CI-GEF PROJECT AGENCY

GEF Project Document

Spatial Planning for Protected Areas in Response to Climate Change - SPARC

Global

October 23, 2015

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Project Information			
Project Title:	Spatial Planning for Protected Areas in Response to Climate Change (SPARC)		
Project Objective:	Provide countries in the Neotropical, Afrotropical and Indo-Malayan biogeographic realms with the assessments and data needed to improve planning, design and management of terrestrial protected areas for climate change resilience.		
Project Outcomes:	1.1. Information on species range shifts and ecosystem change made available for regional protected areas planning. 1.2. Conservation planning tools allowing regional assessments of representation losses resulting from species range shifts and ecosystem changes developed and readily available. 1.3. Regional assessment teams have information needed to understand priority areas for protected areas system planning to counteract loss of representation due to climate change. 2. 1. Regional assessments produced by teams of leading scientists from each of the three regions. 2.2. Research-to-policy briefs prepared and presented to government protected areas agencies 2.3. Decision support tools for visualization and interactive use of the research results produced. 3.1. Participatory monitoring and evaluation framework integrated at all levels of project management. 3.2. Adaptive implementation of regional assessments.		
Country(*ies*):	83 tropical countries in the 3 target regions (Neotropical, Afro-tropical and Indo-Malayan biogeographic realms)	**GEF ID:**	5810
GEF Agency(*ies*):	Conservation International	**CI Contract ID:**	
Other Executing Partners:	The Moore Center for Science and Oceans at Conservation International (MCSO); University of Leeds; University of Stellenbosch; Catholic University of Chile; Xishuangbanna Tropical Botanical Gardens	**Duration in Months:**	36
GEF Focal Area(*s*):	Biodiversity	**Start Date** (*mm/yyyy*)**:**	01/2016
Integrated Approach Pilot:	N/A	**End Date** (*mm/yyyy*)**:**	12/2018
Name of Parent Program:	N/A	**ProDoc Submission Date:**	10/1/2015
Re-submission Date(*s*):			

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Co-Financing 2:University of Stellenbosch	785,00
Co-Financing 3: University of Arizona	649,716
Co-Financing 4: University of Leeds	598,000
Co-Financing 5: Catholic University of Chile	450,000

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Co-Financing 6: IUCN	350,000
Co-Financing 8: Commonwealth Scientific and Industrial Research Organization (CSIRO)	184,584
Total Co-Financing :	3,655,992
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ACRONYMS & ABBREVIATIONS

CBD	Convention on Biological Diversity
DGVM	Dynamic Global Vegetation Model
GBIF	Global Biodiversity Information Facility
GCM	Global climate model (formally ‘General Circulation Model’)
GDM	Generalized Dissimilarity Model
IPBES	Intergovernmental Panel on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
RCM	Regional Climate Model
RCP	Representative Concentration Pathway
SDM	Species Distribution Model
TBA	Trait-based Assessment
UNFCCC	United Nations Framework Convention on Climate Change

GLOSSARY OF TERMS

Biodiversity	In general, species, ecosystems and genetic diversity; in this proposal, species and ecosystems (the focus of GEF protected areas goals)
Conservation planning software	Computer software or algorithms used to assist in conservation planning; in this proposal, software used to select protected areas to meet ecosystem and species representation (GEF goals) targets
Decision support tool	An interactive platform that allows policymakers to query research results in order to formulate decisions
Dynamic Global Vegetation Model (DGVM)	Computer simulation of global ecosystems and changes in their location due to climate change and elevated atmospheric C02
Ecosystem	In general, a connected set of living organisms and their environment; in this proposal, a set of plants and animals typical of a habitat type and region
Generalized Dissimilarity Model (GDM)	A method for comparing physical similarity in climates and physical environment for predicting patterns of biodiversity under both current climate and future climates
Global biodiversity hotspots	Thirty five areas with globally high rates of endemism and habitat loss. The global biodiversity hotspots harbor over 70% of the Earth's terrestrial species in less than 3% of global land area.
Priority biogeographic realms	For the purposes of this proposal, the Neotropical, Afrotropical and Indo-Malayan realms (excluded: Nearctic, Palearctic, and Oceania realms). Referred to in the proposal as 'the regions'.
Priority country	For the purposes of this proposal, countries within the Neotropical, Afro-tropical and Indo-Malayan biogeographic realms
Range shift	Movement in the location of populations of a species due to climate change. Every species prefers a unique set of climatic conditions, and individuals of a species will move to track those conditions as climate changes.
Regional Assessment	For the purposes of this proposal, assessment of one of the three priority biogeographic realms (Neo-tropic, Afro-tropic, Indo-Malayan)
Representative concentration pathway	A future trajectory of global greenhouse gas emissions used in climate change models

Representative Concentration Pathway (RCP)	A future trajectory of greenhouse gas concentration in the atmosphere, representing the results of human pollution
Research-to-policy brief	A report summarizing issues relevant to national or multi-country policies emerging from project research in non-technical language and highlighting policy and planning decision points
Species Distribution Model (SDM)	Simulation of the changes in a species range due to climate change (see Glossary, 'range shift'). Also known as 'bioclimatic model' or 'niche model'
Trait-based Assessment (TBA)	An assessment of the world's most climate change-vulnerable species, based on life history traits

CI-GEF PROJECT AGENCY

Spatial Planning of Protected Areas in Response to Climate Change (SPARC)

PROJECT DOCUMENT

SECTION 1: PROJECT SUMMARY

1. The most accepted and common strategy for conserving biodiversity is the establishment of protected areas. The Convention on Biological Diversity (CBD) has supported protected areas as a conservation tool since its inception and has reaffirmed this commitment through the expansion of the global conservation estate under the Aichi targets 11. The GEF-recipient countries, GEF agencies, and co-financing partners are among the largest investors in protected area creation and management. However, these investments and their successful application are placed at risk by climate change.

2. Biodiversity, and threats to biodiversity, will be changing in response to climate change (Dawson et al. 2011), affecting the context of success for protected areas. Many species' ranges will move to track suitable conditions with increasing likelihood that they fall outside of the protected areas systems originally designed to conserve such features (Krosby et al. 2007). As species shift, ecosystems will fragment, adjust and re-assemble affecting habitat coverage and spatial representation across protected areas.

3. The location of species will not only shift within national territories, they will move in ways that involve multiple countries. About half of all plant species are believed to be multi-country endemics, while roughly 80% of the world's birds are resident in two or more countries (Pitman et al. 2002). Even among restricted range birds with high levels of endemism, about one third span international borders. In addition, "mobile threats" such as agricultural zones, development corridors, invasive species, diseases and their vectors will further impact protected areas effectiveness. Human land uses, such as crop production, are distributed within climate gradients, and these uses will also shift among multiple countries (Turner et al. 2013).

4. As a result, scientific recommendations for actions that will increase the effectiveness of national protected area networks in the face of climate change will require a trans-boundary perspective that includes multiple countries and encompasses the movement of key species groups that reserve networks focus on, as well as changes in the distribution of threats to biodiversity.

5. This perspective is critical for efficient planning and management of protected areas, as it provides the basis for understanding what national actions can be taken independently, and what actions are contingent on the actions of neighboring countries. Without this information, countries may not invest in climate change adaptation due to a lack of certainty, lack of knowledge of biodiversity and threat trajectories, the scattered nature of required information, and the technical difficulties of assembling scenarios at the geographic scale of likely change. These limitations are particularly acute in the tropics, most affecting precisely the high biodiversity countries most at risk of biodiversity loss.

6. This proposal focuses on constructing scenarios of change in the three highest diversity continental tropical regions, to better understand threats from disrupting climate shifts and opportunities for

adaptation of terrestrial protected area networks[1]. Specifically, the project has two technical components and one component dedicated to coordination and knowledge management.

7. In **Component 1**, we provide scenario analyses in three tropical biogeographic realms spanning 83 countries in the Neotropics, Indo-Malayan tropics and Afrotropics, focusing on the vulnerability of protected area networks to climate change**.** This synoptic analysis addresses the lack of integrated analyses of the most important threats and opportunities for protected area network enhancement in the face of climate change and enables corresponding national and regionally coordinated actions.

8. In **Component 2**, regional assessments bring the expertise of regional scientists to bear on a more detailed analysis of protected areas and climate change. Loss of species and ecosystem representation will be assessed for individual protected areas and opportunities to restore lost representation identified. We will work with stakeholders to create country and multi-country research briefs and action plans, enabling more effective and efficient planning processes informed by analyses of climate-induced changes in biodiversity, as well as changes in the major threats to biodiversity.

9. In **Component 3**, we establish a project monitoring framework and prepare knowledge products to share the recommendations emanating from the project.

10. The project implementation is headed by a core team consisting of a Principal Investigator, Project Manager (postdoctoral researcher), 3 lead regional scientists, and 3 representatives from international advisory institutions assisting with data development and design of methods. The core team will be advised by a Science Advisory Panel, representing leading climate-impact and protected area planning scientists and includes representation from the three selected geographies.

11. A Project Management Unit (PMU) will ensure compliance with technical and financial reporting, procurement process and due diligence for mainstreaming of triggered stakeholder engagement and gender strategy safeguards throughout the project cycle. The project is planned over 3 development phases spanning three years progressing from (1) procuring relevant global data and model results, developing models and methods, (2) running the three comparative regional assessments and (3) development of research to policy recommendations and decision support tools directed to architects and beneficiaries of protected areas (see section 4D).

12. Stakeholder groups will be directly embedded into project planning in each region and will take part in the translation of research briefs into action plans (Component 2). Leading climate-impact scientists from the Neotropics, Afrotropics, and Indo-Malayan tropics will interact with a range of stakeholders drawn from GEF agencies, civil society, international organizations, government ministries and representatives of local communities that are directly affected by protected area management effectiveness.

13. The synthesized data and scenario analysis (Component 1), the regional assessment results for countries and multi-country research to policy briefs (Component 2) will allow countries in the Neotropics, Indo-Malayan tropics and Afrotropics to (1) understand the change and potential loss of species representation in protected areas; (2) understand the loss of ecosystem representation

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[1] Freshwater and Marine Protected Area networks are beyond the scope of this proposal.

in protected areas and (3) explore options that reverse or reduce the risk presented to species and ecosystems representation in national and regional protected area frameworks.

14. These contributions aim to support national protected areas systems that maximize representation of species and ecosystems as climate changes and hence bolster the resilience to climate change of tropical countries across the selected geographies.

SECTION 2: PROJECT CONTEXT

A. Introduction

15. Climate change is impacting species and ecosystems worldwide (Root et al 2004, Parmesan and Yohe 2004). Species' ranges are shifting to track suitable conditions as climate changes. Simulations of future change show movements of species and ecosystems, rearrangement of plant and animal communities, the emergence of novel communities and risk of extinction for hundreds of thousands or millions of species (Thomas et al 2004, Urban 2015).

16. Protected areas are a principal conservation tool for conserving species and ecosystems (Dudley et al 2014). They have been shown to be effective in reducing extinction risk from climate change (Hannah et al 2007). Representation of species and ecosystems is a general goal of national protected areas systems and a specific goal of GEF support to these national efforts.

17. Climate change rearrangement of species and ecosystems may result in loss of representation in protected areas, increasing extinction risk (Araujo et al 2004). This problem is accentuated because most protected areas have not been selected a part of a systematic spatial planning effort and not planned with climate change in mind (Williams et al 2005). As a result, the opportunity to place protected areas in the best locations to avoid extinctions and loss of representation of species and ecosystems due to climate change is mostly unrealized.

18. This situation is changing, with GEF funding pioneering efforts to integrate climate change into national protected areas planning. But much is left to be done and the scope of planning required transcends national boundaries. Species' ranges movements in response to climate change often occur on regional and continental scales, making it more cost effective to conduct continental-scale assessments with nested country assessments, rather than having country assessments perform multiple repetitive and independent continental scale analyses. Because the resources required to mount continental-scale assessments are substantial, there are major cost-savings to be realized in performing a uniform set of continental scale studies. This project will produce continental-scale assessments of the impacts of climate change on protected areas, providing a cost-effective framework in which country-level planning and decision-making for climate change can take place.

B. Environmental Context and Global Significance

19. Tropical countries host most of the world's terrestrial biodiversity, including nearly 7 in 10 plant species (Joppa et al 2013). As much as 50% of tropical rainforests may have been cleared in the last half-century, with some other tropical habitats, such as dry forests, disappearing even more rapidly (Lambin et al 2003). Restricted range endemic species are found overwhelmingly in the tropics, because of their small ranges many of these species are threatened and especially important to represent in protected areas (Myers et al 2001, Stattersfield 1998). Because of rapid habitat loss and high biological importance, protection of tropical ecosystems and species is critical to conserving global biodiversity. Protected area establishment and effective management will help avoid extinction for millions of species.

20. Climate change complicates the race to protect tropical biodiversity (Peters and Lovejoy 1992). Theory suggests that tropical species may be among the most climate-vulnerable on the planet (Tewksbury et al 2008). High levels of tropical biodiversity result in part from strong habitat-partitioning along steep environmental gradients, especially on the flanks of tropical mountains (Rosensweig 1995). For this reason, even though temperature changes may be muted in the

tropics compared to high latitudes, the number of species and the sensitivity of species to climate change may be higher in the tropics than anywhere else on the planet (Deutsch et al 2008).

21. For example, birds whose ranges fall within very limited elevation bands have very tight climatic tolerances, because temperature varies directly with elevation, hence the temperature difference between their lower range boundary and upper range boundary is small (Hannah 2015). These bird species are sensitive to climate change, because as temperatures warm their lower range boundary will quickly overtake their upper range boundary. These climate change sensitive birds are found overwhelmingly in the tropics, with the greatest number in the tropical Andes (Hannah 2015).

22. While temperate species may adjust to climate change by moving latitudinally or upslope, for most tropical species only elevational adjustment is possible (Colwell et al 2008). This is because temperature gradients along the equator are very slight – the velocity of climate change is very fast in equatorial lowland environments – a species has to move a long way to track a degree of warming (Loarie et al 2009). Only on the slopes of tropical mountains are there strong temperature gradients and slower velocities of climate change (Burrows et al 2011).

23. Yet tropical mountains are also the very areas that make up the global biodiversity hotspots where habitat loss is high (Myers et al 2001). Excluding islands, 11 of 20 continental biodiversity hotspots are tropical montane systems. These tropical montane systems harbor large numbers of climate change sensitive species. The vast majority (85%) of the climate change sensitive birds are found in global biodiversity hotspots (Hannah 2015). This means that the tropical refuges from climate change are both the most diverse and most threatened.

C. Socio-Economic and Cultural Context

24. The tropics are home to 70% of the world's poorest people (State of the Tropics 2014). Four hundred and sixty seven million people in the tropics live in urban poverty, with perhaps even more rural poor (State of the Tropics 2014). Poorly controlled diseases such as dengue fever and malaria are much more common in the tropics than in temperate latitudes, in part because of tropical affinities and in part because of lack of health infrastructure and means of prevention.

25. Undernourishment has declined in the tropics over the past 20 years, but still remains higher than other areas (State of the Tropics 2014). Life expectancy and child mortality are decreasing substantially, paving the way for a demographic transition to smaller family sizes in many parts of the tropics (State of the Tropics 2014). However, this transition is nascent and population growth in the tropics remains strong. The tropics are expected to add 3 billion people by 2100.

26. The extent of primary forests and other natural habitats are decreasing rapidly in the tropics (Hansen et al 2013). Emerging satellite imagery capabilities allow improved quantification of land use change, showing that forest loss has been under-estimated in some regions (Margono et al 2014). Brazil has been able to dramatically reduce deforestation rates in the Amazon, while some areas in Asia continue to see high rates of loss (Hansen et al 2013, Margono et al 2014). The decline in available natural habitats means that the scope for adding protected areas, including those sited to maximize representation as climate changes, is limited and declining rapidly (DeFries et al 2005).

27. The introduction of invasive species into ecosystems is creating loss of habitat integrity in many parts of the tropics (Bellard et al 2013). Climate change is expected to complicate this problem because invasive species may benefit from ecological 'gaps' left as ecosystems rearrange and move in response to climate change (Walther et al 2002). For example, Chytrid Fungus is decimating

amphibian populations worldwide, in episodes of extinction that are strongly linked to climatic conditions and climate change (Pounds et al 2006).

28. Agricultural frontiers are pressing into the last natural areas protected by inaccessibility (Bryant 1997). Infrastructure is improving, altering access to land. International land purchases and use agreements are bringing agricultural development on unprecedented scales to formerly sparsely populated areas (Edelman et al 2013). Climate change will affect these dynamics by altering crop suitability (Turner et al 2010). Coffee suitability has been projected to decline dramatically (Laderach et al 2015), while suitability for other crops will increase (Hannah et al 2013), destabilizing land use and complicating conservation planning.

29. Climate change impacts on society will result in substantial land use changes and in new pressures for change. Any change in access or availability of ecosystem goods and services (e.g. food security) and/or risk to local communities (e.g. coastal flooding) has direct relevance for communities and will influence traditional lifestyles.

30. Climate change and any adaptation measures are further expected to influence the roles assumed by both men and women who interact in different ways with their natural resource.

31. Building protected areas systems that are robust into the future requires assimilation of these multiple complex social settings While no planning effort can foresee all such changes, most conservation planning now generally ignore or exclude consideration of climate change. Improving on this baseline is urgently needed for protected areas planning and even initial investments towards generating understanding will pay large dividends.

D. Relevant Policies, Laws, Regulations, Rules, and Standards

32. *The Convention on Biological Diversity (CBD)* targets the increase of conserved terrestrial area to 17% of national territories, with the intent of increasing representation of species and ecosystems in protected areas. This target (Strategic Goal C, Target 11) can only be effectively met if the increase in representation gained in the short-term is not undermined in the long-term by erosion of representation due to climate change. Therefore, fundamental to meeting the intent of the Aichi targets is improving protected areas system function as climate changes. Because GEF directly supports the CBD species and ecosystem representation targets with its investments, the maintenance of these goals as climate changes is particularly relevant to the GEF portfolio. The CBD has convened a joint panel under the Subsidiary Body for Science, Technical and Technological Advice (SBSTTA) examining the impact of climate change on biodiversity and making recommendations to both conventions (CBD and UNFCCC).

33. *The Promise of Sydney* is a declaration emerging from the IUCN World Parks Congress 2014 in Sydney Australia. The vision of the Promise of Sydney included investment in securing protected areas and protected areas systems from the effects of climate change. The climate change recommendations of the promise called for enhancing climate change adaptation for protected areas and for new thinking in planning and management to help find solutions for the likely impacts of climate change (IUCN 2015).

34. *The United Nations Framework Convention on Climate Change (UNFCCC)* seeks to stabilize atmospheric greenhouse gas emissions in order to avoid dangerous human interference in the climate system. The extinction risk associated with climate change has been important in policy discussions of appropriate limits to greenhouse gas emissions. Extinctions of corals and other species due to climate change help benchmark ‘dangerous interference’. The degree to which

protected areas can or cannot reduce extinction risk due to climate change therefore has fundamental relevance to the goals of the climate change convention. The convention is increasingly acknowledging the need for adaptation, such as reducing protected area vulnerability to species and ecosystem movements, as it is clear that both adaptation and mitigation will be required to minimize damages from climate change. Designing protected areas systems specifically to cope with climate change is a top adaptation action for natural systems.

35. *National protected areas legislation.* Most nations in the tropics have enacted legislation establishing protected areas systems and management authorities. Most are also party to the CBD and UNFCCC, yet the work in these two policy streams is often conducted in isolation, without regard especially to the effect climate change may have on protected areas outcomes. Increasingly, national delegations to the CBD and UNFCCC are recognizing the importance of tropical forests in achieving reductions in greenhouse gas emissions. Much less frequently are the consequences of climate change for protected areas considered.

E. Institutional Context

36. *The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)* is the intergovernmental body that leads international coordinated assessment of the state of the planet's biodiversity and the ecosystem services it provides. The ability of protected areas to maintain species and ecosystem representation is central to the IPBES mandate of understanding and synthesizing impacts to biodiversity and needed responses. IPBES recognizes the importance of protected areas for conserving biodiversity and maintaining ecosystem services. The need to understand all threats and convey that information to decision makers make IPBES goals parallel to those of this project.

37. *The Intergovernmental Panel on Climate Change (IPCC)* provides regular state-of-the-science synthesis of climate change science to policymakers and the world. Impacts of climate change and biodiversity are a regular feature of IPCC reports. Species range shifts, ecosystem migration, and resulting loss of representation has been featured in the IPCC Third Assessment Report, Fourth Assessment and Fifth Assessment Report (AR5, 2014). Regional impacts on species and ecosystems are prominently featured in regional summaries, particularly in the arctic, but also in tropical systems. Physical changes in tropical glaciers are among the most dramatic on the planet, and climate-linked extinction risk in tropical species, including amphibians and corals, may be among the highest of all species. Tropical species have been found to be more sensitive to climate change, and therefore at risk even if temperature change in the tropics is more muted than at high latitudes.

38. *The International Union for the Conservation of Nature (IUCN)* is a grouping of government, private sector and NGO organizations and individuals. Prominently, the IUCN maintains assessments of threatened species, including a climate change specialists group focused on assessing the extinction risk of species that may result from climate change. This group has conducted a survey of the birds, amphibians and corals most vulnerable to climate change based on life history traits. The IUCN also tracks the status and progress of protected area coverage. No assessment currently exists to bring these two topics together to examine how climate change vulnerabilities may reduce species and ecosystem representation protected areas are intended to achieve.

39. *National Protected Areas Management Agencies* are beginning to revise protected areas systems for climate change. With support from GEF, Mexico is embarking on a program of understanding climate change impacts on protected areas and factoring them into spatial planning, protected area

expansion and management (*Strengthening management effectiveness and resilience of protected areas to protect biodiversity under conditions of climate change; GEF 4647*). National protected areas agencies in Colombia, Brazil and other Amazon basin countries are examining climate change impacts on biodiversity and protected areas of the Amazon biome. Many other national protected areas systems need to be updated for climate change, but lack the resources to conduct a thorough regional analysis that would capture the species movements of species and ecosystems represented in the system.

SECTION 3: PROJECT JUSTIFICATION

A. Problem Definition: Global Environmental Problems and Root Causes

40. Climate change is causing species ranges to move upslope and to higher latitudes (IPCC 2013). These range shifts take place at paces unique to each species, resulting in rearrangement of plant and animal associations (Williams 2001). The result is species moving, sometimes to areas entirely outside their current range, the formation of novel ecosystems, and the movement or disappearance of current ecosystems across parts or all of their ranges (IPCC 2013).

41. Protected areas must be placed carefully to be effective in the face of these changes (Hannah et al 2007). Protected areas are fixed in place, so they can only capture range movements when they are properly sited to take advantage of elevational shifts that are limited in extent or are large enough to encompass latitudinal shifts (Williams 2005). In the tropics, elevational shifts are especially important, since latitudinal climate differences are small along the equator (Loarie 2009).

42. Most protected areas have not been sited to be effective in the face of climate change (Peters and Darling, 1985). Many current protected areas were designated to protect areas with unusual natural features (e.g., Yellowstone National Park, Maasai Mara National Park) or to take advantage of available land of little value for agriculture or urban development (e.g., Sunderbans National Park). As a result, existing national protected areas systems are not well designed to deal with climate change – they are likely to suffer loss of species and ecosystem representation as climate change unfolds.

43. The root cause of systems poorly planned for climate change is the lack of recognition of the impacts of climate change in the last century when most national protected areas systems were developed. This oversight can now be redressed using state-of-the-art climate science and biological theory. The root cause of species range shifts and the movement of ecosystems is climate change itself, which is the topic of IPCC science summaries and UNFCCC climate change policies (IPCC 2013).

44. Protected areas systems have not been adapted to climate change because until recently it was believed that tropical systems were less vulnerable to climate change than higher latitude systems and because it was not know whether protected areas could be an effective conservation response to shifting ranges and moving ecosystems. Tropical protected areas management agencies have not had the expertise nor budgetary resources to conduct climate change assessments.

45. The tropics will undergo less temperature change than temperate or high-latitude systems, which led to early interpretations that biodiversity in the tropics, would be less vulnerable to climate change. However, theory has shown that species in the tropics have evolved to deal with narrower climatic fluctuations, so the magnitude of human-caused climate change will be large relative to natural fluctuations (Tewksbury 2008). This means that tropical species may be among the most vulnerable to climate change, not the least.

46. At the same time that views of tropical vulnerability were emerging, conservation planning studies were confirming the value of protected areas in climate change response. Climate change biologists in the 1980s questioned how fixed protected areas could be an effective response when biodiversity was moving. However in the past two decades, research has emerged showing that protected areas can be effective even as species ranges shift, if sites for protection are selected explicitly to deal with climate change (Williams et al 2005, Hannah et al 2007). Specifically, protection needs to focus on areas of high topography and steep elevation gradients where the

velocity of climate change is low, allowing a fixed area that is limited in size encompass both present and future ranges of moving species and ecosystems (Burrows et al 2011).

