wiki/Biodiversity_hotspot, but excludes 4 hotspots in Australia, New Zealand and the US.

[19] Qatar, Luxembourg, Macau, Singapore, Norway, Kuwait, Brunei, Hong Kong, United Sates, United Arab Emirates, Switzerland, Netherlands

- ***How much additional land or water is required to ensure connectivity?*** There is very little agreement globally about how much connectivity is required to sustain species populations, maintain ecological processes, and enable climate change adaptation. The optimal amount of connectivity within a country depends highly on the context, including the existing degree of habitat conversion, fragmentation and degradation; opportunities for restoration; the extent of large-ranging species; and the existing coverage and isolation of protected areas and ICCAs. Countries with a high degree of existing protection, a low degree of protected area isolation and a relatively intact natural land cover will likely require relatively low levels of investment in new connectivity corridors.

  Furthermore, there is very little data on existing levels of connectivity. Figure 2 shows a coarse-resolution map of current levels of connectivity, indicating that there will need to be a relatively large investment in connectivity in many areas of the world.

Figure 2: Protected area connectivity[20]

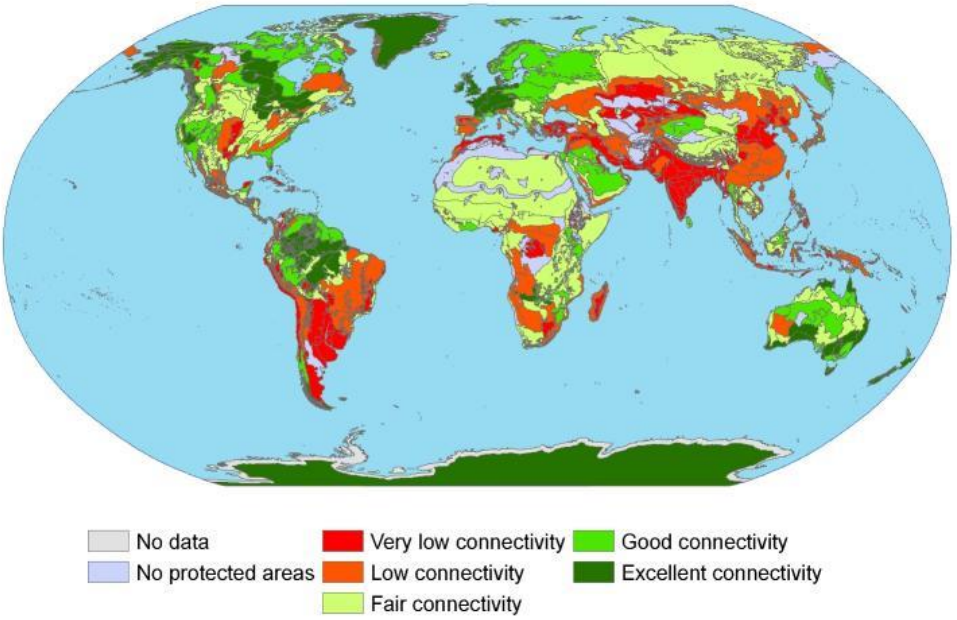


Table 8 shows indicative ranges of levels of the extent of protected areas and connectivity corridors required to create a well-connected network, and Box 1 provides a case study of the extent of corridors required in Lithuania to achieve national connectivity goals.

Table 8: Indicative examples of levels of connectivity in well-connected protected area networks

Country	***Total area in ha***	***Total area protected***	***% of area protected***	***Total area in connectivity corridor***	***% of area in connectivity corridor***
Lithuania[21]	65,300 km^2	9821 km^2	15%	5519 km^2	8.5%
Latvia[22]	64,589 km^2	11,585 km^2	18%	16,188 km^2	25%

[20] Source: Woodley *et al*. 2012 based on WDPA 2012 and terrestrial ecoregions from Olson *et al*. 2001, as reported in Bertzky *et al.*, 2012.