B. Barriers to Addressing the Environmental Problems and Root Causes

47. The root cause of lack of protected area adaptation for climate change is the lack of understanding that climate change poses a fundamental challenge for maintaining representation of species and ecosystems in protected areas. However, over the past decade this problem has been recognized by researchers and tools for addressing it have been elaborated. These tools include multiple species and ecosystem modeling techniques and conservation planning tools that address climate change (Williams et al 2005, Phillips et al 2008, Game et al 2011). These methods are all now tested and well recognized in the peer-review literature. They can be used by policy and decision makers with the assistance of trained technical staff or through user-friendly decision support tools such as MIDAS (Patel et al 2011). However, a number of barriers prevent them from being widely applied to in practice. The expertise and budgetary resources to conduct sophisticated assessments of species movements in response to climate change have been largely absent in the tropics. The EU has mounted multi-million Euro research efforts to understand range shifts and protected area effects in Europe. No comparable effort has been mounted in the tropics. The need to assess optimal sites for climate change across thousands of species, each of which may span multiple national borders, has presented barriers of cost and data.

<u>Barrier 1</u>: Lack of resources for comprehensive assessment

48. The expertise and budgetary resources to conduct sophisticated assessments of species movements in response to climate change have been largely absent in the tropics. The EU has mounted multi-million Euro research efforts, such as ACCELERATES (Assessing climate change effects on land use and ecosystems: from regional analysis to the european scale), to understand range shifts and protected area effects in Europe. No comparable effort has been mounted in the tropics. The need to assess optimal sites for climate change across thousands of species, each of which may span multiple national borders, has presented barriers of cost and data.

<u>Barrier 2</u>: Lack of data to estimate tropical species' response to climate change

49. Data on species response to climate change include data on climate-related traits and species occurrence data for distribution modeling. Until recently, these data have been dispersed and largely unavailable for assessments, except in specific locales. Species occurrence data comes from diverse sources, including vegetation plots and herbaria records. Data on traits comes from researchers specializing in particular (plant or animal) taxa. These data are usually held by individual researchers or botanical gardens, often in non-digital form only accessible through special request, making data assembly for regional assessments difficult.

50. Recently, the dispersed nature of these data has begun to change dramatically. Regional or global species data repositories are creating digital access to data from hundreds of researchers. The IUCN assembled data on traits that confer climate sensitivity for birds, reptiles and corals. These and other new data sets make regional climate change assessments possible, but have not yet been tapped for this purpose in the tropics.

Barrier 3: Inability to mine large global datasets

51. Data on ecosystem response to climate change and on physical correlates of ecosystem change come from Dynamic Global Vegetation Models and Generalized Dissimilarity Models, both of which are run on supercomputers or large computer arrays and produce massive amounts of data. Individual protected areas or countries don't have the time or expertise to mine these large global datasets to retrieve ecosystem information about their particular area of interest.

Barrier 4: Country-focused protected areas planning

52. The country focus of most protected areas planning is itself a barrier to regional assessment of climate change impacts on biodiversity. Country-focused assessment makes sense in the absence of climate change, since each country has its own protected areas legal context and policy and resource constraints. However, when species' ranges move across national borders due to climate change, planning on a regional scale not only makes sense, it is the only way to get the full regional context necessary for effective country plans.

Barrier 5: Relative scarcity of Regional Climate Models (RCM) for the tropics

53. Global climate models have horizontal resolutions of hundreds of kilometers, and do relatively poorly at representing local climatic controls such as orographic rainfall and cooling up steep slopes. Regional climate models have horizontal resolutions of kilometers or tens of kilometers and capture these local climate-making phenomena much more fully. However, most regional climate models have been developed in North America and Europe, with most simulations focusing on these regions. Until the last five years, RCM availability for the tropics has been poor, making fine-scaled climate projections unavailable for tropical regional assessments. Recently, this situation is changing, with increasing RCM simulations for Latin America, Africa and tropical Asia. These recent RCM simulations have not been incorporated into regional biodiversity assessments however.

Barrier 6: Time lags in translating research into actionable recommendations

54. Climate change research involves multiple disciplines, with advances in one discipline generally diffusing to other disciplines through the scientific literature. This means that, for instance, incorporation of RCM simulations into biodiversity assessments would typically wait until the RCM results are published and downloadable data from the simulations posted online. Since peer-review and publication may take 18 to 24 months and posting data online takes additional time, several years may elapse before developments in one field are mainstreamed in other disciplines. Further lags occur in translating published research into real-world protected areas plans.

C. Current Baseline (Business-as-Usual Scenario) and Future Scenarios without the Project

55. Most tropical protected areas management agencies are currently planning without comprehensive information about climate change impacts. Mexico[2] is one of the few countries mounting a systematic effort to address climate change impacts in its protected areas system. Regional efforts in West Africa[3] and the Amazon are showing the value of multi-country planning. But most countries fall outside the scope of these exercises.

56. This leaves national protected areas planners and individual protected areas managers with a long-range, complex problem for which they have few analytical tools or capacity to address. For example, in South Africa, the number of Protea species found in protected areas may fall by 8-15% due to climate change by 2050, and by 25-38% if viable populations are to be represented (Hannah et al 2007). This is because these rare plants will be migrating upslope and poleward into unprotected montane habitats to track suitable climatic conditions as the region warms. As a result, the number of threatened Protea species is expected to double in some areas of South Africa due to climate change and land use combined (Figure 1). Adding protected areas in the habitats that are accumulating species threatened by climate change can remove land use as a threat and help ensure the conservation of these species.

57. The majority of tropical countries will pursue climate change planning with partial information from existing studies on individual taxa (e.g., Proteas, birds) or areas, or with no information at all. Improving protected areas response to climate change in these countries will depend on climate change research that happens to be initiated within their system or region. The timeline for availability of research results is highly uncertain and the relevance of research to protected areas planning is happenstance.

58. In this scenario, habitat destruction continues to narrow the scope for protected area establishment, and may result in no scope for placing protected areas in the right places to compensate for range shifts due to climate change. Research may never address the species and ecosystems most at risk, or examine changes in ways that are useful for constructed spatial plans for protected areas systems.

59. Opportunities to place protected areas in locations that help respond to climate change will be missed. Some new protected areas may be placed in locations that help respond to climate change by sheer good luck, or because fragmentary research results suggest important sites. But many other possible locations will go unrecognized due to lack of information on range shifts or due to lack of systematic planning to compensate for range and ecosystem shifts.

60. As climate change continues tropical protected areas systems not designed for climate change will lose species and have representation of key ecosystems reduced. Species will be moving in response to climate change, and without identification of the sites that can capture both present and future ranges, species will move out of protected areas. Ecosystems will move out of protected areas as well. Other species and ecosystems may increase inside protected areas, but the net effect will be loss of representation due to sub-optimal siting of protection.

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[2] Strengthening Management Effectiveness and Resilience of Protected Areas to Safeguard Biodiversity Threatened by Climate Change, Mexico (GEF)

[3] Protected Areas Resilient to Climate Change (PARCC West Africa GEF Project)

61. In countries that have received GEF support to improve representation of priority species and ecosystems, those gains will be eroded. Additional support will be unlikely to redress the problem, since ongoing habitat loss will have eliminated needed habitats by the time the problem is detected. Proactive research and advance planning will be absent and the resulting reactive strategy for dealing with climate change erosion of representation will be expensive and ineffective.

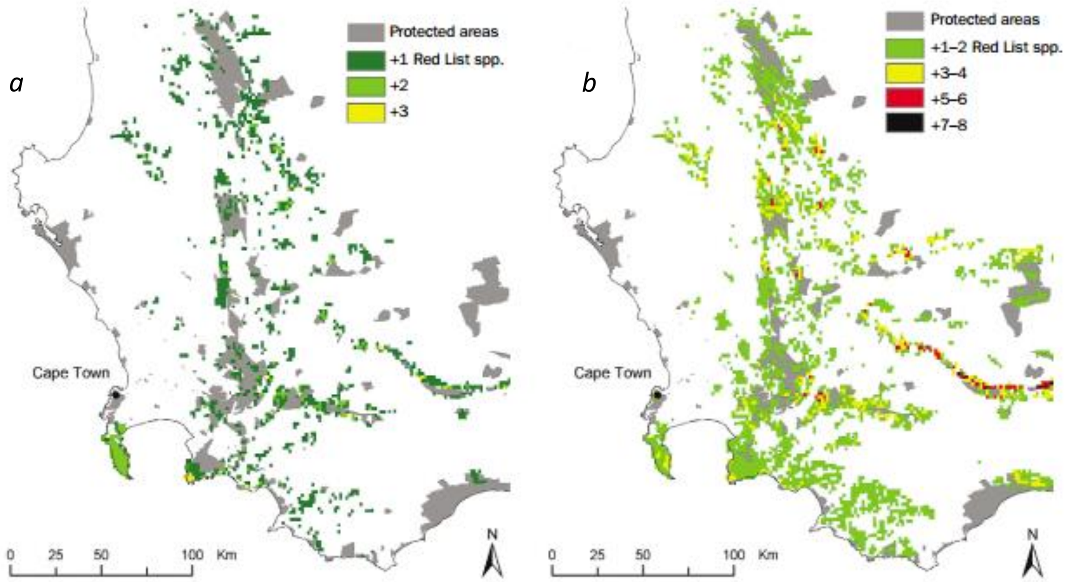


Figure 1: Increase in threatened Proteas due to land use change and climate change and land use combined in 2020 scenarios: (a) Increase in the number of threatened Proteas per grid cell projected using worst-case land use scenario, with existing protected areas (gray) shown for reference.; and (b) Increase in the number of threatened Proteas per grid cell based on a 2020 climate change scenario and the same land use scenario. For comparison, the average number of threatened species per grid cell is 6 under current land use and climate.

Source: Hannah et al 2005.

D. Alternatives to the Business-as-Usual Scenario

62. Alternatives to the Business-as-Usual scenario include 1) individual protected area assessment, 2) country-level assessment, and 3) comprehensive regional assessment.

Alternative 1**:** Individual protected area assessment

63. Each protected area (reserve) can collaborate with local and international researchers to determine vulnerabilities of the area and identify candidate sites in the surrounding landscape to compensate for range shifts that are driving species out of the reserve. National level experts able to conduct the research required for the assessment would move from reserve to reserve, taking years to complete analysis for all protected areas in the country. External resources would be needed for the same reasons as for country assessment, but at a higher level due to the long time required to complete all assessments.

Alternative 2: Country assessment

64. Each country can pursue conservation planning for climate change independently. The national protected areas agency can collaborate with ministries responsible for climate change and climate

modeling to develop regional climate models applicable to the country. This national-level consortium can then plan for the surrounding region to provide the necessary context for country-level decisions. Since national protected areas agencies generally lack the expertise and resources for climate change assessment, external resources from GEF or other sources would be required. Since each nation would repeat regional models used in other national assessments, this series of assessments would be repetitive and use national and international resources inefficiently.

Alternative 3**:** Comprehensive regional assessment

65. The protected areas systems in each major tropical region can be assessed in a collaboration of national/regional and international experts. Regional climate models and locally- and internationally-held biological data would be combined over large areas to encompass species' entire ranges and derive efficient solutions that cross national boundaries. The analysis is divided into major contiguous continental areas bounded by oceans, rather than by regional or country boundaries that are arbitrary from a biological perspective. External support is required, but on a much more modest scale because of the efficiencies of addressing multiple countries and multiple species simultaneously.

E. Cost Effectiveness Analysis

66. The most cost-effective alternative to the BAU scenario is the comprehensive regional assessment. This multi-country, pan-tropical approach achieves efficiencies of scale over both protected area and country assessment approaches. Most species have ranges that span more than one country and most ecosystems (in the sense of GEF protected areas targets) cross national borders. It is therefore more effective to conduct a single comprehensive assessment than it is to conduct multiple overlapping assessments.

67. Country assessment requires assembling regional climate models that include the country and species and ecosystem data for the entire ranges of all species in the country and all ecosystems in the country. This includes large areas outside of the country because climate models must be run over domains larger than the area of interest and because many species found in an individual country will be found in many other countries as well. Climate models are then used to project impacts on species ranges, followed by conservation planning to site new protection to compensate for the effects of climate change on species ranges and ecosystems. Conservation planning again must span multiple countries, to capture the entire ranges of the species addressed in the plan. This is because the survival of the species will depend on multiple populations, so avoiding stochastic extinction requires representation of the species in multiple protected areas. Ensuring that this requirement is met in both the species' present *and* future ranges requires planning across the species entire range. For instance, a conservation plan for *Aloe dichotoma* in Southern Africa would include protection of populations in both Namibia and South Africa (Foden 2008). As climate changes and the species range shifts south to track suitable conditions, more protection is needed in South Africa to maintain the same number of protected populations.

68. Country level assessment is inherently inefficient, because it requires repeating many steps in the analysis. Regional climate models must be run or downscaled multiple times for each country or at least for multiple regions, species data must be assembled from regional and international sources for each assessment, and conservation planning must be run for each assessment. Each of these steps requires largely overlapping data collection or analysis. A more efficient approach generates the regional climate and biodiversity analyses once, then adapts and applies them to individual country contexts.

69. Protected area level assessment is inefficient for the same reasons that country assessment is inefficient, with the inefficiencies multiplied across the number of protected areas in each country. These detailed local assessments have advantages in reflecting local realities, but waste resources replicating climate and biological analyses that are more efficiently carried out at a regional scale.

70. The inefficiencies of country and protected areas assessment alternatives translate directly into cost-effectiveness disadvantage. Each assessment step requires specialist scientists and computer time that cost money. Regional assessments pay for these steps once, across an entire area bounded by oceans. Country and protected area assessment alternatives would pay for these steps multiple times, across overlapping domains within the continent. Paying for these duplicative assessment steps results in serious cost inefficiencies. For example, developing and running a Regional Climate Model can cost hundreds of thousands or millions of dollars.

71. The cost-effectiveness advantage of the comprehensive regional alternative scales with the degree of duplication of country or protected areas alternatives. The protected areas alternative would involve hundreds of duplicated steps and would result in millions of dollars in inefficient expenditure. The country assessment alternative would be more cost-effective than the protected areas alternative, but still much less cost effective than the country approach. In fact, it is difficult to imagine duplicative country approaches unfolding across a continent such as Africa. Nations or donors would recognize the inefficiency and collaborate at least across regions (see the Protected Areas Resilient to Climate Change, PARCC West Africa project) to realize economies of scale.

72. No pan-tropical comprehensive regional assessment approach has evolved to take advantage of this high cost-effectiveness because it would require collaboration among dozens of national level agencies. Such collaboration carries high transaction costs (travel, organizational meetings) that agencies do not have the budget to overcome. An alternative is to plan a pan-tropical comprehensive regional assessment approach and make the results available to country-level decision-makers. This is the most cost-effective approach and is the alternative chosen for this proposal.

B. Incremental Cost Reasoning and Expected Contributions to the Baseline

73. The GEF Alternative will generate information not affordable to individual countries under the baseline scenario, enabling activities that would not be undertaken under that scenario. Under the GEF Alternative, countries will have access to regional climate change information and information about climate responses of species and ecosystems that would only be partly available in a series of country-by-country or protected area-by-protected area assessments. This greater regional context will enable cooperative actions with other countries not possible in the baseline. It will allow country-level decisions to be made in regional context not possible for the number of species or number of ecosystems afforded by the GEF Alternative. Additional actions will be possible in within country protected area planning and in cross-border collaboration that would be impossible without the extended depth and geographic and taxonomic breadth of information provided by the GEF Alternative.

74. **Global scenarios** provide information on global trends in climate change and other threats in a format readily accessible to protected areas agencies. Most protected areas agencies have neither the personnel nor skill sets to assemble global climate, biodiversity and threats datasets. Making such datasets available for national planning exercises would normally be handled through external consultancies. The cumulative cost of external consultancies, gathering global data for application in similar national planning exercises is prohibitive. Most national protected areas agencies would therefore simply forego information available in global scenarios. The GEF Alternative provides this

global scenario information in an accessible and cost-effective format, leveraging national planning funds and making national-level planning efforts more effective and sustainable in the face of climate change.

75. **Regional assessments** make regional climate and biodiversity models available to countries using state-of-the-art methods. Without this support, most countries would use more simplistic and less complete information about climate change effects on species and ecosystems. In particular, comparable regional simulations of species and ecosystem movements to track suitable climate would be limited or unavailable. Countries would use published information from the scientific literature, which would be dated, would not be comparable between taxa or geographies and would be limited in geographic scope. Provision of regional models covering all of a biogeographic realm allows countries to plan using seamless data with no jumps along study boundaries and no gaps. This greatly improves the likelihood of maintaining species and ecosystem representation due to national planning efforts that are sound in the face of climate change. It allows national investments in protected areas planning to benefit from levels of climate change information and regional context not commonly available to national efforts.

C. Associated Baseline Projects

76. Associated baseline projects include efforts to build climate change science for adaptation and assessments, biological data warehousing and single and multi-country climate change planning for protected areas.

77. **Global climate simulations.** Global climate models have been downscaled to ca5km and ca1km horizontal resolution for use in biological modeling (Hijmans 2005). Over 20 GCMs in the CMIP5 series using Representative Concentration Pathways (RCP) scenarios are available for download at Worldclim.org.

78. **Regional Climate Models.** Regional Climate Models (RCM) are available for Africa from several climate modeling groups, including the regional climate modeling team at the University of Leeds. For Latin America, RCMs are available from the climate modeling group at INPE (Brazil) and from the Earth Simulator in Japan. RCM results for Asia are available from the Hadley Centre (UK), the Earth Simulator (Japan) and other groups.

79. **Velocity of climate change.** Velocity of climate change is the rate at which isotherms move across a landscape (Loarie 2009). Velocity of climate change has been determined globally to identify places in which species would have to travel long distances to track suitable climatic conditions, and where suitable conditions can be tracked over shorter distances. The geographic heterogeneity of velocity of climate change has been analyzed for both historical climate change and future climate simulations. Fine-scale analyses are available for some regions and can be constructed for others using downscaled GCM and RCM simulations.

80. **Generalized Dissimilarity Modeling.** Generalized dissimilarity modeling (GDM) is a statistical technique for predicting biological turnover from climate parameters (Ferrier et al 2007). GDM has been conducted globally in 2004 and again in 2014 by CSIRO. These results include predictions of geographic changes in biodiversity due to climate change. While GDM is run on supercomputers and is therefore cost-prohibitive to run for protected areas selection problems for climate change, existing runs can be queried to produce conservation planning results relevant to protected areas.

81. **Species occurrence datasets.** Species occurrence data suitable for modeling range shifts due to climate change are compiled globally by the Global Biodiversity Information Facility (GBIF).

However, GBIF does not house all available records and those records housed a GBIF may not be catalogued using the same taxonomy. As a result, several efforts are underway to compile occurrence data from vegetation plots, herbaria and museum records and vertebrate surveys and remove taxonomic ambiguity. Among the most advanced of these efforts is the BIEN consortium, which has compiled plant species occurrence records for Latin America from plots, collections and other sources.

82. **Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES)** is gathering biodiversity and ecosystem service information from multiple sources. IPBES is a conduit for information about biodiversity to reach the global community and also for connecting global datasets to regional and local applications.

83. **IUCN Traits Based Vulnerability Assessment.** The IUCN has recognized the need to identify species vulnerable to extinction risk due to climate change as part of their threatened species and IUCN Red List activities. Accordingly, IUCN has engaged its experts' groups to assess vulnerability of birds, amphibians and corals to climate change using life history characteristics (Foden 2014).

D. Project Consistency with GEF Focal Area and/or Fund(s) Strategies

84. The project responds directly to the GEF Biodiversity focal area, Objective 1 'improving the sustainability of protected areas systems'. The vision and purpose of the project are directed at ensuring that GEF-supported protected areas systems sustain their function as climate changes.

85. The project will support sustainability of protected areas systems by providing the information needed to improve their performance as species ranges and ecosystems shift in relation to protected area boundaries. The project will do this by conducting regional assessments and conservation planning, identifying additional areas where new protection can help maintain and improve species and ecosystem representation, both now and in the future under climate change.

E. Project Consistency with National Priorities, Plans, and Policies

86. The project is consistent with the Convention on Biological Diversity (CBD), with the CBD Aichi Biodiversity Targets and with country planning documents such as National Biodiversity Strategic Action Plans (NBSAP) and National Adaptation Programs of Action (NAPA).

87. The CBD seeks to conserve biodiversity, including species and ecosystems. The long-term attainment of this goal is only possible if conservation is robust to climate change. Protected areas are a major element of CBD conservation efforts. Representing species and ecosystems within protected areas is complicated when species and ecosystems move in response to changing climate. The project specifically provides information that will allow improved representation of species and ecosystems as climate changes, thereby directly contributing to CBD outcomes.

88. The Aichi Biodiversity Targets include focal areas that seek to protect the components of biodiversity and address threats to biodiversity. The project directly addresses protecting components of biodiversity, by providing information on how representation of species and ecosystems can be maintained or improved as climate changes. The project directly addresses climate change as a threat to biodiversity, and provides a mechanism for addressing the species and ecosystem movements that pose that threat.

89. NBSAPs frequently mention the need to maintain protected area goals in the face of climate change, but offer no concrete mechanism for reversing the loss of representation in protected areas as species and ecosystems move in response to climate change. Other NBSAPs do not fully or adequately address the issue of climate change and are in need of improved information on which to base recommendations for climate change adaptation.

90. NAPAs frequently address the need for adaptation of biodiversity conservation and protected areas systems, without concrete links to protected areas planning. Other NAPAs do not address protected areas or are still developing approaches for adaptation of biodiversity and protected areas systems. NAPAs are based on existing research and do not commission new research, so are dependent on information from research efforts such as will be provided by the project.

91. NBSAPs and NAPAs are in need of greater coordination. There is an 'expertise gap' in which protected areas specialists do not understand enough climate change biology for effective protected areas planning, while climate scientists do not understand protected areas issues well enough to propose adaptation actions. This project directly focuses on that gap, providing information that bridges climate change and protected areas expertise to effectively design protected areas systems that will meet their representation and other goals as climate changes.

SECTION 4: PROJECT STRATEGY

A. Project Vision and Objective

93. The project vision and objective are described in the Project Results Framework (Appendix 1). The vision and objective emphasize the GEF5 biodiversity strategy targets of ecosystem protection (Objective 1, Core Output 1) and threatened species protection (Objective 1, Core Output 2) and the high biodiversity, low resource countries most in need of high quality information on climate change impacts on biodiversity (GEF-5).

94. **Project Vision:** National protected areas systems that maximize representation of species and ecosystems as climate changes.

95. **Project Objective**: Provide countries in the Afrotropical, Neotropical and Indo-Malayan biogeographic realms (hereafter: 'the regions') with the assessments and data needed to improve planning, design and management of terrestrial protected areas for climate change resilience.

B. Selection of target geographies

96. The project targets the terrestrial part of three high biodiversity tropical biogeographic realms (Figure 2). The tropics are the general area of focus, with the non-island tropics the particular focus. The tropical islands of Oceania have high biodiversity but low potential for cross-border movement of species and ecosystems due to oceanic barriers to dispersal. The same is true for other tropical island nations.

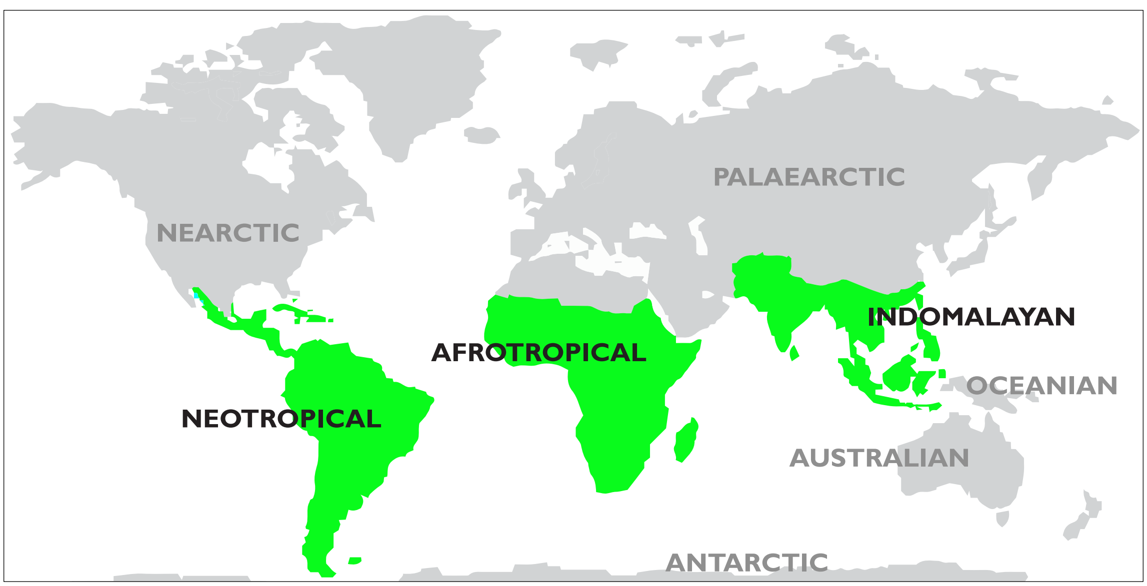


Figure 2: Project priority biogeographic realms. Global biodiversity can spatially be divided into 8 biogeographic realms (Udvardy and Udvardy 1975). Three of those realms encompass tropical species and ecosystems. These are the Neotropical, Afrotropical and Indo-Malayan realms that are the geographic targets of this research.