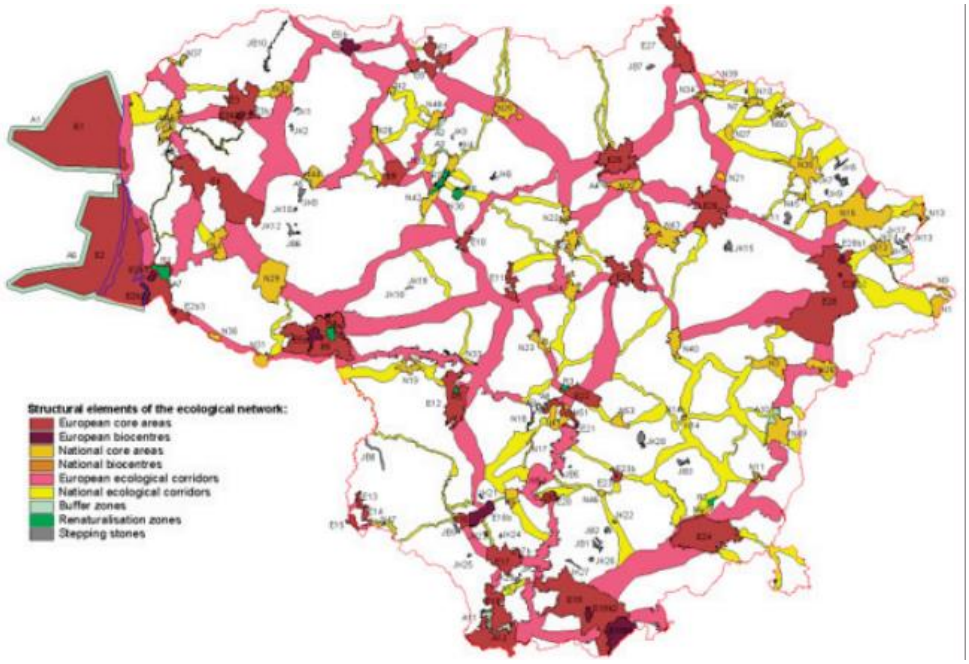
[21] IUCN, 2002

Estonia[23]	45,230 km^2	9,284 km^2	20.4%	13,569 km^2	30%
Bhutan[24]	47,000 km^2	11,230 km^2	28%	4,230 km^2	9%
The Netherlands[25]	41,530 km^2	4259 km^2	10.3%	3041 km^2	7.2

Because it is difficult to determine a percentage for an optimally connected network, because there is no global baseline in connectivity around the world, and because many connectivity goals can be accomplished with the strategic placement of new protected areas, including transboundary areas and ICCAs, this report provides three possible scenarios for achieving the connectivity goal of Target 11: a global investment of an additional **2%**, **5%** and **10%**, above and beyond the protected area goals of 17% for terrestrial and 10% for marine.

Box 1: Case study of designing an optimal well-connected network in Lithuania (source: IUCN, 2002)

The planned ecological network of Lithuania encompasses nearly a quarter of the total land area of the country. The network is comprised of core areas of regional and national significance, corridors of regional and national significance, buffer zones, restoration zones and stepping stones.



[22] IUCN, 2002.

[23] IUCN, 2002

[24] GEF, 2008

[25] Bennett and Molongoy, 2006.

- ***How much does it cost to establish new corridors?*** This report uses the ranges for low, medium and high scenarios for establishing new protected areas for both terrestrial and marine as indicated in section 4.1, and applies these figures to the area of land and water needed to reach 2%, 5% and 10% goals of connectivity.

  Table 9 shows the amount of land and water that would be required to achieve the 2%, 5% and 10% scenarios, and what the costs of doing so would be, using the different methods described above. Although there is a large range in costs, an estimate of **$106 billion** for terrestrial (medium cost scenario with 5% connectivity) and **$4 billion** for marine (average of two medium scenarios) can be considered as reasonable.

Box 2: Cost of establishing corridors in Bhutan

Bhutan provides an excellent case study of a country that has developed a comprehensive set of connectivity corridors (GEF, 2008). Protected areas in Bhutan comprise 11,230 km^2, or 28% of the country. The connectivity corridors comprise an estimated additional 9% of land area. The cost for establishing these corridors (which included planning, monitoring, threat reduction and sustainable livelihood development) was approximately US $1.85 million, shared between the Government of Bhutan (23%), WWF (35%) and the Global Environment Facility (42%). Note that these costs were considered to be the incremental costs of establishing the corridors, and they did not include the cost of acquiring land.

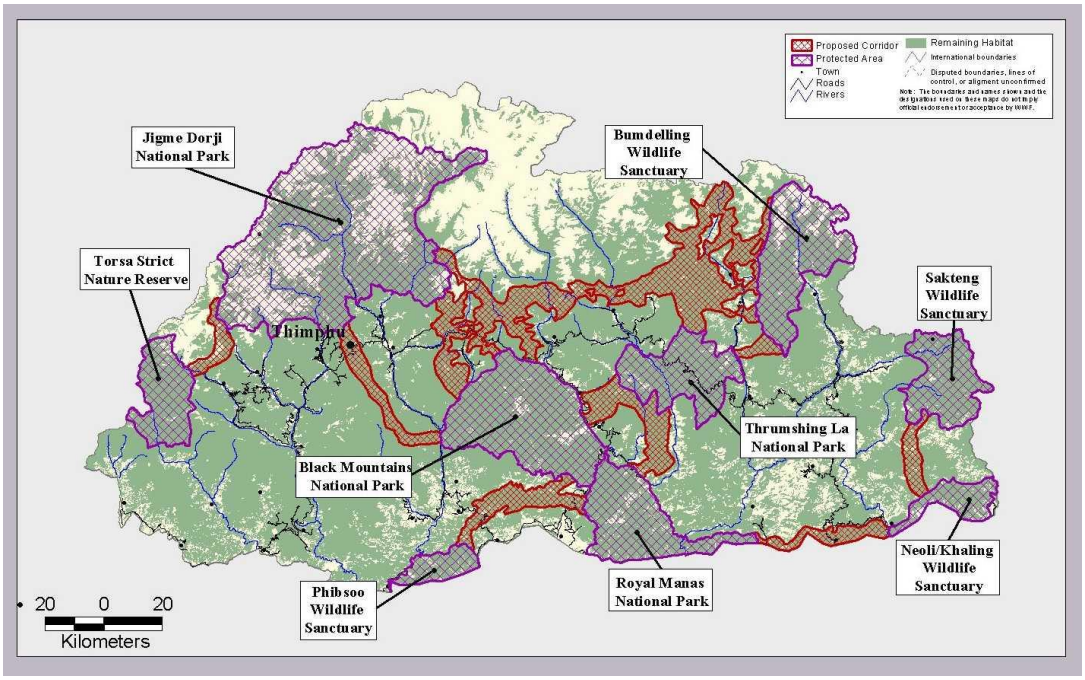


Table 9: Amount of land and marine area required to meet 3 scenarios in connectivity[26]

	2% new areas in connectivity corridors required	5% new areas in connectivity corridors required	10% new areas in connectivity corridors required
Terrestrial	2,644,472 km^2 would be required in new connectivity areas[27]	6,611,179 km^2 would be required in new connectivity areas	13,222,359 km^2 would be required in new connectivity areas
Low scenario ($8,000/km^2)	$21,156 million (or $2,645 million annually for 8 years)	$52,890 million (or $6,612 million annually for 8 years)	$105,779 million (or $13,222 million annually for 8 years)
Medium scenario ($16,000/km^2)	$42,312 million (or $5,289 million annually for 8 years)	$105,779 million (or $13,222 million annually for 8 years)	$211,558 million (or $26,445 million annually for 8 years)
High scenario ($24,000/km^2)	$63,467 million (or $7,933 million annually for 8 years)	$158,669 million (or $19,834million annually for 8 years)	$317,337 million (or $39,667 million annually for 8 years)
Marine	Between 383,328 km^2 (for 0-12 nautical miles), and 2,751,246km^2 (for 0-200 nautical miles) would be required for connectivity	Between 958,320 km^2 (for 0-12 nautical miles), and 6,878,115 km^2 (for 0-200 nautical miles) would be required for connectivity	Between 1,916,640 km^2 (for 0-12 nautical miles), and 13,756,230 km^2 (for 0-200 nautical miles) would be required for connectivity
Low scenario ($500/km^2)	Between $192 million and $1,376 million (or between $24 million and $172 million annually for 8 years)	Between $479 million and $3,439 million (or between $60 million and $430 million annually for 8 years)	Between $958 million and $6,878 million (or between $120 million and $860 million annually for 8 years)
Medium scenario ($1,000/km^2)	Between $384 million and $2,751 million (or between $48 million and $343 million annually for 8 years)	Between $958 million and $6,878 million (or between $120 million and $860 million annually for 8 years)	Between $1,916 million and $13,756 million (or between $240 million and $1,720 million annually for 8 years)
High scenario ($2,000/km^2)	Between $768 million and $5,502 million (or between $96 million and $687 million annually for 8 years)	Between $1,916 million and $13,756 million (or between $240 million and $1,720 million annually for 8 years)	Between $3,832 million and $27,512 million (or between $480 million and $3,439 million annually for 8 years)

[26] Both the 0-12 nautical mile range and the 0-200 nautical mile range are used in the marine calculations.

[27] The WCMC World Database on Protected Areas lists a total of 132,223,590 km2 of terrestrial area – the total land surface of the Earth, minus the surface area of Antarctica, and lists a total of 19,166,400 km^2 for 0-12 nautical miles, and 137,562,301 km^2 marine and coastal area within 200 nautical miles of national shorelines.

Key issues in estimating the cost of new connectivity corridors

- **Private lands and connectivity corridors**: A key issue in establishing connectivity corridors is the issue of private lands. In many countries, there will be only limited opportunities to establish new connectivity corridors on publicly owned and managed lands. In many cases, the establishment of new corridors will require an array of policy mechanisms, many of which will likely focus on privately owned lands and ICCAs. As with the establishment of new protected areas through the legal recognition of ICCAs, the establishment of connectivity corridors on private lands will likely require significantly less funding, but will also require a complex suite of management, education, policy and financial incentives and mechanisms. For example, in the Agulhas Plain of South Africa, a conservation corridor covers 37% of the territory, but approximately 40% of the area of this corridor is conserved through private landowners, mostly in the form of stewardship agreements and conservation easements (Cadman *et al*., 2010).

- **Is it reasonable to assume that countries would accept national targets of protection higher than 17% to achieve connectivity and other goals?** A major question may be whether countries would be willing to accept goals of higher than 17% of protection. According to the WDPA, 65 of the world's 228 nations and territories have already protected more than 17% of their terrestrial area. Furthermore, a recent review of the national protection goals set by more than 70 countries (CBD, 2012e), found that an additional 32 countries have set national protection goals higher than 17% -- in some cases much higher – 12 countries (e.g.,Namibia, Botswana, Colombia, Algeria) have set national targets of more than 25% protection.[28]

5.3 Costs and resources required to strengthen management effectiveness

This section outlines the factors required to determine the cost of strengthening management effectiveness in new and existing terrestrial and marine protected areas, in order to achieve Target 11.

- ***What is the current level of effective management?*** A recent study of protected area management effectiveness from nearly 7,000 protected areas worldwide[29] by Leverington *et al*. (2010) found that 13% of protected areas were clearly inadequate, 27% had basic management with major deficiencies, 35% had basic management, and 25% had sound management in place. Although the study included a wide range of marine and terrestrial protected areas, management effectiveness differences between the two types were not included. Extrapolating from these figures to the total area of existing protected areas, the current extent of estimated management effectiveness is shown in Table 10.

Table 10: Estimates of the area of existing protected areas under different levels of management effectiveness

	Global %	Extrapolated area in km^2
Clearly inadequate	13	2,394,243

[28] See www.cbd.int/protected/implementation/actionplans for national protection targets set by each country.