Source: Adapted from Udvardy and Udvardy (1975).

97. While protected areas systems in islands will need planning for climate change as well, these analyses are efficient on a national level, in contrast to national level assessments where cross-border movements are possible, which are not cost-efficient when conducted in isolation. As a

result, all islands that fall entirely within the national territory of one country are excluded from this project. This excludes all of the Philippines, Sri Lanka, Taiwan and all of Oceania except for New Guinea. These island states will need similar analysis, but conducted on a nation-by-nation basis. Because New Guinea has potential cross-border species and ecosystem movements, it is included in the project target geographies although it formally falls outside of the Indo-Malayan realm.

C. Project Components, Expected Outcomes, and Outputs

98. This project is organized in three components that will deliver eight interrelated outcomes. The Project's Results Framework is presented in Appendix I.

<u>COMPONENT 1:</u> Global data compilation and analysis of protected area vulnerability to climate change.

99. This component will focus on developing global scenarios of change, applicable in all three study regions and to developing methods that will be applied in the regional analyses. The component is organized around GEF5 protected areas core outputs of ecosystem protection (Objective 1, Output 1) and threatened species protection (Objective 1 Output 2) (GEF-5). To assess the impact of climate change on species and ecosystem representation, work in the component will use global datasets to assess species and ecosystem movements to track suitable conditions. Threatened species will include current IUCN Red List species and species likely to be threatened by climate change. Ecosystems will include both current ecosystems and potential future novel ecosystems created as species move and re-arrange in response to climate change.

100. While protected areas cannot stop species movements in response to climate change, they can protect key destinations and pathways from habitat destruction, thus giving species avenues of protection through which to move. Currently threatened species will move out of existing protected areas due to climate change (Araujo, 2004), requiring new protection in habitats where they remain or newly arrive to maintain their coverage in protected areas. As species move, they will disassemble and re-assemble, causing ecosystems to move and new, novel ecosystem to arise. New protected areas can maintain coverage of existing ecosystems and provide coverage to novel, emerging unprotected ecosystems.

101. This component will assemble evidence for analysis of ecosystem change and species movements on continental scales in the three study regions. Data compiled will include physical correlates of biological change, including velocity of climate change and generalized dissimilarity modeling. Biological data, especially analysis of climate sensitivity based on life history traits, will be included. Explicit models of species and ecosystem movements will be developed. Methods for applying these data in regional analyses will be developed. The combination of comprehensive databases and a standard set of methods will allow each regional assessment to proceed with comparable methods for assessing both ecosystem coverage and threatened species coverage as climate change progresses.

Outcome 1.1: Improved information on species range shifts and ecosystem change made available for regional assessment.

102. This outcome addresses species range shifts and ecosystem change due to climate change. These movements may result in loss of representation in protected areas. The outcome uses state-of-the

art biological models to assess these movements. The outcome will employ five major types of models, representing the spectrum of approaches that have been proposed in the peer-review literature. These are physical correlates of biological change, velocity of climate change, trait-based assessment, Dynamic Global Vegetation Models (DGVM) and species distribution models (SDM).

103. The end of the project target is to have data on species and ecosystem change available for regional analysis from a spectrum of methods; including species distribution models, ecosystem models, climate vulnerable traits assessment, velocity of climate change (including novel and disappearing climates) and Generalized Dissimilarity Modeling (GDM). Up to 5,000 species will be modeled, including 3,000 or more plants and 2,000 threatened or climate vulnerable vertebrates. Up to 150 ecosystems will be modeled, both as ecoregions and as plant functional types in Dynamic Global Vegetation Models. The indicator for this outcome is the number of species and ecosystem databases and geospatial data available to the regional assessment teams.

104. Models will typically consist of maps of current modeled distribution, maps of future modeled distribution, and difference maps. Each future distribution will be simulated at least two time steps (e.g., 2050, 2080), for up to 20 global climate models and for multiple RCP emissions scenarios for each GCM. These models will be assembled into GIS map databases for the regional assessments and will be made publicly available at the end of the project as electronic atlases. Atlases of GDM and velocity of climate change will also be prepared representing multiple time periods, multiple GCMs and multiple emissions scenarios. The present distribution of species with climate vulnerable traits (as defined by Foden et al 2013) will be mapped and a subset of these vulnerable trait species will be included in the species models.

105. Species distribution models (SDM) will be used to assess species range movements in response to climate change. SDM are useful because all species are expected to respond to climate change individualistically – moving to track suitable conditions that are unique to the species. This results in new species' ranges as climate changes, with species potentially moving into or out of existing protected areas. It also means that novel species assemblages may appear and existing assemblages disappear, causing existing ecosystems to move. Project SDM results will be used to identify loss of species representation in protected areas due to range movements, and the loss of ecosystem representation in protected areas due to changes in species assemblages.

106. The IUCN Trait-based assessment of species' vulnerability to climate change will be used to identify species and geographies in which special protected areas siting or management may be required to prevent extinctions (maintain representation). Available results address vertebrates (birds and amphibians) and the project will undertake initial triage for plants. The locations of vulnerable species will help identify areas and taxa for more detailed modeling in the regional assessments of Component 2.

107. Ecosystem movements will be assessed using Dynamic Global Vegetation Models (DGVM) and physical proxies for biodiversity. The DGVM results will be obtained from a standalone DGVM or from the land use change components of Earth System Models, an advanced form of global climate model that incorporates dynamic land use change feedbacks. DGVM results will be obtained for the same 20 GCMs and same time periods (2050, 2080) and emissions scenarios (RCP 8.5 and 4.5) as are used in the species modeling. Native DGVM resolution (typically 80-200km) will be downscaled to 5km using splining interpolation. DGVM plant functional types and biome types will be mapped onto global ecoregions to assess ecosystem representation change from present to future climates.

108. Physical proxies will be used to further assess ecosystem change. Velocity of climate change and Generalized Dissimilarity Modeling (GDM) results will be used to characterize geographic distances and similarity index space which climate change will forces ecosystems to traverse. GDM assesses biophysical differences between regions globally and regionally. It can be perturbed with climate change because climatic conditions are part of the physical template. The results of GDM will be used to inform spatial planning of protected areas by maximizing the differences in conditions represented in national protected areas systems, and hence the likely diversity of species protected, both in the present and in the future.

109. Velocity of climate change can be used to assess the distance a species or ecosystem must traverse to track suitable climatic conditions. Velocity of isotherms is most commonly used, but velocity can be calculated for precipitation and other climatic conditions. Velocity of climate change can be combined with known species climatic tolerances to produce bioclimatic velocity, which then corresponds closely to velocities calculated from project SDM results. While velocity of climate change and GDM cannot be translated directly into loss of representation, these metrics can help identify protected areas likely to be affected by loss of representation of species or ecosystems or both.

Output 1.1.1: Species range shifts due to climate change simulated at coarse scale and species vulnerability data compiled.

110. Data for species distribution modeling (SDM) are currently scattered in dozens of international, national and local databases. Species distribution changes are modeled in many individual research efforts, using diverse sources of inputs and methods. The project will consolidate data sources for SDM and run SDM simulations using uniform data input standards and methods. This will allow results to be compared within and across regions, enabling conservation planning with uniform inputs.

111. The project will produce change models for up to 3,000 plant species and 2,000 vertebrate species. Species with traits that make them vulnerable to climate change (Foden et al 2013), currently threatened species and species that may become threatened due to climate change will be prioritized. The indicator for this output is the number of species change models created or converted into formats readily accessible for regional assessment.

112. Species distribution models will be prepared at coarse (5km) scales for use in the regional assessments. To provide input for these global scenarios, species occurrence data will be compiled at 5km resolution for use in Maxent and other species distribution models. Modeling will be conducted at 5km for 2050 and 2080 scenarios, using 20 GCMs and RCP8.5 and 4.5 emissions scenarios for all species for which sufficient information exists in global herbaria and museum records such as the BIEN database for the Neotropics, the Missouri Botanical Garden *Tropicos* database and IUCN records.

113. Trait-based assessment will be used to identify species at particular risk as priorities for modeling, and to identify multi-country areas in which collaboration and cross-border conservation planning will be particularly appropriate. Trait based assessments have been produced by IUCN that can be used for this purpose for birds and amphibians (Foden et al 2013).

114. The project will map the distribution of species with climate vulnerable traits and model future distribution changes in these species. These maps and maps of modeled future distributions will be

compiled into GIS databases for use in the regional assessments and into electronic atlases for public distribution at the end of the project.

Output 1.1.2: Global models of ecosystem change compiled and formatted.

115. Global modeling efforts currently exist which can inform protected area planning on national and regional scales, but are not in formats that are regionally accessible or applicable to conservation planning applications. The project will compile these global results and extract information on ecosystems, velocity of change and biophysical dissimilarity into formats that can be used in regional climate change planning for protected areas. The relevant global models include Dynamic Global Vegetation Models (DGVM) and physical surrogates for ecosystem change, including Generalized Dissimilarity Models (GDM), and velocity of climate change.

116. Modeling of ecosystem change will be undertaken for approximately 150 ecoregions in the three project regions. Change in ecosystem extent and position will be mapped both through climatic models similar to the species models and through more complex global models known as Dynamic Global Vegetation Models (DGVM). All ecosystem models, whether created by the project or adapted from DGVMs, will be mapped for multiple GCM and emissions scenarios and multiple time periods. Physical surrogates of ecosystem change will be mapped to provide additional information on the challenges posed to ecosystems and species by climate change. The maps of ecosystem change, species change and change in physical surrogates will be compiled into GIS databases for use in the regional assessments and into electronic atlases to be made publicly available online at the conclusion of the project. The indicator for this output is the number of ecosystem change models or datasets created or converted into formats readily accessible for regional assessment

117. DGVM are run independently driven by climate model inputs, or are integrated into land surface simulations of GCMs and Earth System Models. In either case, the results are large global datasets covering the entire planet and multiple GCM/emissions scenarios. Data for the tropics will be extracted and converted into GIS datasets readily used in conservation planning software for use by regional assessment teams.

118. GDM is a statistical tool for assessing physical surrogates of biodiversity change. Like DGVMs, GDM is run on supercomputers and produces massive datasets. Information for the tropics will be extracted from the global runs. A system will be developed to use GDM results in conservation planning. Because the supercomputer simulations cannot be varied to simulate each protected area selection option, a system for using GDM results in iterative protected area selection and planning will be developed.

119. Novel and disappearing climates and velocity of climate change are physical surrogates of ecological change, which can be used to estimate ecosystem responses to climate change. Novel climates have been shown to correspond to no-analogue communities in paleo ecological studies. Disappearing climates have been shown to correspond to plant associations increasing in rarity. The velocity of climate change indicates the distance an ecosystem (or species) might have to move to maintain current climate conditions (for instance distance upslope to track warming temperatures). Novel and disappearing climates and velocity of climate change can all be calculated globally on desktop computers. Values for the tropics will be extracted from global runs and compiled into GIS datasets.

120. GIS datasets of present and future ecosystem distributions, GDM and velocity of climate change will be prepared for the regional assessments, and electronic atlases of the change maps will be made publicly available online at the end of the project.

Outcome 1.2: Conservation planning tools allowing regional assessment of representation losses resulting from species range shifts and ecosystem changes developed and readily available.

121. This component produces methods for the regional assessments that will be conducted in Component 2 and for the coarse-scale global scenarios assessment of this component. The global scenarios in turn provide context for the regional assessments.

122. The end of project target is that conservation planning software, including Zonation, Marxan and Network Flow are tested for application at continental scales for regional assessment. The best performing methods will be made available to the conservation community in each region and used in the regional assessment component of the project. The best performing methods may be current climate modules of Zonation, Marxan and Network Flow, or they may be improvements to these methods developed by the project. The indicator for this outcome is number of methods for conservation planning for climate change available to regional assessment teams.

123. Marxan, Zonation and Network Flow are all tools used in protected area network design to maximize species coverage while minimizing what needs to be protected. All can assess the current species coverage (representation) in a protected areas system and iteratively assess the most cost or area effective additions using an optimization (Network Flow) or near-optimizing algorithm. All three use maps or models of current species distribution to calculate whether and how fully each species is covered in a protected areas system.

124. Marxan, Zonation and Network flow all have climate change modules. These modules use models of species' future ranges to calculate representation in protected areas under climate change, just as they calculate representation under current climate. While species may move into or out of protected areas as they respond to climate change, the problem arises when range shifts to track suitable climate take species out of protected areas (Araujo et al 2004).

125. The first step in finding a climate change solution is to identify which species are losing coverage in protected areas because of their movements. This clearly undermines efforts to increase species coverage in protected areas, such as the GEF-5 core outputs. Once the species losing coverage are identified, new protection can be proposed, based on the expected future range of the species, to restore the lost representation. These same methods can be applied to analysis of ecosystem coverage in protected areas, both currently and under climate change.

126. The climate modules of Marxan and Zonation, and Network Flow are generally implemented by different research groups, studying different regions (e.g., South Africa for Network Flow, Australia for Marxan). This makes comparison of results and assessing strengths and weaknesses of each method difficult. These methods are most often applied to country datasets, while multi-country analyses are needed to capture species movements in response to climate change. The project will test all three methods to determine which method or methods to use in the regional assessments.

Output 1.2.1: Methodology for assessment of representation losses in terrestrial protected areas developed and peer-reviewed.

127. Assessing loss of representation of species using SDMs and ecosystems using DGVMs involves use of future scenarios. Because multiple modeling (SDM and DGVM) methods are available and because multiple GCM and emissions scenarios exist, this assessment requires uniform methods to produce comparable results across regions. The project will develop methods that produce comparable results using multiple GCM scenarios, emissions scenarios and species modeling methods. These ensemble methods will be applied in both the regional assessments and in the coarse-scale global scenarios.

128. The project will test Marxan, Network Flow and Zonation for ease of use, computational time required and optimality of results to determine which are most appropriate for use in the regional assessments. A standard method will be developed for assessing loss of coverage of species and ecosystems so that all three regional assessments use comparable methods. The indicator for this output is a method manual for regional assessment of representation losses for both species and ecosystems available to regional assessment teams.

129. Loss of species representation will be calculated using Marxan, Zonation and Network Flow by comparing coverage under present climate with coverage calculated using models of future species distributions under climate change. Loss of ecosystem coverage will be assessed in the same way. The results and computation times across the three methods will be compared.

130. Loss of species or ecosystem representation can also be assessed through proxies. The project will use velocity of climate change, novel and disappearing climates and GDM as proxy methods. No current standard exists for interpreting loss of representation from these proxies. The project will develop methods to estimate loss of species and ecosystem representation from velocity and GDM proxies, applicable to regional analysis. The product is a method's manual for assessing species and ecosystem representation loss from protected areas due to climate change.

131. The methods manual will be used by the regional assessment teams and may be used by country protected area planning agencies with sufficient technical resources. Operational versions of Marxan, Zonation and Network Flow and their climate modules are available for download online. The project will make any modifications to these modules available online as well. For countries without the technical capacity to use these tools directly, the project will develop a decision support software that will allow planners to visualize results of the analysis through maps and explore the impacts of alternate decisions in a GIS-like interface (see Outcome 2.3).

Output 1.2.2: Methodology for protected areas system planning to compensate for representation losses developed and peer-reviewed.

132. The project will review Marxan, Zonation, Network Flow and other available conservation planning software and adapt or combine them to create a tool that will allow protected area selection in locations that will restore representation lost due to climate change. The method developed will be the first standard approach to using diverse inputs from GDM, velocity, trait-based, DGVM and SDM simulations. It may involve an element of multiple conservation planning software and will result in an integrated tool that can be applied in the identification of high risk areas in Component 1 in each of the three regional assessments of Component 2.

133. The development of standard methods across all three regions will be extended to selecting additional protection to restore lost representation of species and ecosystems, a more complex

problem. The results of the analysis will be published in the peer-review literature. The indicator for this output is a methods manual for regional protected areas planning to maintain representation in the face of climate change available to regional assessment teams.

134. Once loss of representation has been assessed, new protection can provide additional representation to help compensate for that which has been lost. Marxan, Network Flow and Zonation accomplish this by searching for unprotected future populations of the same species that are losing representation. By protecting areas harboring these populations, representation (coverage) in protected areas is restored. The same principle is used to restore ecosystem representation. Areas containing unprotected ecosystems that are losing representation under climate change are prioritized for new protection.

135. Restoring and improving representation emphasizes the importance of the cross-border scope of the project. Ecosystem or species coverage lost in one country may need to be made up in another country. The best solutions can be found only by searching all countries in which the ecosystem or species is found.

136. The outputs of Network Flow, Marxan and Zonation climate change modules are more likely to diverge in selecting new protected area to restore representation, because each method uses a somewhat different approach to solving the climate change problem. As with the previous output, the project will calculate results using all three methods, comparing computational time and results, to select a best method or methods for application in the regional assessments, summarized in a methods manual.

137. As with the loss of representation analysis, the methods manual will be used by the regional assessment teams and may be used by individual country protected area planners where sufficient technical capacity exists. Where technical capacity isn’t sufficient to fully implement conservation planning for climate change, the project will provide a decision support tool that will allow visualization of main results of the project analysis and exploration of the consequences of major decisions (e.g., which of several candidate areas to protect) in a user-friendly GIS-like environment on laptop computers.

Outcome 1.3: Regional assessment teams have coarse scale information needed to understand priority areas for protected areas system planning to counteract the loss of representation due to climate change.

138. One of the first questions regional analysts will need an answer to is where multi-country actions to address climate change are likely to be needed. Some species range shifts will play out entirely within national borders, in which case nation-level planning will be efficient. Many other species will experience range shifts spanning two or more countries, in which cases national-level planning will be inefficient compared to multi-country planning. Among the primary purposes of the global scenarios component of the project is identifying likely areas requiring multi-country action. This allows prioritization of data collection for the finer-scale regional analyses. While the fine-scale analysis may identify other multi-country areas or modify those identified in this component, it is expected that most of the major multi-country regions will be identified in the global scenario analysis, greatly facilitating the work of the regional assessment teams.

139. The end of project target is that preliminary, coarse scale conservation planning is available for the three regional assessments. The identification of high risk areas on continental scales will help

focus the regional assessments on the multi-country areas most in need. The indicator of this outcome is that regional maps of high risk areas are available

140. Biodiversity models, threat models and conservation planning tools are needed to conduct these global scenarios. The biodiversity (species and ecosystem) models will be generated by Outcome 1.1. The threat models will be adopted from the existing literature and existing threat analyses of project partners. The conservation planning tools will be developed as part of Outcome 1.2. The conservation planning software will look for areas of remaining natural habitat that can reduce loss of species and ecosystem representation if protected. Priority of protection will be determined in part by the level of current and expected future threat experienced by candidate areas. The conservation planning conducted at 5km horizontal resolution will be course for national-level planning purposes, but completely adequate for identifying pressure points and areas where multi-country action may be required.

Output 1.3.1: Coarse scale conservation planning conducted for the three regions

141. Using the conservation planning software from Outcome 1.2 and the data compiled in Outcome 1.1, the project will conduct a coarse scale protected area planning exercise for all three regions. This will serve as a test run of methods to be used in the regional assessments and will help identify likely geographic and taxonomic emphases for the regional assessments.

142. The assessment of species and ecosystem losing representation in reserves will be combined with the recommendations for new protection to compensate for climate change losses. Areas with high numbers of species moving out of protected areas to track climate change, high numbers of protected areas losing species or ecosystem coverage, and areas with the most area recommended for new protection will be combined to identify 3-6 high risk areas per region.

143. The products are coarse scale regional maps of protected areas likely to lose representation of species or ecosystems and possible areas for new protection to maintain and improve representation. The indicator for this output is the number of geographies and taxa identified as most in need of regional assessment.

COMPONENT 2: Regional assessment and research-to-policy briefs

144. Regional assessments provide the most detailed and in-depth analysis of the project and provide the results summarized in research-to-policy briefs and the decision support tool. The regional assessments will tap the best regional expertise in climate change biology. They will mine data available only in the region. They will use Regional Climate Models (RCM) as well as GCMs. They will explore in detail the high risk areas identified in Component 1, as well as providing multi-country context for the entire region.

145. Each assessment will be coordinated by a regional lead scientist. The regional lead scientist will compile a regional assessment team composed of the best scientists from all parts of the region. The collaborating regional scientists and the regional lead scientist will design the program of work for the region, using the methods designed in Component 1. Grants administered by the regional lead scientists will support students and post-doctoral researchers working with collaborating regional scientists.

146. The regional assessments will build on the results of Component 1, adding detail and increased resolution, especially for the identified high risk areas. Regional assessments will use RCM as well

as GCM climate simulations, will tap the best available regional knowledge of biodiversity and climate change, will mine regional data sources and produce results responsive to regional needs and conservation context.

147. Based on the results of this research, national-level actions and multi-national level actions to counteract loss of representation will be identified. These actions will be summarized in research-to-policy briefs. Because protected area planning always involves multiple options, and exercising one options affects the availability of other options, actions to maintain representation are best presented in an interactive framework. The project will develop decision-support tools that allow interaction with the research results. Protected areas planners and managers will be trained in the use of these interactive tools.

Outcome 2.1.1: Fine grain regional assessments produced by leading regional scientists from the priority biogeographic realms.

148. Regional lead scientists representing institutions within each of the three regions will assemble teams of other regional scientists to conduct fine-scale assessments. These assessments will refine the coarse global scenarios and will elaborate country- and multi-country actions for use in research-to-policy briefs and decision-support tools.

149. The end of project target for the outcome is that regional assessments are available, providing context that enables efficient country-level assessments and actions. All countries in the target regions have regional protected area context and country-specific assessments of species and ecosystem change. The indicator for this outcome is that regional assessment results are available and published in the peer-review literature.

150. The regional assessments will consist of core analysis using data sources and methods common to all three regions, and regional analyses tailored to the specific needs and conditions of each region. The core analysis will allow comparison of results across regions, answering question such as whether species or ecosystems will lose representation and whether there are adequate options for new protection to maintain or improve representation. The regional analyses will focus on geographies of special interest, species of special interest to regional policymakers and other local-to-continental scale concerns not adequately captured in the core analysis.

Output 2.1.1: Scenario analysis refined at high resolution (1km) by teams of leading scientists in each priority biogeographic realm.

151. The regional lead scientist in each region will convene a group of 6-10 leading regional scientists to design and implement each of the three regional assessments. The regional assessment team will come from universities and research institutions within the region, cover fields of expertise including climate change science, species modeling and ecosystem change. The analyses comprising the regional assessment will be designed by the regional assessment team, working within the guidelines developed in Component 1 and using the insights generated in the global scenarios analysis. Each regional analysis will unfold over the course of 18 months beginning in year 2 of the project. The results of the regional analyses will provide fine-grain insights into the issues and areas in need of attention to make protected areas robust to climate change.

152. Publications will be in the peer-review international literature and in leading regional journals. Regional assessments are expected to investigate multiple dimensions of climate change in the

region, using the tools developed in Component 1. Additional data from the region, the use of RCM climate simulations and in-depth knowledge of the region will make the regional assessments highly relevant to regional and national decision-making and a valuable contribution to the literature on climate change and protected areas. The indicator for this output is the number of publications of regional assessment results.

153. The regional lead scientist is the hub of the regional assessment. They select collaborating regional scientists to compose the assessment team. They convene the inception meeting for the assessment at which the assessment team designs the regional assessment in detail. The regional lead scientist conducts the final analysis for the assessment, synthesizing contributions from each team member. The regional lead scientist provides the technical substance for the research-to-policy briefs and the decision support tool.

154. The regional collaborating scientists compose the regional assessment team, under the direction of the regional lead scientist. The regional collaborating scientists will lead focused studies for the assessment, as defined by the team in the inception meeting. The regional collaborating scientists will provide feedback on other parts of the assessment research, participate in monitoring and present research-to-policy briefs to protected areas agency staff in their home country.

155. The regional assessments will span 12-14 months. The design of the regional assessment will be finalized by the regional assessment team at the inception meeting for the assessment. At that meeting, research roles and assignments will be agreed and small grants assigned to cover needs of the regional research. The regional collaborating scientists will then spend the next 8-10 months conducting the assessment research. The assessment process concludes with a synthesis meeting at which the products of the assessment components are assembled into the final assessment product. At that meeting, recommendations for the research-to-policy briefs are developed and the scenarios for inclusion in the decision support tool are decided.

156. Each regional assessment will draw on all of the sources of data developed in Component 1 of the project. The species and ecosystem change data from global sources will form the backbone onto which more detailed regional information will be built. Additional species and ecosystem change data available for the region will be identified. Additional data for geographic priorities within the regions will be pursued. The regional assessment team will combine global data and regional data to provide the most complete possible picture of climate change impacts in the region.

157. Conservation planning is the final step of the regional assessment. It will generally be conducted by the regional lead scientist. It will produce the key recommendations of the assessment for the research-to-policy briefs and provide the data for the scenarios of the decision support tool. The regional assessment teams will use the conservation planning methods developed in Component 1 to assess loss of species and ecosystem representation due to climate change. Protected areas particularly affected by loss of representation due to climate change will be identified. Species at risk due to loss of representation will be identified. Ecosystems losing most or all representation will be identified. Protected areas harboring large numbers of climate change sensitive species or large areas of species or ecosystem boundary shifts will be highlighted.

158. The products from this output will be maps of protected areas losing representation, tables of species and ecosystems losing representation, and summaries of the regional assessments in peer-review publications.

Output 2.1.2: Potential regions for protected areas expansion to offset loss of representation identified.

159. Recommended locations for additional protection to maintain and improve representation will be suggested based on the outputs of the conservation planning. Representation loss due to climate change-related species or ecosystem movements can be recovered by placing new protection in areas that harbor the moving species.

160. Candidate areas for new protection may be in the same country in which a species has lost protection due to climate change, or it may be in a neighboring or more distant country. Some large unprotected habitats may offer compensatory representation for numbers of species and ecosystems. Other habitats may be small additions to existing protected areas that allow a species to move through protected habitat from its current range to its future range (Williams et al 2004). The indicator for this output is the number of potential priority areas for expansion of protection that are identified.

161. The conservation planning tools based on Network Flow, Marxan and/or Zonation developed by the project (see Component 1) will allow regional assessment teams to design efficient protected areas systems for maintaining and improving representation. These conservation plans include options for choices among several candidate sites for new protection. Once a site is selected in the plan, representation is recalculated and the next most valuable set of site choices is highlighted.

162. Since no model or algorithm can perfectly simulate the future, the expert opinion of members of the regional assessment team will be used to interpret modeling and conservation planning results. Expert opinion will be used to help eliminate poor or unlikely choices for additional protection, to choose sites with high social benefit, and to provide interpretations of the modeling and planning results to help protected areas policymakers and technical decision makers understand and use the assessment results.

163. Loss of representation of species and ecosystems from protected areas is expected due to climate change, but has never been estimated in a comprehensive way on regional scales. The results of the regional analysis will identify remaining natural habitat that might be added to protected areas networks to improve representation of species and ecosystems under climate change. Where there is no remaining natural habitat or no scope for additional protected areas due to non-climate threats, the regional analyses will suggest management actions, such as translocation, to avoid loss of representation.

164. The product of the output is a number of potential priority areas for expansion of protection to maintain and improve representation, and identification of areas and species for management where there is no scope for additional protection**.**

Outcome 2.2: Research-to-policy briefs prepared and presented to government protected areas agencies.

165. The results of the regional analyses will identify species and ecosystems that may lose representation due to climate change, and pinpoint protected areas from which those loses are projected to occur. To alert protected areas systems managers of where these vulnerabilities lie, each regional assessment will produce research-to-policy briefs outlining losses of representation and actions that can help restore representation. Two types of briefs will be prepared, those addressing multi-national actions and those addressing national actions.

166. The end of project target is for protected areas policymakers and technical decision makers to have access to systematic information on climate change and priorities for climate change response. The indicator for the outcome is the number of multi-national and country research to policy briefs presented to protected areas agency staff.

167. Research-to-policy briefs are short, easy-to-read reports, well-illustrated with maps of potential species and ecosystem movements in response to climate change, that highlight important possible protected areas actions for policymakers. A typical research-to-policy brief is a 5 page printed color document that will be presented to protected areas agency staff with several additional copies for circulation among staff and an electronic copy for all interested staff. Personal presentations will be possible for up to 12 priority countries in each region, other countries will receive printed copies by mail and electronic copies by email.

168. Research-to-policy briefs will address both collaborative multi-country actions and actions that countries can take on their own. Multi-country briefs will be presented to 2 groups of countries in each region. These country groups are likely to the same high risk areas identified in Component 1, modified by the more detailed findings of the Component 2 regional assessments.

169. Multi-country briefs identify collaborative actions that require coordination among two or more countries. Such actions can be implemented through existing trans-frontier management entities, such as the Kalahari-Gemsbok National Park complex between Botswana and South Africa. Or they may suggest new cross-border or tri- or multi-national management efforts that are needed to adapt to climate change.

170. Country briefs address actions that can be taken unilaterally by countries. While these actions may be suggested by climate-driven events in other countries, they can be implemented without multi-country collaboration. For instance, climate change may drive a range shift in a species currently represented in the protected areas of one country, causing loss of representation, requiring new protection is needed in a second country to compensate for the losses. The loss of representation would be treated in one country brief, while the additional protection would be addressed in the brief of the second country, since the action can be taken by that country alone.

171. Both multi-country and country briefs will emphasize maps of reserves that lose species or ecosystem representation and opportunities to restore representation in new protected areas. They will illustrate species movements in threatened species through maps showing current range, future range and overlap. They will illustrate major ecosystem changes with similar maps of present and future range. Each brief will highlight key protected areas additions or management strategies that will help cope with climate change. Each brief will include a section on dealing with uncertainty. Briefs will explain the use of the project decision support tools (see Outcome 2.3) for decision makers who seek a more interactive way to explore project results.

Output 2.2.1: Research-to-policy briefs delineating multi-country technical issues and multi-national collaborative response opportunities associated with species and ecosystem changes.

172. Multi-country issues arise when as species' range boundary moves across a national border due to climate change or when critical populations of a species move from one country to another. Similar changes in ecosystems can require multi-country solutions. Complex species and ecosystem changes may implicate more than just two countries. For instance, a when a rare species found in three countries undergoes major loss of suitable conditions, action in all three countries may be required to prevent extinction. But the marginal costs of action may be very different in the

different countries, depending on land uses and threats. It may be most cost-effective to plan across all three countries to achieve extinction avoidance at least cost. Research-to-policy briefs outlining multi-country technical issues such as these will be produced by each regional assessment. They will be presented to individual country protected areas agencies and to regional planning bodies.

173. The project will present research-to-policy briefs in person at protected areas agencies for 2 multi-country groups (4-6 countries total) per region. Remaining countries implicated in multi-country briefs will receive hard copies of briefs by mail and electronic copies by email. The indicator for this output is the number of multi-country research-to-policy briefs distributed to protected area agency staff.

174. Examples of multi-country actions include adding protected area in one country in anticipation of species movements from another country, translocation of species from one country to another when natural dispersal cannot keep pace with climate change, or fire management to maintain a rare ecosystem type that is losing representation in protected areas due to climate change. The research-to-policy brief will identify opportunities for collaborative action, and may suggest mechanisms for collaboration, such as where trans-boundary management arrangements that already exist would facilitate actions need to adapt to climate change.

175. Multi-country briefs will be presented to protected areas management agencies in the individual implicated countries. They will be presented to regional protected areas management entities including transboundary management authorities, peace parks committees, and parks sub-committees of regional development entities such as SADC. The exact management entities targeted for presentation will be determined by the country makeup of the entities and the countries implicated in the brief.

176. The products of the output are multi-country briefs for several country pairs or clusters in each region.

Output 2.2.2: Research-to-policy briefs on country technical issues and opportunities for protected areas adaptation presented to government protected areas management agencies.

177. Country-level actions will be addressed in separate research-to-policy briefs for each of the 82 countries across the three regional assessments. The project will produce country-level reports that outline individual technical issues (e.g., the needs of one species due to expected climate change effects) and systematic issues (e.g., the need to improve institutional capacities where several species or ecosystems need similar responses).

178. All countries receiving in-person presentation of a multi-country brief will also receive in-person presentation of the country brief. An additional 6 countries will receive personal presentation of the country brief in each region, for a total of 12 personal presentations of country briefs in each region. Personal presentations of country briefs will be followed by training in use of the decision support tool (see Outcome 2.3). The indicator for this output is the number of country research-to-policy briefs presented to country protected area staff.

179. The country briefs will address both management actions and potential policy implications. For example, a species that is losing its main representation in a protected area due to climate change, but has no suitable habitat outside the protected area, might be prioritized for in-situ management at a particular site. A species whose range might be moving between protected areas may undergo a period of residence in unprotected lands, making it a candidate for threatened species status.

Policy change may be required if a protected area's statutory purpose is to protect a species (e.g. Gemsbok National Park) or ecosystem that may no longer be found there in the future. Threatened species legislation may need revision to account for projected effects of climate change on species abundance and representation in protected areas.

180. Country briefs will be presented during in-person policy briefings to senior executives and system planners (policymakers and technical decision makers) as well as select field managers by members of the regional assessment team in priority countries. Select countries will be targeted for personal presentation by assessment team members, based on the number of species and ecosystems implicated in the country brief. Remaining countries will receive briefs by mail and electronic copies.

181. The products of this output are 82 country research-to-policy briefs

Outcome 2.3: Decision support tools for visualization and interactive use of research results.

182. Cumulative impacts across many species will result in choices to be made – choices in possible sites for protection to counter representation losses, choices between which species and areas to address first. These decisions can be identified in research-to-policy briefs, but making the decisions requires more sophisticated interaction with the results of the regional assessments. For example, adding protection to a patch of natural habitat may reduce loss of representation for multiple species, changing the need for new protection in other parts of those species' ranges, thus changing the priority for conservation for other unprotected habitat patches. This means that there is not just one answer to climate change and that a decision in one part of a species' range has repercussions in other parts of that species' range and for other species. Sound decision-making requires that these options can be explored in an iterative manner, exploring options with stakeholders to arrive at socially acceptable solutions that meet representation goals. The MIDAS decision support system has been developed to meet this need for marine protected areas planning (Patel et al 2011) and will be adapted to terrestrial protected areas for this project.

183. The end of project target for the outcome is delivery of a MIDAS-based decision support tool to decision makers in up to 12 countries per region. This interactive tool will allow exploration of multiple options and decision consequences on a laptop computer. The indicator for this outcome is decision support tools developed and disseminated.

184. The project will develop a decision support tool based on the MIDAS framework and train protected areas planners in its use. MIDAS has at its core a look-up library of results from modeling. In this case, the models will be simulations of species movements, ecosystem change, and conservation planning solutions that restore representation lost due to climate change. The MIDAS interface allows users to select decision options - for instance selecting an area for new protection – and then to see the result in map and numerical form from the MIDAS library of modeled runs – for instance seeing the level of ecosystem representation restored by the addition of a protected area.

185. The MIDAS-based decision support tool will allow protected areas agency staff to explore the consequences of decisions taken now for conservation outcomes under climate change decades into the future. The conservation planning tools developed by the project (Network Flow, Marxan or Zonation-based) will indicate areas that are most efficient in restoring species and ecosystem representation lost to climate change. But those technically most efficient areas may not meet social agendas, so managers may want to select sub-optimal sites for new protection. The decision support tool will let managers see the consequences of these decisions in terms of total amount of

protected area needed to fully restore lost representation, or in terms of additional land acquisition costs, all on an ordinary laptop computer.

186. The tool will let managers explore different lines of evidence, including species models, ecosystem models, GDM and trait-based assessment. They will be able to experiment with different spatial configurations, and to understand the consequences of different protection choices for multiple species and ecosystems. Training sessions will give managers or technicians the skills to operate the decision support system and work with policymakers to explore implications.

Output 2.3.1: Option-exploration decision support tool developed and protected areas planners and policymakers trained in its use.

187. In addition to the recommendations of the research-to-policy briefs, dynamic tools are needed to help policymakers and planners weigh multiple effects of protected areas decisions and to explore tradeoffs between climate change actions and other needed protected areas actions. For instance, a species representation decline may suggest the need for additional protection, but the exact site of that protection will affect representation of other species and help compensate for other climate-related loss of representation. Policymakers and planners need to be able to explore these multiple ramification and weigh them against social and policy factors.

188. Half-day training sessions will be held for agency technical staff on the same days that research-to-policy briefs are presented to agency staff. In this way, agency policymakers can see major decision points in the research-to-policy briefs, while technical staff will learn how to interactively explore the decision space surrounding climate change. The indicator for this output is number of protected areas agency staff trained in and using the decision support tool.

189. The project will develop a decision support tool specifically to address this need for dynamic, iterative planning. The support tool will be based on the Marine Integrated Decision Analysis (MIDAS) platform (Patel et al 2011). MIDAS was developed for application in fisheries decisions, but can be adapted to any multi-dimensional decision problem. The project will modify the basic MIDAS architecture, adapting it for use in decision support for terrestrial protected areas and climate change.

190. The core of MIDAS is a series of look-up libraries populated with research results. Users define solution choices they would like to explore from a menu, and MIDAS calls the appropriate research results. This allows many time-consuming modeling or conservation planning runs to be at a user's fingertips in real time. The user is not able to infinitely vary the scenarios they would like to explore; rather MIDAS gives users a range of solutions to choose from, and lets them iteratively explore the consequences of those solution choices.

191. In the case of this project, the focus of the MIDAS-based decision support tool will be on protected areas planning. In the conservation planning software the project is using, each protected area choice re-orders all subsequent choices. To populate the decision support tool, the project will run large number of possible choices in the conservation planning software, using the results to populate the look-up library in MIDAS. The lookup library can be queried on a laptop computer through the decision support tool interface. This allows users to quickly explore different options, with MIDAS providing results from previous analyses, rather than having to wait for each run to be programmed and completed.

192. The decision support tool will let users explore different climate impacts and protected areas outcomes suggested by different lines of evidence. For example, if a protected area planner wants

to compare recommendations for additional protection from species distribution modeling versus velocity of climate change, MIDAS can call up those sets of results for comparison.

193. Training in use of the decision support tool will be given to protected areas agency staff in 12 priority countries. In those countries, policymakers, planners and select protected areas managers will be trained in use of the tool in intensive full-day seminars. The trainings will be conducted by members of the regional assessment team. Up to 12 staff members and NGO collaborators will be trained per session.

194. Individuals trained in MIDAS will be given online access to the decision support tool. Online refresher tutorials will be available. Users will be encouraged to contribute case studies illustrating the incorporation of climate change into national protected areas planning or multi-national collaboration.

195. The products will be protected area agency staff trained in use of the decision support tool.

COMPONENT 3: Monitoring and Evaluation

196. Researchers from the project core team, the regional assessments and the decision-support team will be engaged in an interactive project management system that includes monitoring and evaluation. Progress in each Outcome will be monitored by the Outcome team, with products evaluated by the project core team. An adaptive research model will be used, in which outcomes in the global scenario analysis inform the regional assessments, and the results of regional assessment influence global scenarios in an iterative process.

Outcome 3.1: Participatory M&E framework and an informative and proactive feedback mechanism integrated into all levels of project cycle management.

197. A participatory monitoring and evaluation framework will be employed, keyed to the project results framework. All project researchers will enter monitoring data relevant to their project components. Outputs will be evaluated by researchers using them elsewhere in the project.

198. The end of project target for this outcome is the leading scientists working together across disciplines, using an active monitoring framework to help move knowledge ahead synthetically. Knowledge links across disciplines will promote learning within the project. The indicator for this outcome is a monitoring plan completed and reflected in data compilation and regional assessment work plans.

Outcome 3.2: Adaptive implementation of scenario modeling.

199. An adaptive research model will allow results of the global scenario analysis to inform the regional analyses, and the regional analyses to test the assumptions underlying global scenarios and modify them as the research progresses. The methods developed for regional assessments will be tested by a science advisory panel and adapted. Sub-regional and country context will be used to adapt regional assessments. In all cases, early results will be used to test and refine project assumptions and methods.

200. The end of project target for this outcome is scientists in three major tropical regions systematically learn from one another. Sharing of insights across regions speeds learning within regions. The indicator for this outcome is the number of adaptations to regional assessments based on learning from other regions.

D. Project Timeline

201. The project will unfold in three major phases; global methods and data, the regional assessments, and the presentation of decision support tools (see Appendix II for Project Timeline). In the first phase, project methods will be defined and preliminary analyses performed at a 'global' scale, across all three tropical study regions. In the second phase, methods, data and preliminary coarse-grain analyses from the first phase will be combined with regional data and analyses to complete regional assessments. The third phase will put in place decision analysis tools that will allow protected areas planners to access and interactively work with the regional assessment results.

Phase 1:

202. The project inception meeting will be used to define overall project methods and refine the project timeline. The core team will develop general principles for applying the range of tools (SDM, DGVM, trait-based assessment, GDM and velocity) the project will use. The core team will discuss conservation planning software and tools for interpreting each of the methods. Additional methods may be added based on the judgment of the core team.

203. The project core team will use the recommendations of inception and subsequent advisory meetings to create a final methodology for all modeling in the project. The methods drafted by the core team will then be peer-reviewed by the project science advisory panel. The final methods, reflecting changes made based on the input of the science advisory panel will then be finalized. All three regional assessments will use this single set of methods.

Phase 2:

204. The second phase encompasses the three regional assessments and will cover 18 months of the project. Taking the outputs of Phase 1, the three regional lead scientists will assemble teams of leading regional scientists to conduct each assessment. This phase begins with planning meetings for the regional assessments. Each planning meeting will establish the regional assessment team, the work plan and a timeline. Supported by project small grants to postdoctoral and student researchers, the work of each assessment will unfold over 12-14 months. Each assessment will culminate in a meeting of the assessment team to review research results and draft country recommendations.

Phase 3:

205. The third phase translates the regional assessment results into research-to-policy briefs and decision support tools used by planners and policymakers and will last 6-8 months, depending on the region. Decision support tools will be built in the early part of this phase, resulting in interactive visualization computer applications that can be used by non-specialists. The latter half of Phase 3 will be devoted to presenting research-to-policy briefs and training planners and policymakers in use of the decision support tools.

E. Expected Global, National, and Local Environmental Benefits

206. **Global benefits.** The project will help secure conservation of global biodiversity in the face of climate change. Representation of species and ecosystems may be lost as species move in response to climate change and ecosystems reorganize. The project will provide the information necessary to reverse this erosion of representation, thus making existing conservation system goals attainable even as climate changes. This will help donors strategize and prioritize protected areas and climate change adaptation investments.

207. The project results will allow the design of expansion of protected areas in ways that are robust to climate change, further ensuring that the gains of GEF and other conservation investments are protected against climate change. Project outputs will therefore secure conservation of globally significant biodiversity. They may also materially assist in sustainable forest management.

208. **National benefits.** National protected areas planning agencies and national policymakers will benefit from a better understanding of the impacts of climate change on species, ecosystems and protected areas. The project will provide climate change insights across entire biogeographic realms that would be difficult and prohibitively expensive for each country to develop independently. National planners will be able to interface with planners in neighboring nations in an efficient way as a result. National protected areas plans and policies for dealing with climate change will be able to be developed in regional context as a result of the project. National efforts will therefore be better informed, better able to ensure the conservation of globally significant biodiversity within national borders in the face of climate change, and be more efficient, freeing resources to address deeper dimensions of climate change and other pressing threats.

209. **Local benefits.** Local communities participating in ecotourism associated with protected areas will benefit from better conservation of the biodiversity assets that tourism relies upon. Planning of tourism for changing species composition will enable greater sustainability in local tourism industries. Local communities may also benefit from better understanding of plant functional changes that may affect ecosystem services such as water provision and pollination, in addition to the biodiversity benefits to tourism.

F. Linkages with other GEF Projects and Relevant Initiatives

210. This project builds on the experience of the GEF Protected Areas Resilient to Climate Change project in West Africa and shares motivation with the GEF supported effort to integrate climate change into protected areas in Mexico. Both of these efforts complement the present project by being more in-depth analyses into the same issues addressed by the project. They provide tests of the project broad-scale analyses and may benefit from the additional geographic context provided by the project.

211. The PARCC project examined the resilience of West African protected areas to climate change. The project term is 2010-2015 and project final products are being written up now. The project engaged planners over a multi-country region, examined climate change over that region and examined possible species range shifts due to climate change. This project will interface with PARCC leaders at IUCN and the University of Durham to learn modeling lessons, and with select stakeholders to improve decision-support tools. This project will not select West Africa as a focal region for decision support, as a result of the in-depth analysis already provided there by PARCC.

212. The Amazon Biome project of WWF is not GEF funded, but has strong complementarity to the present project. Amazon Biome is funded by the German Climate Initiative (IKI) and seeks to

integrate climate change into decision-making about Amazonian conservation. The project will maintain close communication with Amazon Biome and share modeling results with the Amazon Biome stakeholder's network.

213. ScenNet is an initiative of IPBES that seeks to create scenarios of biodiversity and ecosystems to inform conservation and IPBES reports. ScenNet is a multi-country effort and will be working on climate change scenarios as well as other scenarios of biodiversity change. The project will integrate scenario development where possible and interface with ScenNet for stakeholder engagement where project and ScenNet audiences coincide.

Table 1: Other Relevant Projects and Initiatives

GEF Projects Other Projects/Initiatives	Linkages and Coordination
PARCC West Africa (GEF)	Project completed, lessons learned incorporated into SPARC.
Amazon Biome Project (WWF-IKI)	Partially concurrent with SPARC, will liaise for stakeholder engagement.
ScenNet, Global (IPBES)	Partially concurrent with SPARC, collaborating for stakeholder engagement.
Strengthening Management Effectiveness and Resilience of Protected Areas to Safeguard Biodiversity Threatened by Climate Change, Mexico (GEF)	Partially concurrent with SPARC, will coordinate to capitalize on modeling and analyses already completed. Note that only a fraction of Mexico falls within the SPARC focal region (Neotropical realm).

G. Project Stakeholders

214. The Convention on Biological Diversity (CBD) and its signatory nations are the ultimate beneficiaries of this project. National protected areas agencies in the 82 countries of the Neotropics, Afro-tropics and Indo-Malayan realms are the immediate beneficiaries. Local, national and international conservation NGOs will benefit from improved protected areas planning for climate change. Local tourism enterprises and ecosystem services recipients may also be positively affected by the project.

215. The CBD and its signatory countries will be positively affected by the project as the information generated by the project will enable national protected areas agencies to more effectively site and manage protected areas to conserve biodiversity as climate changes. Without the project, CBD goals and participating countries' ability to help meet CBD targets would be compromised by climate change, since present systems are not designed with species and ecosystem movements in mind. With the project, CBD goals will be better achieved, as species and ecosystem representation is maintained and planning for new protected areas will be able to incorporate species and ecosystem dynamics.

216. National protected areas agencies will be able to plan protected areas systems with state-of-the-science information on climate change. This will allow national agencies to assess possible losses of species and ecosystem representation due to climate change. It will allow them to extend protection to areas that can help compensate for lost representation. These agencies will be able to plan new protection incorporating knowledge of how species and ecosystems may move in response to climate change, thus choosing sites that will simultaneously improve current representation and maximize representation goals under future climate changes.

217. Local, national and international conservation NGOs focused on biodiversity conservation will benefit from improved performance in their national agency partners and from better information about the effects of climate change and how to counteract negative effects of climate change on species and ecosystem representation in protected areas. This will help NGOs achieve their missions, let their efforts to combat other threats take place in a more complete context, and provide new rationales for fund-raising.

218. Local communities may benefit where advance planning decreases community-protected area conflict. Last-minute actions to rescue species on the brink of extinction due to climate change may conflict with community desires for protected area management. Information about likely climate change impacts can reduce the likelihood of extinction and reduce the need for urgent, last-ditch conservation efforts. Advance planning can help anticipate conflicts and reduce any negative impacts on communities. Local tourism enterprises and community sharing of park entrance fees (where practiced) may benefit from retention of species that are the focus of tourism interest.