[29] Although this represents a small fraction of the number of the world's 120,000+ protected areas, it represents a huge percentage of the area of the world's protected areas – as much as 60% or more, since most of the protected areas included in the assessment were typically the country's largest protected areas, such as national parks.

Basic management but with major deficiencies	27	4,972,659
Basic management in place	35	6,446,039
Optimal management in place	25	4,604,314

- ***How much does it cost to effectively manage protected areas?*** This assessment used several different figures from a literature review, and from GEF Council documents, to estimate a low, medium and high scenario for the cost of effectively managing terrestrial and marine protected areas (see Table 8).

  - Based on several previous studies on financial needs of terrestrial protected area systems in developing countries, and applying the model developed by Balmford *et al*. (2003) and approximating the data on protected size, annual GDP per km^2, human development index and purchasing power parity, Bruner *et al*. reported that annual management costs of existing protected areas in developing countries amounts to approximately 1.8 billion per year, or, adjusted to 2012 inflation, $**208/km^2** annually.

    Bruner *et al.* (2004) also reported that the average start up management costs per km^2 for new protected areas is likely to be greater than that for existing protected areas, and the annual management costs for the expanded protected areas might rise by an estimated $1.8 billion per year, because high priority areas for expansion are largely in more fragmented and developed regions. The effective management of new protected areas per km^2, adjusted to 2012 inflation, amounts to $**301/km^2** annually.

  - Similarly, Butchart *et al*.,(2012) estimate that median annual costs of effectively managing protected important bird areas range from **$272km^2** in low income countries to **$607/km^2** in upper middle income countries. However, the authors also point out that low ranges of management effectiveness costs can be as little as **$14/km^2** in low income countries and **$32/km^2** in lower middle countries, places where much of the new protected area estate will likely occur in the next 8 years if the Aichi Targets are to be met.

  - McCrae-Strub *et al*. (2011) studied 13 MPAs from Asia, Africa, Latin America and North America and the various costs of managing marine protected areas, shown in Table 11:[30]

    Table 11: Estimated costs of effectively managing new marine protected areas

MPA size (km^2)	Cost of effective management of marine protected areas/km^2
5	$47,623
50	$7,723
500	$1,253
5,000	$203
50,000	$33
500,000	$5

[30] Estimates for the smallest MPAs (.5 km^2) for $63,752/km^2 and the largest MPAs (1,000,000 km^2) for $60/km^2 are considered anomalies and not included in this report.

- According to GEF-4 documents[31], US $450 million was apportioned to support 80 million hectares of protected areas, for an average of $500/km^2 over a four-year period. According to GEF-5 documents[32], an investment of $700 million was apportioned to improve the management effectiveness of protected areas covering an estimated 170 million hectares, for an average of US $410/km^2 over a four-year period. Given these two estimates, this report uses an average of $455/km^2 over a four-year period, or $113.7/km^2 annually. Adjusted to 2012 inflation rates, this would mean an average cost of **$119/km^2** to improve management effectiveness. Note that this figure applies to, does not differentiate between, terrestrial and marine protected areas, and that these figures do not include co-financing costs, so should be considered at the lower end of the spectrum.
- A study of 20 Latin American protected areas (Bovarnick et al., 2010) found that $404.8 million was allocated across 5 million km^2, but basic management costs were $750 million, and optimal management costs were $1.2 billion, giving a range of between $**80**/km^2, for sub-optimal management, $**150**/km^2 for basic management, and $**240**/km^2 for optimal management.
- Given the range of variation in the costs of effectively managing new and existing protected areas, this report considers the following range for the cost of effectively managing new and existing terrestrial protected areas: a) a low scenario of **$50/km^2**; b) a medium scenario of **$150/km^2**, and c) a high scenario of **$250/km^2** for both terrestrial and marine protected areas.[33] Although Table 12 provides a wide range of costs, an estimate of $5.1 billion annually, or 23 billion from 2013 to 2020, for effectively managing new and existing protected areas can be considered as reasonable.

Table 12: Cost of effectively managing new and existing protected areas[34]

	Low scenario ($50/km^2)	**Medium scenario** ($150/km^2)	**High scenario** ($250/km^2)
Cost of maintaining and improving existing protected areas			
Cost of maintaining 11 million km^2 of existing protected areas in at least basic management levels and bringing 7.4 million km^2 of existing protected areas into basic levels of management[35]	$920 million annually by 2020, (or $6,078 million from 2013 to 2020)	$2,763 annually (or $18,233 million from 2013 to 2020)	$4,604 annually (or $30,388 million from 2013 to 2020)

[31] GEF/C.29/3,Table 3 available at: http://www.thegef.org/gef/sites/thegef.org/files/documents/C.29.3%20Summary%20of%20Negotiations.pdf

[32] GEF council document document GEF/C.37/3, May 17, 2010, para 49, available at: http://www.thegef.org/gef/sites/thegef.org/files/documents/C.37.3%20Summary%20of%20Negotiations%20of%20the%20Fifth%20Replenishment%20of%20the%20GEF.pdf and.

[33] There is an inherent challenge in estimating the differences between the initial cost of bringing a protected area into effective management, and the ongoing maintenance cost once improved. For the purposes of this report, these costs are not differentiated.