Table 2: Project Stakeholders

Stakeholder	Interests in the Project	Stakeholder Influence in the Project	Project Effect(s) on Stakeholder
Convention on Biological Diversity signatories	Long-term sustainable conservation of biodiversity	Through national protected areas agencies	Positive - improves likelihood that biodiversity will be conserved as climate changes
National Protected Areas Agencies	Receive information that will improve planning and management of protected areas	Through definition of species of interest, through identification of existing and planned protected areas, through use of decision support tools	Positive – improves protected areas planning for climate change; results in more efficient and effective planning of new protected areas
International Scientific Community	Participants in evolving understanding of climate change impacts on species, ecosystems and protected area functioning.	Integrating state of the art knowledge through expert advice and peer review re: climate modeling and effects upon ecosystems and species is central to the project.	Will benefit through increased knowledge of climate change impacts in high-biodiversity tropical regions.
National biodiversity conservation NGOs	Improved performance of protected areas agency counterparts; improved integration of protected areas into national climate change planning	Through interaction with the national and regional scientists working in the regional assessments	Positive – improved working environment and improved information for conservation decisions
International biodiversity conservation NGOs	Improved performance of protected areas agency partners; improved integration of protected areas into national climate change planning	Through interaction with the national, regional and international scientists working in the regional assessments	Positive – improved working environment and improved information for conservation decisions
National climate change	Improved consideration of	Through national	Positive – improved national

planning agencies	protected areas in national climate change adaptation plans	protected areas agency and NGOs	climate change adaptation planning
National development planning agencies	Improved consideration of climate change and protected areas in national development plans	Through national protected areas agency and NGOs	Positive – reduced possible future conflicts between protected areas and development plans
Regional and National Scientists	Key users and providers of understanding of climate change impacts on species, ecosystems and protected areas.	The results of the project will directly inform regional climate change biology research efforts	Positive – Provides local research tools and capital that contribute to a better planning process for avoiding extinctions due to climate change, with sufficient lead time to consolidate research and

H. Project Assumptions Risk Assessment and Mitigation

219. The project faces three main types of risk. First, uncertainties in global climate models are substantial, and must be constrained within the project analyses well enough to allow information useful for protected areas planning to emerge. Second, protected areas managers must be able to use information on climate change in systematic planning of protected areas. Finally, there must be enough remaining natural habitat to extend protection to areas that will compensate for representation loss to climate change.

220. Each of these types of risk affects the project in different outcomes. Protected areas managers ability to use climate change information is most important in Outcomes 1.1, 2.1 and 2.2, and the related risk of not using systematic planning is relevant to Outcome 1.2 and 2.3. Uncertainty in climate simulations is important throughout the project, but is especially relevant in Outcomes 1.1 and 2.3, where information is provided to decision-makers. Sufficient natural habitat for new or extended protected areas is critical where national planners apply climate change information (Outcome 2.3).

Table 3: Project Assumptions

Project Outcome	Key Assumptions
1.1, 2.1, 2.2	Protected managers will be able to understand and use information on species range shifts and ecosystem movements due to climate change.
1.1, 2.3	Uncertainty in global climate model simulations is low enough to permit constructive management decisions about climate change.
1.2, 2.3	National protected areas agencies engage in systematic planning and use conservation planning tools.
2.3	Sufficient natural habitat remains to have scope for new protected areas and for extension of protection to deal with climate change.

I. Project Risk Assessment and Mitigation

221. The three main risks faced by the project are climate projection uncertainty, lack of stakeholder uptake and insufficient natural habitat, as described above. These risks are well recognized by the project and the project uses specific tools to overcome these risks. In addition to the risks associated with project assumptions, there is one risk associated with project management, which is the willingness of scientists to participate in the regional assessments.

222. Climate projection uncertainty is inherent in all climate change assessment and planning. Ensemble forecasts are the leading recognized tool for dealing with uncertainty. The project will use ensemble forecasts in the manner recommended by the IPCC. Scenario planning is another major tool for dealing with uncertainty. The project will incorporate scenario planning in both the global and regional phases of the analysis.

223. Stakeholder uptake is essential to project success. The project is designed to present results to stakeholders in two formats to improve likelihood of uptake. The first product is written, and is accessible even to policymakers with no technical background. The second product is decision support tools, which is accessible to agency technical staff, and to non-specialist policymakers working with agency technical staff. Person-to-person interactions and training with protected agency staff will be used to improve understanding of project outputs and decision support tools. The need for systematic planning is addressed by integrating systematic planning tools directly into the decision support tool package.

224. Lack of sufficient natural habitat to add new or extend protected areas constrains the ability to add protection to rebuild representation of species and ecosystems lost due to climate change. This is a risk in areas of high habitat loss. Where habitat loss is so severe that there is no scope for possible new or extended protected areas, species movements have to be accommodated within existing protected areas. This can be done by enhancing habitats within protected areas to maintain moving populations (and avoid local extinctions), by habitat management to maintain existing populations in their existing locations (e.g., managing fire to prevent ecosystem change) or by artificially translocating species between protected areas where natural range movements are blocked by large areas of no natural habitat.

225. The risk associated with scientist willingness to participate in regional assessments arises because scientists are not directly contracted to perform this work. The project addresses this risk by making participation in the regional assessments professionally attractive, and through small grants. The regional assessments will result in high-profile publications, which will attract participation from top regional scientists. Small grants will be used to facilitate student and postdoc work on the project, further facilitating regional scientist participation.

Table 4: Project Risk Assessment and Mitigation Planning

Project Outcome	Risks	Rating (Low, Medium, High)	Risk Mitigation Measures
1.1, 1.2, 2.1, 2.2, 2.3	National protected areas agencies do not use systematic planning or cannot use climate change information	Low	Training in how to use climate change information and decision support tools; production of decision support tools that explicitly incorporate systematic planning

1.1, 2.3	GCM uncertainty undermines agency confidence in ability to make meaningful decisions	Medium	Use of IPCC-standard ensemble procedures to manage uncertainty; training to deal with uncertainty through ensembles and scenarios
2.3	Lack of remaining habitat for new or extended protected areas	Medium	Recommendation of management actions in existing protected areas in place of additional protection
2.1	Regional scientists' willingness to participate in regional assessments	Low	Provision of opportunities to participate in high-profile peer-review publications; small grants

J. Sustainability

226. Many of the project outcomes are self-sustaining; some may qualify for funding as climate change adaptation. The project Outcomes related to siting of new protected areas are self-sustaining, in that new protected areas designed for climate change are no more expensive to maintain than are protected areas not designed for climate change. Where protected areas are extended to compensate for lost representation, or where management of existing protected areas is the only option because there is no scope for new protected areas, then additional costs occur.

227. Selection of sites for new protection that are robust to climate change carry no additional costs unique to climate change and are therefore self-sustaining. Sites are selected for new protection using multiple criteria, including numbers of species represented, ecosystems represented, level of threat and land cost or availability. This project allows climate change to be added as one of those criteria. Specifically the project will allow protected areas agencies to select areas in which loss of representation of species and ecosystems is minimized, at the same time that other, more traditional criteria, are still met. Once an area is selected for new protection including climate change consideration, the costs of infrastructure and management of the new area are generally not higher than for areas not selected to be robust to climate change. Therefore there are not incremental costs associated with climate change and protected area management can be provided from the sources that would support the expansion of the protected areas system without consideration of climate change.

228. Additional funding is required where special management of existing protected areas is required because there is no scope for new protected areas, or where new protected areas selected with climate change considered are more expensive than other options (for instance where the climate change site has higher land costs than other options). In these cases additional funding is required to deal with climate change in a sustainable way.

229. The Green Climate Fund (GCF) has been established to help countries deal with the challenges of climate change adaptation and mitigation. Where additional funding is needed to secure protected areas from climate change, this is a climate change adaptation cost which is eligible for GCF funding. The project will give country protected areas agencies clear evidence of the need for this funding, thus helping national protected areas agencies to qualify for GCF support. While it is beyond the scope of the project to provide assistance in GCF proposal writing, the project will identify situations in which GCF finance might be justified. The GEF may wish to dialog with the

GCF about a systematic program of funding to address the climate change needs of protected areas.

K. Project Catalytic Role: Replicability and Potential for Scaling Up

230. The project will help catalyze disparate research efforts and provide focus on climate change and protected areas. There are many diverse efforts addressing climate change influences on biodiversity already completed or underway, but they lack regional perspective and common methods and so are largely impossible to assemble into a coherent larger picture. Efforts exist to examine climate change effects on particular species in particular regions, or ecosystem change, or velocity of climate change. Sometimes these efforts are focused on estimating extinction risk or on particular management of individual species. For the most part they don’t cover large numbers of species or large enough areas for planning of protected areas systems across multiple countries. The large domain work that is available (for instance, DGVMs), is generally not focused on conservation planning or protected areas.

231. The project will provide a framework based on common methodologies across all three regions, for a large number of species, ecosystem and physical models. This context will catalyze cross-border protected areas decisions and stimulate integration of studies that are currently geographically or taxonomically isolated from one another. The common methodology developed by the project will serve as a benchmark against which the results of future, more geographically or taxonomically limited studies can be measured.

L. Innovativeness

232. The project is innovative in its scope, its breadth of methods and in its focus on protected areas. No research has attempted to synthesize multiple methods across large regions to answer the question of where new protected areas might help restore species and ecosystem representation lost due to climate change. This study provides these insights for the first time.

M. Project Communications, and Public Education and Awareness

233. Project communications efforts will focus on protected area agency staff. In addition to research-to-policy briefs and trainings using decision support tools, the project will reach out to protected areas staff through international meetings such as IPBES and CBD, through professional networks and through direct personal contact.

234. A project blog and periodic press releases will provide both internet and print opportunities for protected area managers and planners to learn about the project. The project internet portal will act as an electronic newsletter for the project, posting project progress on important components on a regular basis. The project Twitter feed and Instagram outreach will be used to point protected areas managers and planners to in-depth information on the project website.

SECTION 5: COMPLIANCE WITH CI-GEF PROJECT AGENCY'S ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK (ESMF)

A. Safeguards Screening Results

236. The safeguard screening process was completed by the CI-GEF Project Agency on August 17th 2015 on the basis of inputs received from the Executing Agency (CI). The full Safeguard Screening review is provided in Appendix III and the main results are summarized in Table 5.

Table 5: Safeguard Screening Results and Project Categorization

Policy/Best Practice	Triggered (Yes/No)	Justification
Environmental and Social Impact Assessment Policy	No	The safeguard screening process and the review of the project proposal have determined that this project will not cause adverse environmental impacts.
Protection of Natural Habitats Policy	No	The safeguard screening process and the review of the project proposal have determined that this project will not cause or facilitate any significant loss or degradation to critical natural habitats, and their associated biodiversity and ecosystem functions/services.
Involuntary Resettlement Policy	No	The safeguard screening process and the review of the project proposal have determined that this project will not involve the voluntary resettlement of people and/or direct or indirect restrictions of access to and use of natural resources.
Indigenous Peoples Policy	No	The safeguard screening process and the review of the project proposal have determined that this project does not plan to work in lands or territories traditionally owned, customarily used, or occupied by indigenous peoples.
Pest Management Policy	No	The safeguard screening process and the review of the project proposal have determined that this project does not plan to implement activities related to agricultural extension services including the use of approved pesticides (including insecticides and herbicides) or invasive species management.
Physical Cultural Resources Policy	No	The safeguard screening process and the review of the project proposal have determined that this project does not plan to remove, alter or disturb any physical cultural resources.
Stakeholder Engagement	**Yes**	The project plans to consult with stakeholders at the national, regional and international levels. The stakeholders include scientists, protected areas staff, government entities, and parties of various international conventions.
Gender mainstreaming	**Yes**	The project includes developing method manuals, capacity building activities, development of science-to-policy briefs, consultations and deliberations on scientific methodologies for the project. Therefore, the project should put in place the procedures to ensure gender representation and participation at all levels including recruitment for project staff, regional lead scientists, and the scientific advisory panel.

B. Project Safeguard Categorization

237. The Safeguard Screening process indicates that two CI-GEF Project Agency Environmental and Social Safeguards are triggered by this project: a) Stakeholder Engagement, and b) Gender mainstreaming.

238. The Safeguard screening determined that the project's activities will not cause or enable to cause significant negative environmental and social impacts. Rather it is expected that project actions, through validated technical exercises and advice across continent scales, inform and empower "climate smart" national planning. Hence climate associated risk to biodiversity, other ecosystem goods and services and the diverse communities they support should be ameliorated.

239. Therefore, this project has been categorized as Category C.

Table 6: Project Categorization

PROJECT CATEGORY	Category A	Category B	Category C
			X
Justification*:* The review of the Project Safeguards Screening Form indicates that this project will not cause or enable to cause any major environmental or social impacts.			

C. Safeguards Policies Recommendations

240. The CI-GEF Project Agency provided the following safeguard policy recommendations:

1) Stakeholders' engagement: to ensure that the project meets CI-GEF Project Agency's "*Stakeholders' Engagement Policy*", the Executing Agency will develop a Stakeholders' Engagement Plan (SEP) that will be submitted with the ProDoc. The SEP will describe the following:

- The key stakeholder groups that would be engaged throughout the project;
- The consultation process and methods, especially regarding the activities to be implemented under Components 2 and 3 of the project;
- A strategy and timetable for sharing information and consulting with each of these groups; and
- The process by which people affected by the project can bring their grievances to the Executing Entity for consideration and redress.

2) ***Gender mainstreaming****:* to ensure that the project meets CI-GEF Project Agency's "*Gender Mainstreaming Policy*", the Executing Agency will develop and submit for approval, within 30 days of the beginning of the implementation phase, a Gender Mainstreaming Plan (GMP) outlining:

- How gender issues will be effectively incorporated into recruitment processes, capacity building activities, consultations and decision-making bodies;
- The measures that will be put in place to ensure the equitable participation of women and men in the project, and
- The M&E system that would be put in place to ensure that gender issues will be properly tracked over the life of the project to allow for adaptive management measures.

D. Compliance with Safeguard Recommendations

1) Stakeholder' Engagement Plan (SEP)

241. To meet the CI-GEF Project Agency's "Stakeholder Engagement Policy", the EA developed and submitted a "Stakeholder Engagement Plan (SEP)" to the Project Agency.

242. The consultation mechanisms for each type of major stakeholder are to be designed and implemented by the Executing Agency at the beginning of the project implementation phase. These measures will be approved and further monitored by the Project Agency.

243. The full version of the SEP is provided in Appendix VI, which will be supplemented by the Project Management Unit (PMU) during the project inception period. A summary of their objectives and components is provided below:

Stakeholder Engagement Plan (SEP)	
Objectives • Develop engagement activities to ensure stakeholder inclusivity in the context of Full Project implementation and evaluation. • Provide guidelines to EA practitioners and project partners for best practices and principles for engagement with those key institutions, organizations, communities and individuals that influence or would be influenced by project activities. • Receive feedback from those groups influenced during the project cycle towards an adaptive improvement of project results and outcomes. • Develop the thematic context of the project and its work plan with stakeholders to encourage a sense of stewardship and cooperation from an early stage in the project.	**Components** A. Introduction. B. Policies and Requirements. C. Summary of previous stakeholder engagement activities. D. Stakeholder groups involved in the project. E. Stakeholder Engagement Program. F. Methods (to be further developed during Full Project start-up phase). G. Timetable. H. Resources and Responsibilities. I. Grievance Mechanism. J. J. Monitoring and Reporting.

2) Gender Mainstreaming Plan (GMP)

244. To ensure that the project meets the CI-GEF Project Agency's "Gender Mainstreaming Policy", the Executing Agency enlisted support of a Gender Issue Specialist (CI-HQ Social Policy and Practice Unit) to help dimension, identify and incorporate key gender issues. These were mainstreamed within the Project Document before submission to the GEF-Sec.

245. Consultations to determine an appropriate Gender Mainstreaming Plan determined that guidelines be scoped to a GEF targeted research project. This considers that (i) project actions have only indirect links to local communities (interpretation and application of any technical recommendations will be managed at the discretion of national authorities) and (ii) that there is a limited pool of technical candidates and scientific experts available and suitable for recruitment during the project period in each region.

246. The Executing Agency commits to further develop and submit for approval, within 30 days of the beginning of the implementation phase, a Gender Mainstreaming Plan (GMP). A summary of the expected objectives and components is provided below:

Gender Mainstreaming Plan (GMP)	
Objectives • Design and implement the project in such a way that both women and men: • Receive culturally compatible social and economic benefits; • Do not suffer adverse effects during the development process; and • Receive full respect for their dignity and human rights.	**Components** A. Goals and scoping for a GEF-targeted science project Gender Mainstreaming Strategy. B. Gender Mainstreaming Plan: C. Recruitment processes; D. Capacity building activities; E. Consultations ; and F. Decision-making bodies. G. Monitoring and Reporting.

E. Accountability and Grievance Compliance

247. Stakeholders may raise a grievance at all times to the Executing Agency about any actions instigated by the project and the application of its safeguard frameworks. Affected stakeholders should be informed about this possibility and contact information of the respective organizations at relevant levels should be made available either on-line, during the project start-up workshop and/or in project affected sites where most relevant. Unless project-affected communities request an alternative process, the Accountability and Grievance Policy and Mechanism described in the Safeguard Policies and Processes section of the CI- ESMF shall apply.

248. The project Executing Agency (EA) will be the first point of contact in the accountability and grievance mechanism.

249. In the first instance any grievance should be addressed and where possible resolved locally. CI and/or the EA will be responsible for informing project-affected communities about the Grievance provisions, including the ESMF's grievance mechanism. Contact information of the Executing Entity, CI, and the GEF will be made publicly available to all involved stakeholders. Complaints to the Executing Agency can be made through many different channels including, but not limited to face-to-face meetings, written complaints, telephone conversations, or e-mail.

250. In the event that this process does not resolve the grievance, the grievant may file a claim with the CI Director of Compliance (DOC) who can be reached at:

Electronic email: GEFAccountability@conservation.org

Mailing address: Direction of Compliance
Conservation International
2011 Crystal Drive, Suite 500
Arlington, VA 22202, USA.

SECTION 6: IMPLEMENTATION AND EXECUTION ARRANGEMENTS FOR PROJECT MANAGEMENT

A. Project Execution Arrangements and Partners

252. The Project Management Unit (PMU) consists of the Principle Investigator, the project Postdoctoral Researcher and a team of personnel from administration, finance and international finance. The PMU will be responsible for the timely execution of partnership and consultation agreements, budget and procurement compliance, sub-grant administration and management, project Monitoring and Evaluation, due diligence for triggered CI-GEF safeguards and reporting to the CI-GEF Project Agency.

253. The Project Steering Committee (PSC) is represented by the core research team which consists of the Principle Investigator and Postdoctoral Researcher (based in CI), the three regional lead scientists (one each from Latin America, Africa and Asia) 3 international advisors (University of Leeds, University of Arizona and IUCN) and a representative from the GEF Secretariat. The PSC will provide technical oversight and coordination throughout the project.

254. The core research team will also be responsible for design, standardization of project methodology and data quality, ensuring comparable results from all three study regions and coordination to lead project publications. The core research team will be responsible for most, but not all, identification of data sourcing, compilation, preparation and modeling.

255. The three regional lead scientists (for Africa, Neotropics and Indo-Malaysia) are responsible for conducting the regional assessments using the methods developed by the core research team. The three regional lead scientists are Guy Midgley of Stellenbosch University in South Africa for the Afrotropics, Pablo Marquet of the Catholic University of Santiago in Chile for the Neotropics, and Richard Corlett of the Xishuangbanna Tropical Botanical Garden in China for the Indo-Malayan Tropics. Regional lead scientists were selected for their climate expertise, standing in the region and publication record. Dr. Midgley and Dr. Corlett are members of the IUCN climate change specialist group, Dr. Marquet is a fellow of the Santa Fe Institute. All three have been involved in IPCC analyses or review. All have extensive research experience and research connections in their region.

256. Each of the three regional lead scientists will convene a start-up meeting (corresponding to their geography) with a wider network of leading local researchers. The project Principal Investigator and project manager will develop a work-plan for each regional assessment in collaboration with the three lead regional scientists.

257. The Principal Investigator will oversee the administration of grants from the Executing Agency to the collaborating scientists in each region for key elements of their regional assessment with support from the team of personnel from administration and finance. The lead regional scientists, together with their collaborating researchers, will be in charge of both regional outreach to Protected Area agencies and training in the use of decision-support tools.

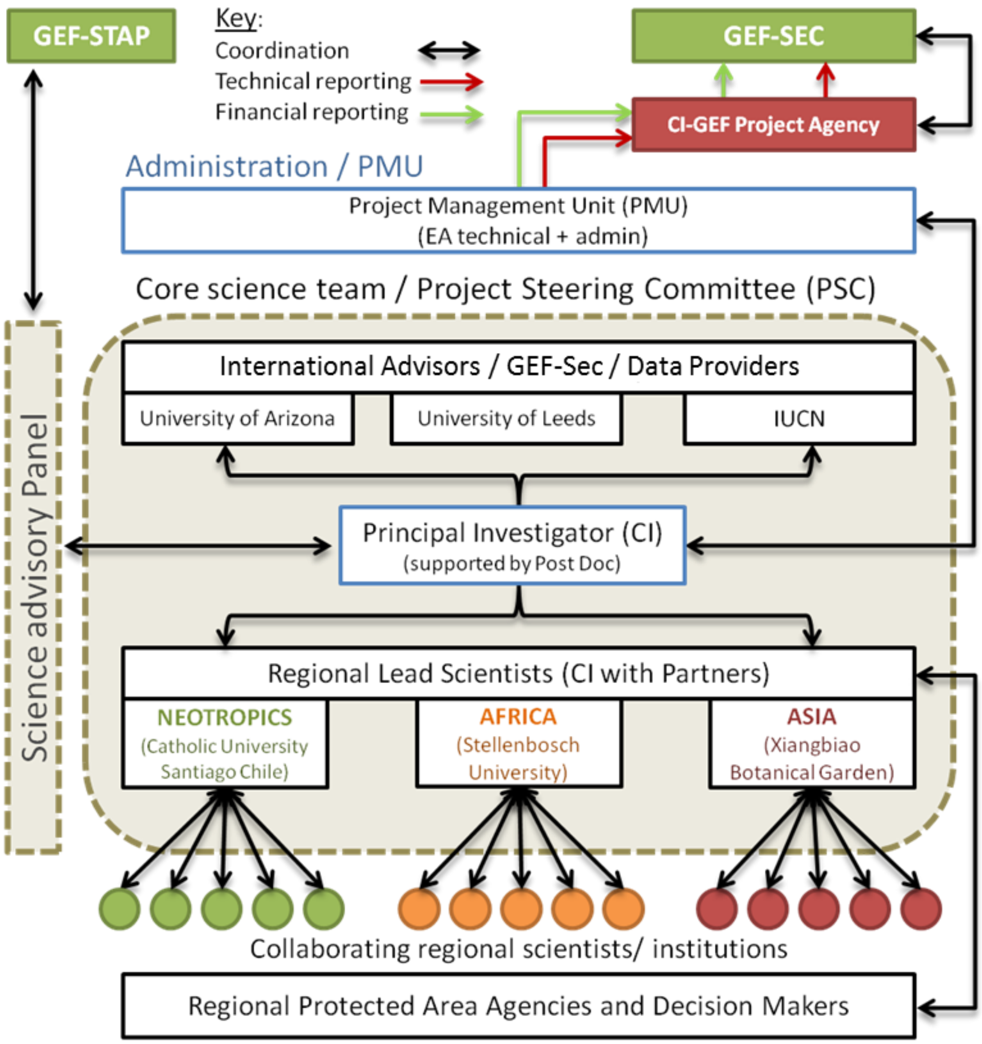
258. The international advisors will assist in data development and help define project methods. As well as helping compile and collate data, they will identify and contribute existing model results to the project (e.g., from trait-based assessment, DGVM, GDM and regional climate models. They provide links with developed country institutions and the data needed for the regional assessments.

259. The project science advisory panel will ensure that project methods reflect a spectrum of state-of-the science approaches that provide the best available insight into climate change adaptation for protected areas planning at broad scales. The chair of the science advisory panel will serve as a link between the project and the GEF Science and Technical Advisory Panel (STAP). The chair of the

science advisory panel will choose two additional members of the panel in consultation with the PSC and STAP. The panel will review and comment on final project methods before they are approved for use in the regional assessments.

260. The CI-GEF Project Agency will provide project assurance, including supporting project implementation by maintaining oversight of all technical and financial management aspects, and providing other assistance upon request of the Executing Agency. The CI-GEF Project Agency will also monitor the project's implementation and achievement of the project outputs, ensure the proper use of GEF funds, and review and approve any changes in budgets or work-plans. The CI-GEF Project Agency will arbitrate and ensure resolution of any conflicts during project implementation.

B. Project Execution Organizational Chart



SECTION 7: MONITORING AND EVALUATION PLAN

A. Monitoring and Evaluation Roles and Responsibilities

262. The Project Management Unit on the ground will be responsible for initiating and organizing key monitoring and evaluation tasks. This includes the project inception workshop and report, quarterly progress reporting, annual progress and implementation reporting, documentation of lessons learned, and support for and cooperation with the independent external evaluation exercises.

263. The project Executing Agency is responsible for ensuring the monitoring and evaluation activities are carried out in a timely and comprehensive manner, and for initiating key monitoring and evaluation activities, such as the independent evaluation exercises.