[34] These figures are annual. However, it is assumed that progress in effective management on existing areas will be incremental, as will the creation, and therefore the management effectiveness, on new protected areas. Therefore, the total costs in Table 12 include the total costs shown here, with each successive year between 2013 and 2020 adding an additional 12.5% of the total cost of effective management.

[35] This report assumes that 12.5% of existing protected areas with deficient management will be brought into effective management each year, from 2013 to 2020.

Cost of effective management on new protected areas with global and ecoregional goals			
Cost of effectively managing an additional ***new*** 6,800,000 km^2 of terrestrial and between 486,000 and 8,400,000 km2 of ***new*** marine protected areas (17% terrestrial and 10% marine ***global*** goal for 0-12 nautical miles and 0-200 nautical miles)[36]	Between $364 million and $760 million annually by 2020 (Total cost for 2013-2020 = between $1,639 million and $3,420 million)	Between $1,093 million and $2,280 million annually by 2020 (Total cost for 2013-2020 = between $4,918 million and $10,260 million)	Between $1,822 million and $3,800 million annually by 2020 (Total cost for 2013-2020 = between $8,197 million and $17,100 million)
Cost of effectively managing 10.8 million km^2 of ***new*** terrestrial and 9.7 million km^2 of ***new*** marine protected areas (17% and 10 ***ecoregional*** goals)	$1,025 million annually (Total cost for 2013-2020 = $4,6012 million)	$3,075 million annually (Total cost for 2013-2020 = $13,837 million)	$5,125 million annually (Total cost for 2013-2020 = $23,062 million)

Key issues in management effectiveness

- **Restoration – a key issue in management effectiveness**: An important component of effective management is restoration, as a significant percentage of protected areas around the world have degraded habitats and ecosystems. Stolton and Dudley (1999) found that nearly a quarter of forest protected areas had some level of degradation. The costs of restoration, including on protected areas, is likely to be highly variable – a recent CBD report (CBD, 2012e) estimated that the cost of restoration ranges from $22,600/ha to $542,000/ha. The costs of restoration are assumed to be included under Target 14, and are not factored into this assessment.

5.4 Costs and resources required to improve sustainable finance and enabling policy environments

Two additional aspects of effective management are the establishment of sustainable finance policy mechanisms, and the creation of an enabling policy environment, including a favorable legal framework. Although these topics are covered in the assessment of costs for Targets 2 and 3, and Target 20 respectively, they are included here to show indicative levels of funding that might be required to achieve Target 11.

- ***What is the status of sustainable finance and enabling policy environment globally?*** Based on a 2009 review of 110 countries, the CBD found that approximately 85% of countries had not established an enabling policy or legal environment, and a similar number had not established sustainable finance mechanisms. From these figures, this report assumes that sustainable finance mechanisms and enabling policy environments will need to be established in approximately 160 countries. However, not all countries have reported on progress, and fewer than 160 countries may be required to complete these actions. For the purposes of this report, a low scenario is considered

[36] This report assumes that new protected areas will be increased incrementally over 8 years, thus the cost of management effectiveness on new lands is also increased incrementally.

to be **80** countries, a medium scenario is considered to be **120** countries, and a high scenario is considered to be **160** countries.

- ***How much does it cost to establish sustainable finance mechanisms and enabling policy environments?***

    - ***GEF funding proposals***: The method for estimating the cost of sustainable finance and enabling policy was to review GEF funding proposals over the past 12 years[37]. An average cost of strengthening the enabling policy environment and fostering sustainable finance was calculated by identifying the average cost estimated in each funding proposal, and then adjust for 2012 inflation rate. See Table 9 for details. Costs for improving sustainable finance ranged from $1.19 million to $60.45 million, with an average of $13.33 million. Costs for improving the enabling policy and legal environment ranged from $.73 million to $10.72 million, with an average of $3.45 million. Based on these data, the following ranges are considered in this report: for sustainable finance, a) a low scenario of $**5** million/country; b) a medium scenario of $**10** million /country; and c) a high scenario of $**15** million/country; and for policy and legal environment, a) a low scenario of $**1** million/country; b) a medium scenario of $**2** million/country; and c) a high scenario of $**3** million/country.

Table 13: Representative sample of the range of costs required to strengthen finance and policies[38]

Country	GEF ID Number	GEF grant (in $ millions)	Co-Finance (in $ millions)	Total (in $ millions)	Year	Adjusted for 2012 (in $ millions)
Sustainable finance						
Chile	2772	3.8	14.66	18.46	2008	19.64
Costa Rica	2773	.81	1.12	1.93	2008	2.05
Egypt	3209	2.79	10.69	13.48	2008	14.34
Belize	3861	.59	.51	1.1	2009	1.17
Georgia	3557	.69	4.83	5.52	2007	6.1
Serbia	3946	.95	2.97	3.92	2009	4.19
Jamaica	3764	2.77	7.49	10.26	2010	10.78
Mozambique	3753	4.9	14.9	19.8	2010	20.8
Bolivia	620	15.3	31.4	46.7	2001	60.45
Armenia	3945	1	4.54	5.54	2009	5.92
Bahamas	3729	.5	6.1	1.11	2009	1.19
Enabling policy environment and legal framework[39]						
Egypt	3209	.98	3.11	4.09	2008	4.35
Chile	2772	1.55	1.68	3.23	2008	3.44
Costa Rica	3956	.23	4.85	5.08	2011	5.17
Nicaragua	2702	.63	1.54	2.17	2008	2.31
Botswana	3419	.36	1.9	2.26	2007	2.5

[37] All GEF proposals are available at www.thegef.org.

[38] Note that reliance upon GEF funding proposals has inherent limitations. Countries may not report the full cost of co-financing required to complete the action, and the funds may not cover all actions required. However, for the purposes of this report, these figures provide a range of minimum costs required.

[39] In some cases, specific components of a project were used, rather than the full project amount, since only a portion of the project focused on the enabling policy environment and legal framework.

Belize	3861	.3	.38	0.68	2009	.73
Montenegro	3688	.28	.87	1.15	2009	1.23
Bahamas	3729	1.4	.46	1.86	2009	1.99
Cape Verde	3752	1.9	8.3	10.2	2010	10.72
Equatorial Guinea	3757	1.5	2.6	4.1	2010	4.31
Djibouti	3713	.54	.55	1.09	2009	1.16

Table 14 shows the range of costs required to improve policy environments and sustainable finance bases, based on the low, medium and high scenarios, and the estimated numbers of countries needed to complete these actions. Note that there are very few studies on the efficiency of investments in policy and sustainable finance, and this is likely to be a key aspect of the costing study of Target 20.

Table 14: Range of costs required to improve enabling policy environment and sustainable finance basis[40]

	Low scenario ($6 million for the lowest ranges for both actions)	Medium scenario ($12 million for the medium ranges for both actions)	High scenario ($18 million for the highest ranges for both actions)
80 countries	$480 million	$960 million	$1,440 million
120 countries	$720 million	$1,440 million	$2,160 million
160 countries	$960 million	$1,920 million	$2,880 million

5.5 Costs and resources required to conduct key assessments

This section outlines factors required to determine the cost of conducting the key assessments that are needed in order to achieve Target 11.

- ***What is the current level of completion of key assessments?*** Table 15 shows the global status of conducting the key assessments required to achieve Target 11.[41]

Table 15: Estimated national status of completing key assessments globally

Assessment	Estimated number of countries with completed or nearly completed assessments	Estimated number of countries with limited or no progress on key assessments
Ecological gap assessment (including connectivity, representativeness, governance types)	85	107

[40] These costs can be considered one-time costs.

[41] Data from Leverington *et al*., and two global reviews conducted by the CBD Secretariat in 2009 and 2012.

Management effectiveness assessment (including capacity, governance effectiveness)	80	92
Policy environment assessment, including legal framework assessment and protected area valuation	50	142
Sustainable finance needs assessment and finance plan	50	142

- ***How much does it cost to conduct key assessments?*** This assessment estimated the average cost of conducting key assessments by reviewing the cost of a range of assessments from multiple countries from the GEF Early Action Grant project (see Table 16). Because of the variability in the cost of key assessments, the ability to combine some assessments and thereby reduce costs (e.g., management effectiveness and governance, or policy environment and sustainable finance), and the uncertainty of the actual costs of co-financing, a range of low, medium and high costs is provided at the end of the table.

Table 16: Representative sample of costs of key assessments from the UNDP implemented, GEF supported Early Action Grant for Protected Areas[42]

Country	Gap assessment (in $ thousands)	Management effectiveness and capacity assessment (in $ thousands)	Legislative and policy assessment (in $ thousands)	Sustainable finance needs assessment (in $ thousands)
Afghanistan	68	233	110	---
Albania	98	90	---	---
Antigua and Barbuda	329	40	77	114
Armenia	142	95	---	---
Bahamas	---	72	105	---
Belize	---	---	110	65
Bosnia and Herz.	162	---	---	---
Cambodia	---	98	47	---
Djibouti	60	---	47	45
Dominican Rep.	39	67	---	67
Fiji	160	---	75	---
Grenada	---	---	133	---
Guatemala	---	91	58	---
Honduras	---	---	---	56
Jamaica	---	18	215	---
Kiribati	125	---	---	---
Lao PDR	---	---	55	139
Mali	---	167	---	---
Mauritania	---	152	---	---
Micronesia FS	179	383	---	159
Mongolia	153	49	---	57
Panama	137	---	---	---

[42] Includes funds from both the GEF and co-finance funds from both governments and NGOs.

Papua New Guinea	178	---	75	---
Samoa	160	---	---	---
Solomon Islands	129	---	---	85
Vanuatu	---	---	165	---
ANALYSIS	Gap assessment (in $ thousands)	Management effectiveness and capacity assessment (in $ thousands)	Legislative and policy assessment (in $ thousands)	Sustainable finance needs assessment (in $ thousands)
Range	39 – 329	18 – 383	47 – 165	56 – 159
Approximate Average	140	120	100	90
Low scenario	70	40	50	50
Medium scenario	140	120	100	90
High scenario	210	160	150	140

Table 17: Summary of costs required to complete key assessments globally

Assessment	Estimated # of countries with limited or no progress	Low scenario	Medium scenario	High scenario
Ecological gap assessment	107	$7.5 million	$15 million	$22.5 million
Management effectiveness assessment	92	$3.68 million	$11.04 million	$14.72 million
Policy environment assessment	142	$7.1 million	$14.2 million	$21.3 million
Sustainable finance needs assessment and finance plan	142	$7.1 million	$12.78 million	$19.88 million
TOTAL		$25.38 million	$53.02 million	$78.4 million