264. Key project executing partners are responsible for providing any and all required information and data necessary for timely and comprehensive project reporting, including results and financial data, as necessary and appropriate.

265. The Project Steering Committee plays a key oversight role for the project, with regular meetings to receive updates on project implementation progress and approve annual work-plans. The Project Steering Committee also provides continuous ad-hoc oversight and feedback on project activities, responding to inquiries or requests for approval from the Project Management Unit or Executing Agency.

266. The CI-GEF Project Agency plays an overall assurance, backstopping, and oversight role with respect to monitoring and evaluation activities.

267. The CI Internal Audit function is responsible for contracting and oversight of the planned independent external evaluation exercises at the mid-point and end of the project.

B. Monitoring and Evaluation Components and Activities

268. The Project M&E Plan includes the following components (see M&E Table 8 for details):

<u>Inception workshop</u>

269. Project inception workshop will be held within the first three months of project start with the main project stakeholders. An overarching objective of the inception workshop is to assist the project team in understanding and taking ownership of the project’s objectives and outcomes. The inception workshop will be used to detail the roles, support services and complementary responsibilities of the CI-GEF Project Agency and the Executing Agency.

270. The project's M&E plan will be presented and finalized at the project inception workshop, including a review of indicators, means of verification, and the full definition of project staff M&E responsibilities.

<u>Inception workshop Report</u>

271. The Executing Agency will produce an inception report documenting all changes and decisions made during the inception workshop to the project planned activities, budget, results framework, and any other key aspects of the project. The inception report will be produced within one month of the inception workshop, as it will serve as a key input to the timely planning and execution of project start-up and activities.

<u>Project Results Monitoring Plan</u> (Objective, Outcomes, and Outputs)

272. A Project Results Monitoring Plan was developed by the Project Agency (see Appendix IV-a for details), which includes objective, outcome and output indicators, metrics to be collected for each indicator, methodology for data collection and analysis, baseline information, location of data gathering, frequency of data collection, responsible parties, and indicative resources needed to complete the plan.

273. In addition to the objective, outcome, and output indicators, the Project Results Monitoring Plan table also includes all indicators identified in the Stakeholders' Engagement Plan (SEP) prepared for the project, thus they will be consistently and timely monitored.

274. The monitoring of these indicators throughout the life of the project will be necessary to assess if the project has successfully achieved its expected results.

275. <u>Baseline Establishment</u>: in the case that all necessary baseline data has not been collected during the PPG phase, it will be collected and documented by the relevant project partners ***within the first year*** of project implementation.

<u>GEF Focal Area Tracking Tools</u>

276. The relevant GEF Focal Area Tracking Tools was completed i) prior to project start-up, and will be updated ii) prior to mid-term review, and iii) at the time of the terminal evaluation.

<u>Project Steering Committee Meetings</u>

277. Project Steering Committee (PSC) meetings will be held annually. PSC meetings will be conducted using an internet conference interface due to the geographic distances between partners. One in person meeting is planned in year 2 of the project. Meetings shall be held to review and approve project annual budget and work plans, discuss implementation issues and identify solutions, and to increase coordination and communication between key project partners. The meetings held by the PSC will be monitored and results adequately reported.

<u>CI-GEF Project Agency Field Supervision Missions</u>

278. The CI-GEF PA will conduct annual visits to the project country and potentially to project field sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Oversight visits will most likely be conducted to coincide with the timing of PSC meetings. Other members of the PSC may also join field visits. A Field Visit Report will be prepared by the CI-GEF PA staff participating in the oversight mission, and will be circulated to the project team and PSC members within one month of the visit.

<u>Quarterly Progress Reporting</u>

279. The Executing Agency will submit quarterly progress reports to the CI-GEF Project Agency, including a budget follow-up and requests for disbursement to cover expected quarterly expenditures.

<u>Annual Project Implementation Report</u> (PIR)

280. The Executing Agency will prepare an annual PIR to monitor progress made since project start and in particular for the reporting period (July 1st to June 30th). The PIR will summarize the annual project result and progress. A summary of the report will be shared with the Project Steering Committee.

<u>Final Project Report</u>

281. The Executing Agency will draft a final report at the end of the project.

Independent External Mid-term Review

282. The project will undergo an independent Mid-term Review within 30 days of the mid-point of the grant term. The Mid-term Review will determine progress being made toward the achievement of outcomes and will identify course correction if needed. The Mid-term Review will highlight issues requiring decisions and actions, and will present initial lessons learned about project design, implementation and management. Findings and recommendations of the Mid-term Review will be incorporated to secure maximum project results and sustainability during the second half of project implementation.

Independent Terminal Evaluation

283. An independent Terminal Evaluation will take place within six months after project completion and will be undertaken in accordance with CI and GEF guidance. The terminal evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term evaluation, if any such correction took place). The Executing Agency in collaboration with the PSC will provide a formal management answer to the findings and recommendations of the terminal evaluation.

Lessons Learned and Knowledge Generation

284. Results from the project will be disseminated within and beyond the project intervention area through existing information sharing networks and forums. The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation though lessons learned. The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects. There will be a two-way flow of information between this project and other projects of a similar focus.

Financial Statements Audit

285. Annual Financial reports submitted by the executing Agency will be audited annually by external auditors appointed by the Executing Agency.

286. The Terms of References for the evaluations will be drafted by the CI-GEF PA in accordance with GEF requirements. The procurement and contracting for the independent evaluations will handled by CI's General Counsel's Office. The funding for the evaluations will come from the project budget, as indicated at project approval.

Table 6: Project M&E Plan Summary

Type of M&E	Reporting Frequency	Responsible Parties	Indicative Budget from GEF (USD)
Inception workshop and Report	Within three months of signing of CI Grant Agreement for GEF Projects	Project Team Executing Agency CI-GEF PA	$30,245
Inception workshop Report	Within one month of inception workshop	Project Team CI-GEF PA	$2,932
Project Results Monitoring Plan (Objective, Outcomes and Outputs)	Annually (data on indicators will be gathered according to	Project Team CI-GEF PA	$2,095

Type of M&E	Reporting Frequency	Responsible Parties	Indicative Budget from GEF (USD)
	monitoring plan schedule shown on Appendix IV)		
GEF Focal Area Tracking Tools	i) Project development phase; ii) prior to project mid-term evaluation; and iii) project completion	Project Team Executing Agency CI-GEF PA	$2,095
Project Steering Committee Meetings	Annually	Project Team Executing Agency CI-GEF PA	$16,186
Quarterly Progress Reporting	Quarterly	Project Team Executing Agency	$1,591
Annual Project Implementation Report (PIR)	Annually for year ending June 30	Project Team Executing Agency CI-GEF PA	$2,387
Project Completion Report	Upon project operational closure	Project Team Executing Agency	$4,481
Independent External Mid-term Review	CI Evaluation Office Project Team CI-GEF PA	Approximate mid-point of project implementation period	$25,000
Independent Terminal Evaluation	CI Evaluation Office Project Team CI-GEF PA	Evaluation field mission within three months prior to project completion.	$25,000
Lessons Learned and Knowledge Generation	Project Team Executing Agency CI-GEF PA	At least annually	$2,848
Financial Statements Audit	Executing Agency CI-GEF PA	Annually	$24,000

SECTION 8: PROJECT BUDGET AND FINANCING

A. Overall Project Budget

288. The project will be financed by a medium size GEF grant of USD $1.8M with co-financing from Conservation International, The University of Leeds (UK), Xishuangbanna Tropical Botanical Garden (China), The University of Stellenbosch (S. Africa) and the University of Arizona (US). A summary of the project costs and the co-financing contributions is given in the two tables below. The project budget may be subject to revision during implementation. The detailed Project Budget is provided in Appendix VII.

Table 7: Planned Project Budget by Component

Budget Item	Project budget by component (in USD)				
	Component 1	Component 2	Component 3	PMC	Total budget
Personnel salaries and benefits	74,278	201,447	175,009	66,943	517,677
Professional services	74,969	92,250	-	74,000	241,219
Travels and accommodations	27,956	100,454	-	1,840	130,250
Meetings and workshops	1,612	20,940	-	1,600	24,152
Grants & Agreements	218,268	617,395	-	-	835,662
Equipment	900	923	1,677	-	3,500
Other direct costs	5,442	24,158	18,160	4,641	52,402
TOTAL GEF FUNDED ROJECT	**403,425**	**1,057,566**	**194,846**	**149,025**	**1,804,862**

Table 8: Planned Project Budget by Year

Budget Item	Project budget by year (in USD)			
	Year 1	Year 2	Year 3	Total budget
Personnel salaries and benefits	148,405	167,807	201,465	**517,677**
Professional services	45,519	70,450	125,250	**241,219**
Travels and accommodations	23,374	46,840	60,036	**130,250**
Meetings and workshops	1,600	11,844	10,708	**24,152**
Grants & Agreements	187,531	375,375	272,576	**835,662**
Equipment	3,500	-		**3,500**
Other direct costs	11,609	13,884	26,909	**52,402**
TOTAL GEF FUNDED PROJECT	**421,538**	**686,200**	**697,123**	**1,804,862**

B. Overall Project Co-financing

289. Project co-financing (cash and in-kind) will be secured for the project to the total of USD$ $3,655,992 (Table 9).

290. Conservation International will provide $638,692 in co-financing. $189,188 is cash co-financing for component 1 and project management. $449,504 is provided as in-kind co-financing for datasets and models used in the analysis and technical support. The datasets and models will support the global analyses under component 1 and the regional assessments under component 2

291. The Catholic University of Chile (Santiago) will provide $450,000 in cash for office costs and technical support to the Neotropical regional assessment across all three years of the project. This will support building of physical and species databases during the project, as well as conducting analyses for the regional assessment. The co-financing supports Component 1 and 2 of the project.

292. Stellenbosch University (South Africa) will provide $785,000 total co-financing to support Component 1 and 2 of the project. $365,000 of cash co-financing and $420,000 of in-kind co-financing is provided for datasets, climate scenarios and management time in support of the Afrotropical regional assessment. The datasets include biodiversity change scenarios under climate change, species models parameterizations, vegetation trend analysis and projections of land cover change.

293. The University of Leeds will provide $598,000 co-financing to the project. Cash co-financing in the amount of $48,000 is proposed in year 1 for component 1 for the design of the global analysis and use of regional climate models for the regional analyses. In year 2 cash co-financing ($50,000) and in-kind co-financing ($500,000) will be provided for regional climate model simulations for use in the regional assessments in year 2 of the project. Simulations will include Africa and Asia regional climate models, with associated support to help interpret and use the models in the regional assessment framework.

294. IUCN will provide a traits-based assessment of climate change vulnerable species in support of global analyses and regional assessments in years 1-2 with an in-kind value of $350,000. The trait-based assessment will be used in the analyses of Component 1 and the results of those analyses and some parts of the trait-based data are expected to be incorporated into the regional assessments in Component 2.

295. The University of Arizona will provide species datasets informatics techniques and models with in-kind and cash value of $649,716 over years 1-3. The datasets will include species datasets compiled from occurrence, plot and trait data. The models will include climate scenarios of species and ecosystem change in the Neotropics. The co-financing support all three components of the project.

296. CSIRO (Australia) will provide Generalized Dissimilarity Modeling (GDM) results in support of both global (component 1) and all three regional assessments (component 2), with and in-kind value of $184,584. GDM is a statistical analysis of physical similarity that serves as a surrogate for biological change.

297. The co-financing commitment letters are attached in the Appendix VIII

Table 9: Committed Cash and In-Kind Co-financing (USD)

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount (USD)
GEF Agency	Conservation International	Cash and in-kind	638,692
Other	Catholic University of Chile (Santiago)	Cash	450,000
Other	Stellenbosch University (South Africa)	Cash and in-kind	785,000
Other	University of Leeds (UK)	Cash and in-kind	598,000
Other	University of Arizona (US)	Cash and in-kind	649,716
Other	CSIRO (Australia)	In-kind	184,584
Other	IUCN	In-Kind	350,000
TOTAL CO-FINANCING			$3,655,992

Appendix I: Project Results Framework

Objective:	Provide countries in the Neotropical, Afrotropical and Indo-Malayan biogeographic realms with the assessments and data needed to improve planning, design and management of terrestrial protected areas for climate change resilience.
Indicator(s):	a. Number of plans governing national protected areas systems integrating the effects of climate change on species and ecosystem targets b. Number of policies or regulations integrating research-to-policy brief recommendations c. Number of opportunities identified to reduce loss of species or ecosystem representation in protected areas due to climate change d. Number of protected areas agency staff trained in and implementing climate change decision support tools

Expected Outcomes and Indicators	Project Baseline	End of Project Target	Expected Outputs and Indicators
Component 1: Global data compilation and analysis of protected area vulnerability to climate change			
Outcome 1.1.: Information on species range shifts and ecosystem change made available for regional assessments. **Indicator 1.1.:** Species and ecosystem change databases and geospatial data available to regional assessment teams.	Methods for assessing species and ecosystem change in response to climate exist, but data is scattered in global or sub-continental studies not readily available for regional analyses. Many lines of evidence remain unavailable to country level assessments as they are too expensive or too difficult to extract from massive global datasets.	Data on species and ecosystem change is available for regional analysis from a spectrum of methods; including species distribution models, climate vulnerable traits assessment, novel and disappearing climates, velocity of climate change, Dynamic Global Vegetation Models and Generalized Dissimilarity Modeling (GDM). Data are comparable across regions. Data from large global datasets are extracted and made available for regional assessment. Methods for interpreting surrogates such as GDM and velocity of climate change are available and ready for application in conservation planning software.	**Output 1.1.1.:** Species range shifts due to climate change simulated at coarse scale and information on vulnerability compiled. **Indicator 1.1.1.:** Number of species change models created or converted into formats readily accessible for regional assessment. **Output 1.1.2.:** Global models of ecosystem change compiled and formatted. **Indicator 1.1.2.:** Number of ecosystem change models and datasets created or converted into formats readily accessible for regional assessment.

Expected Outcomes and Indicators	Project Baseline	End of Project Target	Expected Outputs and Indicators
Outcome 1.2.: Conservation planning methods allowing regional assessment of representation losses resulting from species range shifts and ecosystem changes developed and readily available. **Indicator 1.2**.: Method for regional conservation planning for climate change available to regional assessment teams.	Conservation planning algorithms, including Network Flow, Marxan and Zonation exist for optimizing representation of species and ecosystems in protected areas. All have been tested for protected areas planning for climate change at national or sub-national scales, but none have been applied or tested at continental scales.	Network Flow, Marxan and Zonation conservation planning software are tested for application at continental scales for regional assessment. The best performing methods are adapted specifically for regional assessments, or hybrid or novel methods that outperform existing methods developed and made available. The conservation planning software can assess loss of species and ecosystem representation and generate recommendations for siting of new protected areas to minimize representation loss.	**Output 1.2.1**.: Methodology for assessment of representation losses in terrestrial protected areas developed and peer-reviewed **Indicator 1.2.1**.: Methods manual for regional assessment of representation losses (species and ecosystems) available to regional assessment teams. **Output 1.2.2**.: Methodology for protected areas system planning to compensate for representation losses developed and peer-reviewed. **Indicator 1.2.2.:** Methods manual for regional protected areas planning to maintain representation in the face of climate change available to regional assessment teams.
Outcome 1.3.: Regional assessment teams have coarse scale information needed to understand priority areas for protected areas system planning to counteract loss of representation due to climate change. **Indicator 1.3.:** Regional maps of high risk areas available.	Diverse methods exist to assess where to site protected areas to compensate for climate change. Results of these competing methods are not systematically compared, and level of agreement between methods is unknown. Identification of areas at risk according to multiple methods is impossible.	Preliminary, coarse scale conservation planning is available for the three regional assessments. The coarse-scale results are based on multiple lines of evidence concerning species and ecosystem change, and on conservation planning software tested for climate change. Systematic combination and comparison allows quantifying level of agreement between methods for the first time. Preliminary identification of areas most at risk is available, allowing	**Output 1.3.1.:** Coarse scale conservation planning conducted for the three regions. **Indicator 1.3.1.**: Number of geographies and taxa identified as most in need of regional assessment.

Expected Outcomes and Indicators	Project Baseline	End of Project Target	Expected Outputs and Indicators
		the three regional assessment teams to focus resources on taxa and geographies especially important in each region.	
Component 2: Regional fine scale assessment and research-to-policy briefs			
Outcome 2.1.: Regional assessments produced by teams of leading scientists from each of the three regions **Indicator 2.1.:** Regional assessment results available and published in the peer-review literature.	Country and occasionally multi-country assessments of climate change impacts on protected areas are available. No continental-scale assessments are available for the tropics. Inefficiencies in assessment mount as country-level assessments duplicate regional analyses critical for context. Inefficiency in protected areas actions for climate change resilience mount as some countries have no assessment and some have country-level assessment with incomplete context. Data available in the region isn't always effectively applied, because regional priorities are unknown. The best regional expertise is not applied to interpretation of results due to reliance on national and in-house resources.	Regional assessments are available, providing context that enables efficient country-level assessments and actions. All countries have regional protected areas context and country-specific assessment of species and ecosystem change. Efficient country assessments result as regional assessments provide context that does not have to be repeated by every country. Efficient country actions result because there are no missing or incomplete country assessments of species and ecosystem change. A spectrum of evidence, from physical surrogates to species models to ecosystem simulations are available to all countries in the region. Data from large global datasets and expensive modeling efforts are available in simple GIS format for use in country assessments. Data in the region is effectively applied to geographies and taxa most critical to climate change resilience because regional priorities are known. The best expert opinion in the region informs interpretation of the best available regional and global evidence.	**Output 2.1.1.:** Regional analyses using multiple lines of evidence available and published. **Indicator 2.1.1.:** Number of publications of regional assessment results. **Output 2.1.2.:** Potential for protected areas expansion to offset loss of representation identified. **Indicator 2.1.2.:** Number of potential priority areas for expansion of protection identified.
Outcome 2.2.: Research-to-policy briefs prepared and presented to government	Relevant regional research is unavailable to most policymakers and technical	Protected areas policymakers and technical decision makers have access to	**Output 2.2.1.:** Research-to-policy briefs delineating multi-country technical issues

Expected Outcomes and Indicators	Project Baseline	End of Project Target	Expected Outputs and Indicators
protected areas agencies. **Indicator 2.2.:** Number of multi-national and country research-to-policy briefs presented to protected areas agency staff	decision makers in the tropics. Ad hoc studies at national or sub-regional level appear in the peer review literature. Published research takes several years to be peer-reviewed and published, resulting in research results being dated by the time they are available. The findings of published research do not systematically address the needs of protected areas staff for multi-taxa solutions using multiple lines of evidence and the latest climate models. Headquarters protected areas planners sometimes access the peer-review literature, but often do not. Field-level protected areas managers seldom access peer-review climate impact literature.	systematic information on climate change and priorities for climate change response. The research is peer-review journal caliber, but reaches protected areas agency staff directly, without lengthy review and publication delays. Priority geographies for multi-national collaboration on protected areas adaptation directly reach relevant staff in the form of research-to-policy briefs. This puts state-of-the-science research immediately into the hands of policy and decision makers. The research results are interpreted in regional context and for policymakers and technical staff rather than for academic research audiences of journals, making it immediately more relevant for actual agency policy and planning, and management decisions.	and multi-national collaborative response opportunities associated with species and ecosystem changes produced and presented. **Indicator 2.2.1.:** Number of multi-national research-to-policy briefs distributed. **Output 2.2.2.:** Research-to-policy briefs on country technical issues and opportunities for protected areas adaptation presented to government protected areas management agencies. **Indicator 2.2.2.:** Number of country research-to-policy briefs presented.
Outcome 2.3.: Decision support tools for visualization and interactive use of research results produced. **Indicator 2.3**: Decision support tools developed and disseminated.	Protected areas agencies in the tropics lack interactive tools for climate change decision making. This is a particular limitation for systematic planning of species and ecosystem representation in protected areas for climate change, because each decision about placement of a new protected area affects all subsequent decisions. Without the ability to explore species and ecosystem movements, policymakers and planners are unable to explore options that might offer greater political feasibility or social benefit.	A decision support tool allows policymakers and planners to query climate change and protected areas research results. This interactive tool will allow exploration of multiple options and decision consequences on a mid-level laptop computer. The species and ecosystem representation improvements from designation of possible new protected areas can be assessed and alternatives explored. Where there is sufficient natural habitat for protected areas expansion, this tool will help define design options both for current	**Output 2.3.1.:** Option-exploration decision support tool developed and protected areas policymakers and planners trained in its use. **Indicator 2.3.1.:** Number of protected areas agency staff trained in and using decision support tool.

Expected Outcomes and Indicators	Project Baseline	End of Project Target	Expected Outputs and Indicators
		representation and for representation as climate changes. Policymakers and technical staff will make better-informed decisions about new protected areas and will be more likely to factor climate change into those decisions.	
Component 3: Monitoring and Evaluation			
Outcome 3.1.: Participatory M&E framework and an informative and proactive feedback mechanism integrated at all levels of project management. **Indicator 3.1.:** Monitoring plan completed and reflected in data compilation and regional assessment work plans.	Leading regional scientists work independently of one another, moving knowledge of climate change, impacts on biodiversity and consequences for protected areas ahead incrementally. Knowledge in climate change science such as from regional climate models is slowly adopted by climate change biologists, and in turn information on species and ecosystem movements are slowly adopted by conservation planners. Dissemination across disciplines is largely through the published literature.	Leading regional scientists work together, using an active monitoring framework to help move knowledge ahead synthetically. Knowledge links across disciplines is actively sought out and connections facilitated by the monitoring framework. An integrated work plan allows advances in climate science, climate change biology and protected areas planning to advance in coordination. Scientists will work directly with one another across disciplines, short-circuiting the usual information dissemination through the literature.	**Output 3.1.1.:** Project monitoring system operating and systematically providing information on progress in meeting project output and outcome targets. **Indicator 3.1.1.:** Number of adaptive project management decisions in response to monitoring system information.
Outcome 3.2.: Adaptive implementation of regional assessments. **Indicator 3.2.:** Number of adaptations to regional assessments based on learning from other regions.	Protected area and country-level studies of climate change slowly accumulate to provide a picture of regional effects and opportunities for protected areas adaptations in the three tropical regions. Cross-regional learning occurs through the literature and at professional congresses.	Scientists in the three major tropical regions systematically learn from one another. Regional assessments adapt based on experience and transmit those lessons to other regions. Knowledge mapping and adaptive management provide information about improvements that can be implemented as the project progresses. Sharing of insights across regions speeds regional learning.	**Output 3.2.1.:** Multiple knowledge-mapping products defining portable knowledge gained from each regional assessment, and mapping knowledge flow and information products for each regional assessment. **Indicator 3.2.1.:** Number of instances of information or knowledge discovery in regional assessments identified in knowledge mapping.

<u>Appendix II:</u> Project Timeline

Outcomes/*Outputs*	Timeline											
	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Outcome 1.1.												
Output 1.1.1.: *Species range shifts simulated and vulnerability compiled.*	■	■	■	■	■							
Output 1.1.2.: *Global models of ecosystem change compiled and formatted.*	■	■	■	■	■							
Outcome 1.2.												
Output 1.2.1.: *Methodology for assessment of representation losses in terrestrial protected areas developed and peer-reviewed.*			■	■	■							
Output 1.2.2.: *Methodology for protected areas system planning to compensate for representation losses developed and peer-reviewed.*			■	■	■							
Outcome 1.3.												
Output 1.3.1.: *Coarse-scale conservation planning conducted for the 3 regions.*				■	■	■						
Outcome 2.1.												
Output 2.1.1.: *Regional analyses available and published.*						■	■	■	■	■	■	
Output 2.1.2.: *Potential for protected areas expansion to offset loss of representation identified.*										■	■	■
Outcome 2.2.												
Output 2.2.1.: *Research-to-policy briefs delineating multi-country technical issues and multi-national collaborative response opportunities presented.*										■	■	■
Output 2.2.2.: *Research-to-policy briefs on country technical issues and opportunities for protected areas adaptation presented*										■	■	■
Outcome 2.3.												
Output 2.3.1.: *Option-exploration decision support tool developed and protected areas policymakers and planners trained in its use.*										■	■	■
Outcome 3.1.												
Output 3.1.1.: *Project monitoring system operating a*	■	■	■	■	■	■	■	■	■	■	■	■
Outcome 3.2.												
Output 3.2.1.: *Multiple knowledge-mapping products defining portable knowledge gained from each regional assessment.*							■	■			■	■

Appendix III: Safeguard Screening Results

Date Prepared: August 17, 2015

Date Updated: August 18, 2015

I. BASIC INFORMATION

A. Basic Project Data		
Country: Global	**GEF Project ID**: 5810	**CI Project ID**:
Project Title: Systematic Planning of Protected Areas in Response to Climate Change (SPARC)		
Executing Entity: Conservation International		
GEF Focal Area: Biodiversity		
GEF Project Amount: US$1,804,862		
Reviewer(s): Ian Kissoon/Miguel Morales		
Date of Review: August 17, 2015		
Comments:		

B. Project Objectives:

The project will provide priority tropical countries (Afrotropical, Neotropical and Indo-Malayan biogeographic realms) with the assessments and data needed to improve planning, design and management of terrestrial protected areas for climate change resilience.