6 Results – Summary analysis of costs of achieving Target 11

6.1 Overall cost estimates

This section summarizes the costs of each of the five major actions required to achieve Target 11, and provides low, medium and high scenarios for each. Table 18 shows a very wide range of cost estimates. A reasonable estimate for the total cost of achieving Target 11, however,

Table 18: Estimated investment requirements to achieve Target 11 – Low, Medium and High Scenarios[43]

Action	1-time investment	Total expenses for 2013 – 2020	Total
Low Scenario			
Create new protected areas (including both terrestrial and marine)	$44,243 million		$44,243 million
Create connectivity corridors (including both terrestrial and marine)	$21,348 million		$21,348 million
Strengthen management effectiveness		$7,717 million	$7,717 million
Strengthen enabling policy environment and sustainable finance	$480 million		$480 million
Conduct key assessments	$25 million		$25 million
TOTAL	$66,096	$7,717 million	$73,813 million
Medium Scenario			
Create new protected areas (including both terrestrial and marine)	$91,250 million		$91,250 million
Create connectivity corridors (including both terrestrial and marine)	$112,657 million		$112,657 million
Strengthen management effectiveness		$32,070 million	$32,070million
Strengthen enabling policy environment and sustainable finance	$1440 million		$1440 million
Conduct key assessments	$53 million		$53 million
TOTAL	$205,400	$32,070 million	$237,470 million
High Scenario			
Create new protected areas (including both terrestrial and marine)	$278,600 million		$278,600 million
Create connectivity corridors (including both terrestrial and marine)	$344,849 million		$344,849 million
Strengthen management effectiveness		$53,450 million	$53,450 million
Strengthen enabling policy environment and sustainable finance	$2880 million		$2880 million
Conduct key assessments	$78 million		$78 million
TOTAL	$626,407 million	$53,450 million	$679,857 million

[43] The low scenario assumes only 17% global target with little or no additional representativeness for terrestrial; assumes marine protection only within 12 nautical miles; assumes a 2% scenario for connectivity, and assumes low management effectiveness costs. The medium scenario assumes a goal of at least 17% of each ecoregion and 10% of each marine ecoregion within 200 nautical miles, assumes a 5% scenario for connectivity, and assumes medium management effectiveness costs. The high scenario assumes at least 17% of each ecoregion, assumes a 10% of each marine ecoregion within 200 nautical miles; assumes a 10% scenario for connectivity, and assumes high costs for management effectiveness.

6.2 Potential sources of funding

A full analysis of all potential sources of funding is beyond the scope of this report. However, the following could be considered viable sources of revenue, provided there is an enabling policy environment and sufficient political will:

- ***Carbon funds***: Ricketts *et al*. (2010) estimated that the capital that could be mobilized by international REDD frameworks, at a price of US$5/tonCO2e, could provide as much as approximately $40 billion annually in funding.
- ***Reinvestment of harmful subsidies***: Approximately $1.3 – 1.9 trillion dollars is spent annually on environmentally harmful subsidies around the globe. A fraction of these funds, if reinvested in protected areas, could help cover the cost of achieving Aichi Target 11.
- ***Water fees***: Payment for environmental services schemes have the potential to provide long-term finance to protected areas. Water fees in particular are a promising source of funding for many countries. According to Forest Trends (2008), the market size for compliant water quality trading is currently $874 million annually, while the market size for government-mediated watershed payments is estimated at over $5 billion annually, with China projected to pay direct watershed protection fees of over $43 billion annually by 2020.
- ***Ecotourism***: Global tourism revenues are approximately $2.4 trillion, and a very large portion of this tourism relies on the nature within protected areas. (Eagles and Hillel, 2008). A fraction of this revenue, if diverted to protected areas, could help cover the cost of achieving Aichi Target 11.
- ***Debt-for-nature swaps***: Debt-for-nature swaps are financial transactions in which a portion of a developing nation's foreign debt is forgiven in exchange for investments in biodiversity conservation measures. Since 1987, debt-for-nature swaps have generated over US$ 1 billion for conservation in developing countries. Although such transactions have declined in recent years, they are still effective mechanisms for funding conservation.

6.3 Numbers in perspective

The total of $270 billion for achieving Target 11 may seem daunting. However, this number is achievable:

- $270 billion equates to $33.75 billion annually – equal to only .000472% of the world's gross domestic product (less than $5/person globally) and only .0013% of the GDP of the top 20 wealthiest countries. This figure also represents about 2% of the world's annual environmentally harmful subsidies, 1.4% of annual global tourism revenues, and less than 10% of the total cost of soda consumed by only 15 countries.
- Much of the costs are already covered by governments and other sources of funding aside from overseas development assistance. For example, a study of 20 Latin American countries found that governments and other sources already fund more than half of basic costs for management effectiveness (Bovarnick et al., 2010).
- Numerous willingness-to-pay studies indicate that protected area entrance fees are drastically under-valued, and could represent a significant source of revenue in the future, provided there is an appropriate legal and institutional framework to capture and distribute these benefits appropriately.
- Many of the costs can be dramatically reduced by a) being more strategic in the design and location of new protected areas by targeting under-represented ecosystems that can also serve as connectivity areas and transboundary protected areas; b) encouraging the legal recognition of, and support to, indigenous and community conserved areas and converting areas under sustainable use, such as forest reserves, to protected areas; and c) continuing recent trends in creating very large marine protected areas that help drive down the per/km^2 cost.