Project Description:

Climate change is impacting species and ecosystems worldwide. Species' ranges are shifting to track suitable conditions as climate changes. Simulations of future change show movements of species and ecosystems, rearrangement of plant and animal communities, the emergence of novel communities and risk of extinction for hundreds of thousands or millions of species.

Protected areas are the main conservation tool for conserving species and ecosystems. They have been shown to be effective in reducing extinction risk from climate change. Representation of species and ecosystems is a general goal of national protected areas systems and a specific goal of GEF support to these national efforts.

Climate change rearrangement of species and ecosystems may result in loss of representation in protected areas, increasing extinction risk. This problem is accentuated because most protected areas have not been selected a part of a systematic spatial planning effort and not planned with climate change in mind. As a result, the opportunity to place protected areas in the best locations to avoid extinctions and loss of representation of species and ecosystems due to climate change is mostly unrealized.

This situation is changing, with GEF funding pioneering efforts to integrate climate change into national protected areas planning. But much is left to be done and the scope of planning required transcends national boundaries. Species' ranges movements in response to climate change occur on regional and continental scales, making it more cost effective to conduct continental-scale assessments with nested country assessments, rather than having country assessments perform multiple repetitive and independent continental scale analyses. Because the resources required to mount continental-scale assessments are substantial, there are major cost-savings to be realized in performing a uniform set of continental scale studies. This project will produce continental-scale assessments of the impacts of climate change on protected areas, providing a cost-effective framework in which country-level planning and decision-making for climate change can take place.

C. Project location and physical characteristics relevant to the safeguard analysis:
The project is global with priority for tropical countries in the Afrotropical, Neotropical and Indo-Malayan biogeographic realms.

D. Executing Entity's Institutional Capacity for Safeguard Policies:
A driving principle of CI, the executing entity for this project, is to prevent and mitigate any harm to people and thus to incorporate environmental and social concerns as an intrinsic part of project cycle management. Environmental and social safeguards are tracked during all stages of the project cycle with the main objective of ensuring that supported activities comply with the institution's policies and guidelines. These environmental and social safeguard policies are aligned with GEF's Minimum Standards for environmental and social safeguards and gender mainstreaming policies.

II. SAFEGUARD AND POLICIES

Environmental and Social Safeguards:

Safeguard Triggered	Yes	No	TBD	Date Completed
298. **Environmental & Social Impact Assessment (ESIA)**	299.	**X**		**August 17, 2015**
Justification: The safeguard screening process and the review of the project proposal have determined that this project will not cause adverse environmental impacts.				
Natural Habitats		**X**		**August 17, 2015**
Justification: The safeguard screening process and the review of the project proposal have determined that this project will not cause or facilitate any significant loss or degradation to critical natural habitats, and their associated biodiversity and ecosystem functions/services.				
Involuntary Resettlement		**X**		**August 17, 2015**
Justification: The safeguard screening process and the review of the project proposal have determined that this project will not involve the voluntary resettlement of people and/or direct or indirect restrictions of access to and use of natural resources.				
Indigenous Peoples		**X**		**August 17, 2015**
Justification: The safeguard screening process and the review of the project proposal have determined that this project does not plan to work in lands or territories traditionally owned, customarily used, or occupied by indigenous peoples.				
Pest Management		**X**		**August 17, 2015**
Justification: The safeguard screening process and the review of the project proposal have determined that this project does not plan to implement activities related to agricultural extension services including the use of approved pesticides (including insecticides and herbicides) or invasive species management.				
Physical & Cultural Resources		**X**		**August 17, 2015**
Justification: The safeguard screening process and the review of the project proposal have determined that this project does not plan to remove, alter or disturb any physical cultural resources.				

Other relevant policies and best practices

Triggered	Yes	No	TBD	Date to be Completed
Stakeholder Engagement	X			**To be submitted with the ProDoc**
Justification: The project plans to consult with stakeholders at the national, regional and international levels. The stakeholders include scientists, protected areas staff, government entities, and parties of various international conventions.				
Gender mainstreaming	X			**To be completed 30 days after start date of the project implementation phase**
Justification: The project includes developing method manuals, capacity building activities, development of science-to-policy briefs, consultations and deliberations on scientific methodologies for the project. Therefore, the project should put in place the procedures to ensure gender representation and participation at all levels including recruitment for project staff, regional lead scientists, and the scientific advisory panel.				

III. KEY SAFEGUARD POLICY ISSUES AND THEIR MANAGEMENT

1. Describe any safeguard issues and impacts associated with the proposed project. Identify and describe any potential large scale, significant and/or irreversible impacts:

The Safeguard Screening process indicates that two CI-GEF Project Agency Environmental and Social Safeguards will be triggered by this project:

- Stakeholder Engagement, and
- Gender mainstreaming.

This review has also determined that the project's activities will not cause or enable to cause significant negative environmental and social impacts.

The measures recommended in section 4 (below) should be enough to properly avoid, mitigate or compensate the negative impacts generated by this project.

2. Describe any potential indirect and/or long term impacts due to anticipated future activities in the project area:

- No indirect and/or long term impacts due to future activities in the project area can be anticipated.

3. Describe any project alternatives (if relevant) considered to help avoid or minimize adverse impacts:

- No project alternatives are necessary for this project.

4. Describe measures to be taken by the Executing Entity to address safeguard policy issues:

Stakeholders' engagement: to ensure that the project meets CI-GEF Project Agency's "Stakeholders' Engagement Policy", the Executing Agency will develop a Stakeholders' Engagement Plan (SEP) that will be submitted with the ProDoc. The SEP will describe the following:

- The key stakeholder groups that would be engaged throughout the project;
- The consultation process and methods, especially regarding the activities to be implemented under Components 2 and 3 of the project;
- A strategy and timetable for sharing information and consulting with each of these groups; and
- The process by which people affected by the project can bring their grievances to the Executing Entity for consideration and redress.

The Project Agency will provide the terms of reference for the SEP and oversee the implementation of this plan throughout the duration of the project.

Gender mainstreaming:

I. To ensure that the project meets CI-GEF Project Agency's "Gender Mainstreaming Policy #8", the Executing Agency will develop and submit for approval, within 30 days of the beginning of the implementation phase, a Gender Mainstreaming Plan (GMP) outlining:

- How gender issues will be effectively incorporated into recruitment processes, capacity building activities, consultations and decision-making bodies;
- The measures that will be put in place to ensure the equitable participation of women and men in the project, and
- The M&E system that would be put in place to ensure that gender issues will be properly tracked over the life of the project to allow for adaptive management measures.
- The Project Agency will provide guidelines for mainstreaming gender into the project and oversee the implementation of this plan throughout the duration of the project.

II. For the ProDoc, the Executing Agency will work with CI's gender specialist in identifying and incorporating key gender issues that need to be mainstreamed within the ProDoc before submission to the GEF-Sec

5. Identify the key stakeholders and describe the mechanisms for consultation and disclosure on safeguard policies, with an emphasis on potentially affected people:

The consultation mechanisms by each type of major stakeholder will be designed and implemented by the Executing Agency at the beginning of the project implementation phase, and approved and monitor by the Project Agency.

IV. PROJECT CATEGORIZATION

PROJECT CATEGORY	Category A	Category B	Category C
			X
Justification: The review of the Project Safeguards Screening Form indicates that this project will not cause or enable to cause any major environmental or social impacts.			

V. EXPECTED DISCLOSURE DATES

Safeguard	CI Disclosure Date	In-Country Disclosure Date
Environmental & Social Impact Assessment (ESIA)	N/A	N/A
Natural Habitats	N/A	N/A
Involuntary Resettlement	N/A	N/A
Indigenous Peoples	N/A	N/A
Physical Cultural Resources	N/A	N/A
Pest Management	N/A	N/A

Appendix IV(a): Project Results Monitoring Plan

Indicators	Metrics	Methodology	Baseline	Location	Frequency	Responsible Parties	Indicative Resources
Objective: Provide countries in the Neotropical, Afrotropical and Indo-Malayan biogeographic realms with the assessments and data needed to improve planning, design and management of terrestrial protected areas for climate change resilience.							
Indicator a: Number of plans governing national protected areas systems integrating the effects of climate change on species and ecosystem targets.	# / % of management plans and conservation instruments.	Before-after comparison of planning instruments for each region against standardized measures of climate readiness (where possible).	Baseline % of NPA Plans in each region with inclusions for climate readiness can be established at project start-up.	Regional.	Project start (Y1Q1) and project end (Y3Q4)	Core science team.	10% time estimated for CI regional science advisors
Indicator b: Number of policies or regulations integrating research-to-policy brief recommendations.	# of policies and/or regulations established and/or being processed.	Evaluate instances of new policies and regulations arising as a result of the project recommendations.	No recommendations to policy at project start.	Regional.	Project start (Y1Q1) and project end (Y3Q4)	Core science team.	10% time estimated for CI regional science advisors.
Indicator c: Number of opportunities identified to reduce loss of species or ecosystem representation in protected areas due to climate change.	# of viable endorsed recommendations by science team and/or GEF-STAP.	Project results screened and interpreted by project science advisory and prioritized for field applications with decision makers and PA managers.	No opportunities identified at start of project.	Regional.	Project start (Y1Q1) and project end (Y3Q4)	Core science team.	5% time estimated for Core Science Team with regional leads.

Indicator d: Number of protected areas agency staff trained in and implementing climate change decision support tools.	# of trained staff actively applying CC decision support tools	Evaluate participation of PA staff in project training and their subsequent use of CC tools through targeted surveys.	No project trained PA staff or available tools at start of project	Regional.	Per training event with end of project summary (Y3Q4).	Core science team + PMU.	None.
Component 1: Global data compilation and analysis of protected area vulnerability to climate change							
Indicator 1.1.: Species and ecosystem change databases and geospatial data available to regional assessment teams.	% data preparation and level of access for regional teams.	Estimates from existing and in-preparation data sources updated throughout the project.	Regional datasets not yet available to the project nor organized effectively for a regional assessment.	Regional	Annual updates	PI with international advisors.	1% of time, Core Science Team.
Indicator 1.1.1.: Number of species change models created or converted into formats readily accessible for regional assessment.	# of species distribution models.	Reports from core science team.	No standardized species models accessible or adapted for the regional assessments at project start.	Regional	Annual updates	PI with international advisors	None (included in above)
Indicator 1.1.2.: Number of ecosystem change models and datasets created or converted into formats readily accessible for regional assessment.	# of ecosystem displacement models and data sets.	Reports from core science team.	No standardized ecosystem models accessible or adapted for the regional assessments at project start.	Regional	Annual updates	PI with international advisors	None (included above)

Indicator 1.2.: Method for regional conservation planning for climate change available to regional assessment teams.	Method produced and available to teams.	Standard methodology circulated to regional teams.	No method available at project start.	Regional	Annual update (Yr1Q4)	Core science team	None (part of annual reporting)
Indicator 1.2.1.: Methods manual for regional assessment of representation losses (species and ecosystems) available to regional assessment teams.	Manual produced and available to teams.	Standard methodology circulated to regional teams.	No method available at project start.	Regional	Annual update (Yr1Q4)	Core science team	None (as above)
Indicator 1.2.2.: Methods manual for regional protected areas planning to maintain representation in the face of climate change available to regional assessment teams.	Manual produced and available to teams.	Standard methodology circulated to regional teams.	No method available at project start.	Regional	Annual update (Yr1Q4)	Core science team	None (as above)
Indicator 1.3.: Regional maps of high risk areas available.	# of three regional risk maps in circulation.	Technical reporting	No risk maps available at project start.	Regional (Neotropics, Africa and Indo-Malaysia geographies)	Annual updates	Core science team	None (part of annual reporting)

Indicator 1.3.1.: Number of geographies and taxa identified as most in need of regional assessment.	# of prioritized geographic areas and # of taxa	Results of prioritization exercises.	No prioritization at project start.	Regional	Annual updates	Core science team	None (part of annual reporting)
Component 2: Regional fine scale assessment and research-to-policy briefs							
Indicator 2.1.: Regional assessment results available and published in the peer-review literature.	#Briefs passed to end-users (on-line, targeted outreach etc.) / # of peer review articles.	Technical reporting and registry of project outreach activities that distribute results.	No assessment results available at project start.	Regional	Annual updates	Core science team	2% resources used for publishing and outreach of results.
Indicator 2.1.1.: Number of publications of regional assessment results.	# Publications (grey literature and peer review) produced and their distribution	Technical reporting	No publications at project start.	Regional	Annual updates	Core science team with collaborators	None (included above)
Indicator 2.1.2.: Number of potential priority areas for expansion of protection identified.	# Areas identified	Inputs from regional leads with in-region counterparts	No areas identified at project start.	Regional	Annual updates	Core science team with regional collaborators.	5% of Core Science Team time devoted to research-to-policy briefs
Indicator 2.2.: Number of multi-national and country research-to-policy briefs presented to protected areas agency staff.	# of presented policy briefs	Technical reporting.	No policy briefs at project start	Regional and National	Annual updates	Core science team	5% of Core Science Team time involved in research-to-policy briefs

Indicator 2.2.1.: Number of multi-national research-to-policy briefs distributed.	# of multi-national research-to policy briefs	Technical reporting by core-science team.	No policy briefs at project start	Regional	Annual updates	Core science team	None (included in above)
Indicator 2.2.2.: Number of country research-to-policy briefs presented.	# of national research-to-policy briefs	Technical reporting with national counterparts to regional leads.	No policy briefs at project start	National	Annual updates	Core science team - with regional leads coordinating with national institutions.	None (included in above)
Indicator 2.3: Decision support tools developed and disseminated.	# Tools developed and # Tools accessible to end-users	Technical reporting.	No decision support tools available from the project at start-up.	National	Annual updates	Core science team	5% time estimated for Core Science Team and decision support subgrantee.
Indicator 2.3.1.: Number of protected areas agency staff trained in and using decision support tool.	# of trained PA staff actively applying CC decision support tools	Evaluate participation of PA staff in project training and their subsequent use of CC tools through targeted surveys.	No project trained PA staff or available tools at start of project	National	Annual updates	Core science team + PMU.	None (included in above)
Component 3: Monitoring and Evaluation							
Indicator 3.1.: Monitoring plan completed and reflected in data compilation and regional assessment work plans.	Project M&E Plan complete	Follow project M&E guidelines. Develop plan for inception workshop.	Project Document outlines the steps from project implementation and GEF Agency expectations.	US Based (EA)	Quarterly PMU updates.	PMU	Component 3 PMU resources.

Indicator 3.1.1.: Number of adaptive project management decisions in response to monitoring system information.	# of corrective decisions taken from annual reviews	PSC meeting notes and general coordination.	Project roadmap provide in Project Document.	US Based (EA)	Quarterly PMU updates.	PMU	Component 3 PMU resources.
Indicator 3.2.: Number of adaptations to regional assessments based on learning from other regions.	# of cross learning examples applied during regional assessments.	Provide cross-learning opportunities during the 3 regional assessments.	No adaptation needed until regional assessment exercises begin.	Regional	Updated through annual review.	PSC/ core science team	% time for science team spent on technical evaluations of assessments.
Indicator 3.2.1.: Number of instances of information or knowledge discovery in regional assessments identified in knowledge mapping.	% improvement of applicable CC/PA knowledge due to the regional assessments.	Qualitative estimate by experts of the increase in relevant CC related PA knowledge due to the project.	Variable knowledge on climate smart planning for protected areas exists across the regions	Regional	End of project (Y3Q4)	PSC/ core science team	% time for science team spent on an evaluation of knowledge generated.

Appendix IV(b): Project Safeguards Monitoring Plan.

Indicators	Metrics	Methodology	Baseline	Location	Frequency	Responsible Parties	Estimated Budget
Safeguard Plan 1: Stakeholder Engagement Plan							
Indicator SEP #1: Number and regularity of Project Management and Steering Committee meetings between Project Partners.	# of meetings	PSC and PMU meeting registries	There is a history of pre-meetings during the development of the project with partners (please see SEP in Appendix VI(a)	Virtual and in-person meetings.	Annual	PMU / PSC	$46,431
Indicator SEP #2: Project updates provided to regional decision making authorities and end users of the generated climate scenarios and recommendations.	# of update meetings and support documents	Project registry for project communications and stakeholder engagement.	No project progress to report at start-up.	Virtual, in-person meetings, project communications.	Annual	PSC in coordination with regional science leads in each geography.	$27,803
Safeguard Plan 2: Gender mainstreaming Strategy (to be developed within 30 days of project implementation)							
Indicator xx							
Indicator xx							
Indicator xx							
Indicator xx							

Appendix IV(c): Project M&E Plan and Budget.

Type of M&E	Frequency	Responsible Parties	Budget from GEF (USD)
Inception workshop and report	Within three months of signing of CI Grant Agreement for GEF Projects	Project Team Executing Agency CI-GEF PA	$30,245
Project Results Monitoring (objective, Outcomes and Outputs)	Within one month of inception workshop	Project Team CI-GEF PA	$2,932
Project Safeguard Monitoring Plans	Annually (data on indicators will be gathered according to monitoring plan schedule shown on Appendix IV)	Project Team CI-GEF PA	$2,095
GEF Focal Area Tracking Tools	i) Project development phase; ii) prior to project mid-term evaluation; and iii) project completion	Project Team Executing Agency CI-GEF PA	$2,295
Project Governance Structure Meetings (Steering and Advisory Committees +OFP)	Annually	Project Team Executing Agency CI-GEF PA	$16,186
Quarterly reports	Quarterly	Project Team Executing Agency	$1,591
Annual Project Implementation Report (PRI)	Annually for year ending June 30	Project Team Executing Agency CI-GEF PA	$2,387
Independent Mid-term Evaluation	Upon project operational closure	Project Team Executing Agency	$25,000
Independent Terminal Evaluation	CI Evaluation Office Project Team CI-GEF PA	Approximate mid-point of project implementation period	$25,000
Independent Audit	CI Evaluation Office Project Team CI-GEF PA	Evaluation field mission within three months prior to project completion.	$8,000
	Project Team Executing Agency CI-GEF PA	At least annually	$8,000

	Executing Agency CI-GEF PA	Annually	$8,000

Appendix V: GEF Tracking Tool by Focal Area

Please see attached Appendix V.pdf

Appendix VI (a): Stakeholder Engagement Plan (SEP)

A. Introduction.

1. Climate change is causing a shift in species and ecosystems to move to track suitable climates. Mobile species such as birds and butterflies are among the first to shift, but ultimately plants and other organisms are expected to die off in current parts of their range in which climate becomes unsuitable and to colonize areas in which climate is newly suitable. These movements are known collectively as species range shifts due to climate change and they have been observed in thousands of species. They may occur in a few years for mobile vertebrate species and over generations in sessile species such as plants.
2. Species range shifts pose a fundamental problem for conservation in protected areas. Species that are currently protected within protected areas such as national parks and nature reserves may move into areas in which they are not protected. This undermines efforts, such as those of the GEF, to fund protected area expansion in ways that will extend coverage to all threatened species. Efforts to represent all ecosystems in protected areas are similarly compromised by climate change, because as species move, ecosystems are torn apart and re-assembled, changing which ecosystems are represented in protected areas.
3. Protected areas management agencies in tropical countries need help in assessing these changes. These agencies are attempting to maintain and expand protected areas coverage in complex political settings and in the face of multiple pressures. Information about the biological changes that will accompany climate change is essential to these agencies making dynamic long-term conservation plans that are robust to climate change.
4. This proposal addresses the need for better biological information about what species and ecosystems may lose representation in protected areas due to climate change. It provides information about where and how species may move to track suitable climate, thus allowing protected areas agencies to plan for the long-term survival of species threatened by climate change and other factors.
5. Our objective is to provide protected areas management agency staff in tropical countries with the information they need to intelligently plan for the impacts of climate change-related species range shifts and ecosystem movements. The project will provide data and tools for planning that will augment the information and techniques currently being used by protected areas management agencies to incorporate these aspects into planning of protected areas systems.

B. Policies and Requirements.

6. This plan is intended to fulfill the CI-GEF agency policies on the processes of informing and engaging the partners and stakeholders in the project. The CI-GEF Project Agency oversees the Executing Entity involving all stakeholders as early as possible in the preparation process and makes sure that their views and concerns are taken into account. The CI-GEF Project Agency team will further ensure that the Executing Entity will continue to hold consultations throughout the project as described in this plan. To address this requirement and respond to the design of the project, the stakeholder engagement plan is organized to address each of the three components of the project – global data compilation; regional assessments; and monitoring and evaluation.

C. Summary of Stakeholder Engagement activities during project development.

7. The project development team has engaged in a series of information sharing and consultation activities with a range of project stakeholders throughout the project development phase. These consultations and the stakeholders involved are summarized below.

8. This proposal follows the recommendations of and builds upon the findings of the GEF Science and Technical Advisory Panel (STAP) consultation with leading experts in climate change biology, conducted in January 2014 in Washington D.C. In that meeting, Camile Parmesan, Joan Kleypas, Rebecca Shaw, Lee Hannah, Rebecca Mant, Mark Bush, Miguel Araujo and other leading climate change biologists helped review the resilience of GEF strategies to climate change. Among the leading recommendations of that meeting was that the cross-border movements of species and ecosystems be incorporated into GEF strategies and funding. The science panel recommended that the best way of achieving this goal would be providing data from multiple lines of evidence to protected areas planners, on continental scales useful to multiple countries within regions.

9. Following this consultation with climate scientists led by the STAP, the project design team has remained in touch with the STAP through telephone calls and consultations at the World Parks Congress (WPC) in Sydney Australia in November of 2014. We have received comments on the structure and scope of the research effort from the chair of the STAP climate change workshop and from the STAP secretariat on proposal preparation details, both in telephone calls and in meetings at the WPC.

10. The World Parks Congress (WPC) is convened every four years by the International Union for the Conservation of Nature (IUCN) as the premier global forum on issues concerning protected areas worldwide. Four members of the project development team attended WPC for consultations with protected areas practitioners directly relevant to project objectives. The project development team engaged a wide variety of stakeholders at the WPC, from national protected areas agencies, NGOs and the conservation, civil society and science communities. Team members attended workshops within the WPC concerning climate change and protected areas planning, the use of remote sensing in planning protected areas and other topics. These consultations spanned four days and included project design team meetings to synthesize inputs received.

11. Representatives of the project development team convened a stakeholder consultation on November 17 2014 at WPC. Stakeholders in attendance included parks managers, parks administrators, NGO staff and members of the science community in attendance at WPC. Over 40 stakeholders attended the consultation, which was split into several segments to gather stakeholder input on project design. In particular, stakeholders were asked to help define what was sufficient to make protected areas systems robust to climate change. Stakeholders defined biological and decision-making factors needed for protected areas to be successful as climate changes. These factors were integrated into project design elements. The chair of the STAP climate science advisory panel was in attendance at the consultation.

12. Informal consultations were conducted between January and May of 2015 with representatives of NGOs, protected areas agencies and scientists in Latin America, Asia and Africa. These consultations included a focus on identifying NGO and development donor projects that would complement or provide context for the current proposal. Current and planned activities identified in these consultations were incorporated into project plans for interfacing with collaborators. A formal review of relevant possible collaborators was compiled by a project consultant in June of 2015. This compilation complemented the informal consultations and provided a catalog of possible data providers, documenting which species or ecosystems and which locations were addressed in these

climat change analyses already completed or underway. These possible resources were incorporated into project design.

13. Structured interviews with protected areas planners and NGO staff were conducted in August-September of 2015, with the purpose of helping identify what research product formats would be most useful to real-world planners. Possible research communications tools were explored within each interview, including written reports, personal presentations, online learning using decision-support tools, laptop-friendly decision support tools, personal training in conservation planning for climate change or distance (online) training in conservation planning tools. The results of these consultations were used to refine project research dissemination.

D. Project Stakeholders.

14. The objective of this Stakeholder Engagement Plan is to involve all project stakeholders, including the GEF and STAP, national protected areas agency staff, NGO staff and the scientific community as early as possible in the implementation process and throughout the process, to make sure their views and input are received and taken into consideration. The plan will help the project establish effective lines of communication and working relationships.

15. We will engage the international scientific community through the regional lead scientists and through the Scientific Advisory Panel. The scientific community will be further engaged in providing peer-review for all project publications through normal peer-review journals. We will engage national protected areas agency staff through the Regional Lead Scientists, through scientists participating in the regional assessments and through outreach from implementing agency science staff, including the project director and project postdoc. These and other key project stakeholders are identified in Table 1.