- Many protected areas are moving toward a more sustainable finance basis by developing business plans and implementing diverse sustainable finance mechanisms, dramatically reducing the financial gaps. Mexico, for example, was able to increase funding for protected areas five-fold from 2000 to 2008 by implementing a variety of sustainable finance mechanisms.
- On a final note, protected areas should be considered as the primary strategy for biodiversity conservation. A comprehensive, representative, effectively managed network of protected areas, if solidly embedded in a country's National Strategies and Action Plans (NBSAPs), will provide an efficient, cost-effective means of achieving many of the other Aichi Targets, particularly Targets 5, 10, 12, 13, 14 and 15.

6.4 Further research required

This assessment highlights the need for further research on a number of questions, including:

- ***Overlap within Target 11***: The extent to which the 17% and 10% goals of protection can capture the goals for representativeness, key biodiversity areas, connectivity and key ecosystem services is unknown. It is likely that an additional amount will need to be protected in order to achieve some or all of these goals, but this amount is largely unknown.
- ***The actual coverage and contribution of ICCAs***: In one estimate, ICCAs are equal in coverage to the existing protected area estate, which would mean that society can easily exceed the 17% and 10% protection goals with minimal investment. However, the true extent of these areas is unknown, as is the degree to which these areas uniformly contribute to the goals of Target 11.
- ***Societal willingness to shift spending in subsidies***: As indicated in this report, shifting even a small fraction of the current costs of negative environmental subsidies to promote positive environmental actions, such as achieving Target 11, would provide far more funding than is required. The extent to which society is willing to make this shift is largely unknown.
- ***The delivery of benefits under basic vs. optimal scenarios***: Although the language of Target 11 is precise, nearly every term can be interpreted to mean different levels of achievement. For example, 'effective management' can mean a bare minimum required to achieve a minimum set of goals, or an optimal level required to achieve broader societal goals. The degree to which marginally satisfactory levels of coverage, representativeness, connectivity, management effectiveness and sustainable finance can deliver societal benefits is largely unknown.
- ***Current expenditures***: The full investment in protected areas is not accurately known, although some estimates place the global annual investments in protected areas at between US$6.5 and US$10.1 billion (Bertzky *et al*., 2012). Actual levels of existing resource allocation would help determine funding shortfalls.

7 Benefits of achieving Target 11

This section outlines some of these benefits, including water protection, hazard mitigation, food security, health and climate change mitigation, among many other benefits. The scope of this study does not permit a more thorough analysis of the multiple benefits of achieving Target 11. Even under the most conservative estimates, the cost of implementing Target 11 would be far out-shadowed by the benefits, which have been estimated as being between 25:1 and 100:1 return on investment (TEEB, 2010).

7.1 Benefits for water protection

The value of ecosystem services for water regulation and supply is estimated to be worth $2.3 trillion, and about a third of the world's largest cities rely upon forest protected areas for their water supply (Stolton et al., 2010). A recent study by Korsgaard and Schou (2010) found that ecosystems provide between $30 to $3,000 per hectare for water provisioning services in developing countries. If even a fifth of the 17% goal of terrestrial protected areas are important for water, that would mean an annual value of between $46 million and $4.6 billion. This does not include the cost of avoiding water treatment facilities, which can be substantial. For example, protected areas in the Catskills of upstate New York helped the state avoid the cost of $6 billion in water treatment costs, and $300 million annually in operating costs.

7.2 Benefits for food security

Protected areas provide a lifeline for many of the world's 2.7 billion people – more than a quarter of the world's population – who survive on less than $2 a day. Protected areas provide multiple benefits to global food security, including by direct resource consumption, by maintaining the genetic diversity of crop wild relatives, by providing fodder and grazing for livestock, and by providing services that are vital to the production of food, including water for irrigation, and pollination, which is worth between $120 and $200 billion globally (Stolton et al., 2010). In addition, protected areas provide key habitat for fisheries, a vital source of food – nearly 3 billion people rely on fish for at least 15% of their daily protein. In one estimate, setting side 20% of total fishing area for protection would cost $270 million, but the benefit would yield $70-80 billion annually, and as much as 4.5-6.7 trillion annually if the full value of ecosystem services are accounted for (Stolton *et al*., 2010).

7.3 Benefits for hazard mitigation

Protected area serve a vital function in protecting humans from natural hazards, such as floods, storm surges and hurricanes. This function will only increase under climate change. For example, protected areas help buffer coastal communities from the impacts of storms – protected coral reef ecosystems contribute about $9 billion annually in coastal protection around the world (CBD, 2010).

7.4 Benefits for health

Protected areas are critical for maintaining human health. Protected areas harbor medicinal plants, valued conservatively at over $60 billion annually in South Asia alone, and this figure is estimated to grow to over $5 trillion by 2050 in that region (Nagpal and Karki, 2004).

7.5 Benefits for climate change mitigation

The world's existing protected areas is estimated to contain 15.2% of the global carbon stock of 2,052 gigatons. The amount of 312 gigatons is equivalent to more than 43 times the total annual global emission from fossil fuels (Cambpell et al., 2008). The cost of replacing this stored carbon is enormous – Canada's protected areas store about 4.4 gigatons of carbon, and the cost to replace this would amount to between $11 billion and 2.2 trillion (CBD, 2010).

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