E. Stakeholder Engagement Program.

16. Key stakeholders and stakeholder engagement activities are summarized in the table below.

17. The stakeholder engagement program will be implemented in conjunction with the Gender Mainstreaming Strategy and Action Plan thus ensuring that gender equity is maintained throughout project interactions with stakeholders.

Project Stakeholders.

Stakeholder	Interests in the Project	Project Effect(s) on Stakeholder	Engagement During Project Implementation
GEF and STAP	Securing long-term conservation goals of protected areas portfolio as climate changes	The results of the project will help GEF to identify countries most at risk of losing species and ecosystem representation from protected areas; it will help GEF and STAP design appropriate country and multi-country responses to restore lost representation.	GEF will receive all project reports, recommendations and data. The former chair of STAP will be invited to head the Science Advisory Panel of the project. Project results will be conveyed to the STAP in advance of publication, for sharing with GEF where appropriate.
Convention on Biological Diversity signatories	Long-term sustainable conservation of biodiversity	The project will provide better data for reporting on achievement of CBD goals and the likelihood of progress towards those goals being maintained under climate change.	Project results will be summarized for national CBD focal points, including improved strategies for dealing with climate change through national protected areas agency actions.
National Protected Areas Agencies	Key users of data and simulations of climate change effects on protected species and ecosystems	The project will provide national protected areas agencies with improved information about climate change impacts on species and ecosystems represented in protected areas, particularly on loss of representation that will require compensatory action.	National protected areas planners will help define responses to lost species and ecosystem representation, either by increasing protected area to add representation lost due to climate change, or through implementing other management actions (translocation, in-situ habitat enhancement) where new protection is not an option.
International Scientific Community	Participants in evolving understanding of climate change impacts on species, ecosystems and protected area functioning.	Will benefit through increased knowledge of climate change impacts in high-biodiversity tropical regions.	May provide data or models used in the project global analyses or regional assessments.
National biodiversity conservation NGOs	Need results of actions to be sustainable in the face of climate change, need improved performance of protected areas agency counterparts on climate change; need improved integration of protected	Will benefit through interaction with the national and regional scientists working in the regional assessments	We will engage national NGOs that work closely on climate change and protected areas issues. NGO staff will be eligible for training in decision support tools and conservation planning software packages developed by the project.

Stakeholder	Interests in the Project	Project Effect(s) on Stakeholder	Engagement During Project Implementation
	areas into national climate change planning		
International biodiversity conservation NGOs	Need improved information on climate change impacts on protected areas; Need improved performance of protected areas agency partners and improved integration of protected areas into national climate change planning	Will have access to improved information on climate change impacts on protected species and ecosystems and be able to participate in or support national protected areas strategies that will be robust to climate change.	NGO scientists are members of the assessment team, NGO staff will be involved in decision-support training and outreach.
National climate change planning agencies	Need understanding of effects of climate change on CBD and national protected areas goals.	Will have improved information on protected areas impacts of climate change, associated impacts on surrounding communities and possible national response measures.	Project results will be made available to climate change planning entities, national protected areas staff will receive information and training that will allow them to engage more effectively in national climate change planning.
National development planning agencies	Improved consideration of climate change and protected areas in national development plans	Will have improved information on climate change impacts on protected areas, associated costs of these impacts and costs and benefits of response strategies	National protected areas agency staff directly engaged by the project will interact with national development planners to determine appropriate national budget and international development cooperation requests.
Regional and National Scientists	Key users and providers of understanding of climate change impacts on species, ecosystems and protected areas	The results of the project will directly inform regional climate change biology research efforts.	National and regional scientists will be directly engaged by the project as the primary sources of data and modeling for the regional assessments.

F. Methods for Consultation.

18. To ensure wide dissemination, all project data, decision-support tools and training materials will be made available through websites of the regional assessments hosted by the Lead Regional Scientists. In addition, we will provide links to these websites through the Conservation International website.

19. We will build engagement and consultation of CBD focal points, NGOs and development agencies into the regional assessment methods at the project inception meeting. Representatives of STAP will be engaged through the Science Advisory Panel of the project. International NGOs will be engaged through the executing agency and through the project's international advisors.

20. We will engage national protected areas agency staff in development of response strategies, decision-support tools and conservation planning software package trainings. We will solicit input from them during regional assessment planning and in design of responses to impacts identified in the regional assessments.
21. We will engage the international scientific community through participation and presentations at scientific conferences. We will engage regional scientific communities through appropriate journals and participation in regional science meetings and organizations.

G. Timetable.

22. Estimated schedule for engagements by stakeholder group:

Project Stakeholders	Year 1				Year 2				Year 3			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
GEF and STAP	■	■		■		■		■		■	■	■
CBD signatories						■	■				■	■
National protected areas agencies		■	■			■	■				■	■
International scientific community	■	■	■	■	■	■	■	■				■
National biodiversity conservation NGOs							■					■
International conservation NGOs	■	■	■	■	■	■					■	■
Regional and national scientific communities						■	■	■	■	■	■	■
National climate change planning entities						■						■
National development planning agencies												■

H. Resources and Responsibilities.

23. The Betty and Gordon Moore Center for Science at Conservation International is responsible for project execution and Lee Hannah as Principal Investigator for the project from the Moore Center is responsible for ensuring implementation of the project's Stakeholder Engagement Plan (SEP) at the whole-project level. The Regional Lead Scientists will be responsible for ensuring that the SEP is implemented at the level of each regional assessment. The Principal Investigator and the Regional Lead Scientists will be responsible for budget allocation for implementation of the SEP.

I. Grievance Mechanism.

24. The project focuses on global tropical research and regional assessments, making it unlikely that stakeholders outside of the project team will have grievances regarding project execution.
25. The PSC will set up a process at the project inception meeting for resolving any and all grievances within and without the project. We will post instructions on the regional assessment websites with

contact information and grievance procedures. This will include contact information for PSC members and CI-GEF project agency staff.

26. The primary point of contact will respond to all grievances in writing within 15 working days of receipt. Any grievances recorded will be entered into the project monitoring framework and responses sent to the claimant recorded. If the claimant is not satisfied with the response, the grievance may be submitted directly to the CI-GEF Project Agency.

27. In the event that this process does not resolve the grievance, the grievant may file a claim with the CI Director of Compliance (DOC) who can be reached at:

    Electronic email: GEFAccountability@conservation.org
    Mailing address: Direction of Compliance
    Conservation International
    2011 Crystal Drive, Suite 500
    Arlington, VA 22202, USA.

28. The accountability and grievance mechanism used in this project is that generated by the CI-GEF Project Agency (01/2015). It is documented as a Project Resource and on-line available here .

J. Monitoring and reporting.

29. Two SEP specific indicators are proposed as part of Monitoring and Evaluation Plan (see Appendix IV-b) to help monitor the level of engagement during the project:

Indicator SEP #1:

30. Number and regularity of Project Management and Steering Committee meetings between Project Partners.
31. **Logic:** A measure of internal coordination central to project effectiveness.
32. **Threshold**: Annual

Indicator SEP #2:

33. Regular project updates provided to regional decision making authorities and end users of the generated climate scenarios and recommendations.
34. **Logic:** Well informed authorities/ end users and feedback are central to project success and effectiveness.
35. **Threshold:** At least one comprehensive update managed by regional science leads to relevant regional authorities with feedback received every six months.

Appendix VII: Detailed Project Budget

Detailed GEF Project budget

Version (date) : 10/12015

CONSERVATION INTERNATIONAL

gef GLOBAL ENVIRONMENT FACILITY INVESTING IN OUR PLANET

GEF Project ID: G0004

Project Title: Spatial Planning for Protected Areas in Response to Climate Change (SPARC)

Executing Agencies : Conservation International

Project Amount GEF-funded (USD) :	**1,804,862**	Indicative Project starting date :	**January 1, 2016**
Project Amount co-financing (USD) :	3,655,992	Indicative Project end date :	**Dec. 31,2018**
Total Project Amount (USD) :	**5,460,854**	Duration (in years):	**3**

Component 1 description : Scenario analyses in three tropical biogeographic realms spanning 83 countries in the Neotropics, Indo-Malayan tropics and Afrotropics, focusing on the vulnerability of protected area networks to climate change.

Component 2 description: Regional assessments with the expertise of regional scientists to bear on a more detailed analysis of protected areas and climate change. Loss of species and ecosystem representation will be assessed for individual protected areas and opportunities to restore lost repr

Component 3 description: Project monitoring framework and preparation of knowledge products to share the recommendations emanating from the project

GEF FUNDED BUDGET		Project budget by component (in USD)					Project budget per year (in USD)			
EXPENSES TYPE	***DESCRIPTION***	**Component 1**	**Component 2**	**Component 3**	**Project Management Costs**	**Total**	**YR1**	**YR2**	**YR3**	**TOTAL**
Salaries and benefits	*Principle Investigator 20%*	24,224	45,039	19,691	14,434	**103,388**	32,872	34,550	35,966	**103,388**
Salaries and benefits	*Project Manager (Postdoctoral Researcher) 100%*	46,037	99,722	134,179	-	**279,939**	81,581	97,353	101,004	**279,939**
Salaries and benefits	*Global Synthesis Senior Director 4%*	-	-	21,139	-	**21,139**	6,788	7,043	7,307	**21,139**
Salaries and benefits	*Asia Pacific, Africa/Madagascar, Latin America Regional Scientists - field support 3%*	-	27,803	-	-	**27,803**	-	-	27,803	**27,803**
Salaries and benefits	*Finance and Operations Support*	4,016	28,884	-	52,509	**85,409**	27,164	28,860	29,385	**85,409**
Total Personnel Salaries and benefits		**74,278**	**201,447**	**175,009**	**66,943**	**517,677**	**148,405**	**167,807**	**201,465**	**517,677**
Consultants fees International	*Outreach- online training development*	-	92,250	-	-	**92,250**	-	-	92,250	**92,250**
Consultants fees International	*Statistician and modeling advisor*	73,850	-	-	-	**73,850**	36,400	37,450	-	**73,850**
Consultants fees International	*Statistician and modeling advisor*	1,119				**1,119**	1,119			**1,119**
Consultants fees International	*Midterm Review and Terminal Evaluation*	-	-	-	50,000	**50,000**	-	25,000	25,000	**50,000**
Auditing Fees	*Annual financial project audit*	-	-	-	24,000	**24,000**	8,000	8,000	8,000	**24,000**
						-				**-**
Total Professional Services		**74,969**	**92,250**	**-**	**74,000**	**241,219**	**45,519**	**70,450**	**125,250**	**241,219**
International Transportation	*Project Inception Workshop*	6,350	-	-	-	**6,350**	6,350	-	-	**6,350**
Lodging / meals / perdiem		8,928	-	-	1,240	**10,168**	10,168	-	-	**10,168**
Local transportation		1,350	-	-	600	**1,950**	1,950	-	-	**1,950**
Lodging / meals / perdiem	*Core Science Team Meeting*	4,255	-	-	-	**4,255**	4,256	-	-	**4,256**
Vehicle rental Costs & Fuel		650	-	-	-	**650**	650	-	-	**650**
International Transportation	*Science Advisory Meeting*	2,912	-	-	-	**2,912**	-	2,912	-	**2,912**
Lodging / meals / perdiem		1,716	-	-	-	**1,716**	-	1,716	-	**1,716**
Local transportation		1,066	-	-	-	**1,066**	-	1,066	-	**1,066**
Vehicle rental Costs & Fuel		728	-	-	-	**728**	-	728	-	**728**
International Transportation	Regional Meetings in Africa, Asia, Latin America - Year 2 & 3	-	22,489	-	-	**22,489**	-	11,024	11,465	**22,489**
Lodging / meals / perdiem		-	29,944	-	-	**29,944**	-	14,679	15,266	**29,944**
Local transportation		-	24,929	-	-	**24,929**	-	12,220	12,709	**24,929**
Vehicle rental Costs		-	5,092	-	-	**5,092**	-	2,495	2,597	**5,092**
Local transportation (domestic airfare)	Regional Lead Scientists in-person training on Project Support Tool		9,000			**9,000**			9,000	**9,000**
Lodging / meals / perdiem			9,000			**9,000**			9,000	**9,000**
Total Travel and Accommodations		**27,955**	**100,454**	**-**	**1,840**	**130,250**	**23,374**	**46,840**	**60,036**	**130,250**
Catering	*Project inception workshop*	-	-	-	1,600	**1,600**	1,600	-	-	**1,600**
Catering	*Science advisory meeting*	1,612	-	-	-	**1,612**	-	1,612	-	**1,612**
Catering	*Regional Meetings: Latin America, Asia, Africa*	-	17,758	-	-	**17,758**	-	8,672	9,086	**17,758**
Space Rental and material for workshops	*Latin America regional meeting Venue rental*	-	3,182	-	-	**3,182**	-	1,560	1,622	**3,182**
Total Meetings and workshops		**1,612**	**20,940**	**-**	**1,600**	**24,152**	**1,600**	**11,844**	**10,708**	**24,152**

Grants & Agreements	*University of Leeds*	78,135	41,859	-	-	**119,994**	78,135	37,876	3,983	**119,994**
Grants & Agreements	*Univbersity of Arizona*	80,133	39,867	-	-	**120,000**	49,396	53,446	17,158	**120,000**
Grants & Agreements	*CSIRO*	40,000	-	-	-	**40,000**	40,000	-	-	**40,000**
Grants & Agreements	*Global Vegetation Model*	20,000	-	-	-	**20,000**	20,000	-	-	**20,000**
Grants & Agreements	*Catholic University of Chile*	-	152,483	-	-	**152,483**	-	101,655	50,828	**152,483**
Grants & Agreements	*Xishuangbanna Tropical Botanical Garden*	-	136,300	-	-	**136,300**	-	90,867	45,433	**136,300**
Grants & Agreements	*University of Stellenbosch*	-	187,438	-	-	**187,438**	-	91,531	95,907	**187,438**
Grants & Agreements	*Boston University*	-	59,448	-	-	**59,448**	-	-	59,448	**59,448**
Total Grants & Agreements		**218,268**	**617,395**	**-**	**-**	**835,662**	**187,531**	**375,375**	**272,756**	**835,662**
Furniture and equipment > 5000 USD	IT Equipment	900	923	1,677		3,500	3,500			3,500
Total Equipment		**900**	**923**	**1,677**	**-**	**3,500**	**3,500**	**-**	**-**	**3,500**
Total Other Direct Costs		**5,442**	**24,158**	**18,160**	**4,641**	**52,401**	**11,609**	**13,884**	**26,908**	**52,401**
Total GEF funded project costs		**403,424**	**1,057,567**	**194,846**	**149,025**	**1,804,862**	**421,538**	**686,199**	**697,124**	**1,804,862**

CO-FINANCING			Co-financing by component (in USD)					Co-financing per year (in USD)			
SOURCES OF CO-FINANCING	***NAME OF CO-FINANCIER***	***TYPE OF COFINANCING***	**Component 1**	**Component 2**	**Component 3**	**Project Management Costs**	**Total**	**YR1**	**YR2**	**YR3**	**TOTAL**
GEF Agency	Conservation International	*Cash*	133,127			56,062	**189,188**	189,188			**189,188**
GEF Agency	Conservation International	*In-kind*	223,535	225,969	-		**449,504**	223,535	225,969		**449,504**
Other	University of Leeds	*Cash*	48,000	50,000	-		**98,000**	48,000	50,000		**98,000**
Other	Unversity of Leeds	*In-kind*		500,000			**500,000**		500,000		**500,000**
Other	University of Stellenbosch	*Cash*	55,000	310,000			**365,000**	55,000	310,000		**365,000**
Other	University of Stellenbosch	*In-kind*		420,000			**420,000**		420,000		**420,000**
Other	Catholic University of Chile	*Cash*	50,000	400,000			**450,000**	50,000	250,000	150,000	**450,000**
Other	Commonwealth Scientific and Industrial Research Organisation (Australia)	*In-kind*	123,056	61,528			**184,584**	123,056	61,528		**184,584**
Other	IUCN	*In-kind*	200,000	150,000	-	-	**350,000**	200,000	150,000	-	**350,000**
Other	University of Arizona	*Cash*	134,251	515,465			**649,716**	134,251	515,465		**649,716**
Sub Total Co-financing IN-KIND			**546,591**	**1,357,497**	**-**	**-**	**1,904,088**	**546,591**	**1,357,497**	**-**	**1,904,088**
Sub Total Co-financingIN CASH			**420,378**	**1,275,465**	**-**	**56,062**	**1,751,904**	**476,439**	**1,125,465**	**150,000**	**1,751,904**
Total Co-financing			**966,969**	**2,632,962**	**-**	**56,062**	**3,655,992**	**1,023,030**	**2,482,962**	**150,000**	**3,655,992**
TOTAL PROJECT BUDGET			1,370,393	3,690,529	194,846	205,086	5,460,854	1,444,569	3,169,161	847,124	5,460,854

Appendix VIII: Co-financing Commitment Letters

2011 Crystal Drive, Suite 500, Arlington, VA 22202, USA
Tel: +1 703 341.2400
Fax: +1 703 553.4817
www.conservation.org

CONSERVATION INTERNATIONAL

October 1, 2015

Subject: Co-Financing support for "Spatial Planning for Protected Areas in Response to Climate Change – SPARC"

To Whom It May Concern:

On behalf of Conservation International Foundation, I am pleased to commit $638,692 in co-financing in support of the GEF Funded Project, "Spatial Planning for Protected Areas in Response to Climate Change – SPARC".

CI is providing up to $189,188 in cash co-financing for Project Management Costs and Component 1, Global Data Compilation and analysis of protected area vulnerability to climate change for the period beginning May 8, 2014 through December 31, 2017. CI is providing $449,504 in-kind co-financing for a dataset on climate impacts on land uses that may affect protected areas, a model of species distributional responses to climate change, expert inputs on climate change impacts in the Neotropics and a software package for selecting protected areas in response to climate change. The value of the in-kind co-financing is estimated based on the costs incurred to develop these deliverables under a grant from The Regents of the University California on behalf of the California Institute of Energy and Environment during the period April 1, 2003-March 31, 2008. The datasets and models will support the global analyses under Component 1 and the regional assessments under Component 2, Regional Assessment and Research-to-policy briefs, during the period of 2016-2018.

This contribution as described above is intended to qualify as co-financing should the project proposal be successful.

Sincerely,

Jennifer Morris
Chief Operating Officer

THE UNIVERSITY OF ARIZONA.

Ecology & Evolutionary Biology
College of Science
University of Arizona

P.O. Box 210088
Tucson, Arizona 85721-0088
(520) 626-6000
FAX: (520 621-9190

September 20, 2015

Ms. Lilian Spijkerman
Vice President and Managing Director, CI-GEF Project Agency
2011 Crystal Drive
Suite 500
Arlington, Virginia 22202
USA

Subject: Co-Financing support for "Spatial Planning for Protected Areas Response to Climate Change (SPARCC)" PI – Enquist, Brian

Dear Ms. Spijkerman,

On behalf of the University of Arizona, I am pleased to commit $649,716 in co-financing to Conservation International in support of the GEF Funded Project, "Spatial Planning for Protected Areas Response to Climate Change".

This co-financing will support Component 1, Global data compilation and analysis of protected area vulnerability to climate change, and Component 2, Regional assessment and research-to-policy briefs, during the period of 2016-2018.

This contribution as described above is intended to qualify as co-financing should the project proposal be successful.

Sincerely,

Kimberly Andrews Espy, Ph.D
Senior V.P. for Research

BE:bj

INSTITUTE OF ECOLOGY AND BIODIVERSITY

DEDICATED TO SCIENCE AND ITS APPLICATIONS TO SOCIETY

August 28th, 2015

Ms. Lilian Spijkerman
Vice President and Managing Director,
CI-GEF Project Agency
2011 Crystal Drive
Suite 500
Arlington, Virginia 22202
USA

Subject: Co-Financing support for "Spatial Planning for Protected Areas Response to Climate Change (SPARC)"

Dear Ms. Spijkerman,

On behalf of the *Corporación Instituto de Ecología y Biodiversidad* (IEB), I am pleased to commit $450,000 over three years in co-financing to *Conservation International* in support of the GEF Funded Project, "Spatial Planning for Protected Areas Response to Climate Change".

This co-financing will support Component 1, Global data compilation and analysis of protected area vulnerability to climate change, and Component 2, Regional assessment and research-to-policy briefs, during the period of 2016-2018.

This contribution as described above is intended to qualify as co-financing should the project proposal be successful.

Sincerely yours,

Juan J. Armesto

Dr. Juan J. Armesto
Professor
Departamento de Ecología
Pontificia Universidad Católica de Chile
Tel. 56-2-2354-2649

President
Instituto de Ecología y Biodiversidad

Piers M de F Forster

Professor of Physical Climate Change/Royal Society Wolfson Merit Award Holder

School of Earth and Environment
University of Leeds
Leeds LS2 9JT, UK
Tel; email: +44 (0) 113 343 6476; p.m.forster@leeds.ac.uk
www.see.leeds.ac.uk

9 September 2015

Ms. Lilian Spijkerman
Vice President and Managing Director, CI-GEF Project Agency
2011 Crystal Drive
Suite 500
Arlington, Virginia 22202
USA

Subject: Co-Financing support for "Spatial Planning for Protected Areas Response to Climate Change (SPARC)"

Dear Ms. Spijkerman,

On behalf of the University of Leeds I am pleased to commit $598,000 in co-financing to Conservation International in support of the GEF Funded Project, "Spatial Planning for Protected Areas Response to Climate Change".

This co-financing will support Component 1, Global data compilation and analysis of protected area vulnerability to climate change, and Component 2, Regional assessment and research-to-policy briefs, during the period of 2016-2018. The support provided by the University of Leeds represents contributions of high-resolution state-of-the-art climate model data to the SPARC project.

This contribution as described above is intended to qualify as co-financing should the project proposal be successful.

Sincerely,

Piers Forster

IUCN Species Programme
Sheraton House
Castle Park
Cambridge CB3OAX
United Kingdom

Tel. +44 (0) 1223 277 966
Fax +44 (0) 1223 277 845
www.iucn.org

Ms. Lilian Spijkerman
Vice President and Managing Director, CI-GEF Project Agency
2011 Crystal Drive
Suite 500
Arlington, Virginia 22202
USA

24/09/15

Subject: Support for "Spatial Planning for Protected Areas Response to Climate Change (SPARC)"

Dear Ms. Spijkerman,

On behalf of the International Union for the Conservation of Nature (IUCN), I am pleased to commit to contributing IUCN's Climate Change Vulnerability Trait Dataset, which was developed by our organization at a cost of $350,000, to Conservation International in support of the GEF Funded Project, "Spatial Planning for Protected Areas Response to Climate Change"(SPARC). This contribution will be made available considering that the SPARC project's modelled assessments of climate change impacts on species will be made available to IUCN, particularly for use for carrying out Red List assessments of extinction risk.

Please note that these data are being made available under the Terms and Conditions of The IUCN Red List of Threatened Species and we will require appropriate acknowledgement on project outputs.

This contribution will support Component 1, Global data compilation and analysis of protected area vulnerability to climate change, and Component 2, Regional assessment and research-to-policy briefs, during the period of 2016-2018.

This contribution as described above is intended to qualify as co-financing should the project proposal be successful.

Sincerely,

RKB Jenkins.

Dr. Richard Jenkins

Deputy Director
IUCN Global Species Programme

UNIVERSITEIT·STELLENBOSCH·UNIVERSITY
jou kennisvennoot • your knowledge partner

Friday, September 25, 2015

Ms. Lilian Spijkerman
Vice President and Managing Director, CI-GEF Project Agency
2011 Crystal Drive
Suite 500
Arlington, Virginia 22202
USA

Subject: Co-Financing support for "Spatial Planning for Protected Areas Response to Climate Change (SPARCC)"

Dear Ms. Spijkerman,

On behalf of **University of Stellenbosch**, I am pleased to commit **$785,000** in co-financing to Conservation International in support of the GEF Funded Project, "Spatial Planning for Protected Areas Response to Climate Change".

This co-financing will support Component 1, Global data compilation and analysis of protected area vulnerability to climate change, and Component 2, Regional assessment and research-to-policy briefs, during the period of 2015-2020.

This contribution as described above is intended to qualify as co-financing should the project proposal be successful.

Sincerely,
Prof GF Midgley

Botany and Zoology Department, University of Stellenbosch
Merriman Avenue, Stellenbosch, Private Bag 1, Matieland 7602
South Africa

LAND AND WATER
www.csiro.au

CSIRO Black Mountain Laboratories, Clunies Ross Road, Acton ACT 2601
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29th September 2015
Our Ref: EOP 96407

Ms. Lilian Spijkerman
Vice President and Managing Director, CI-GEF Project Agency
2011 Crystal Drive
Suite 500
Arlington, Virginia 22202
USA

RE: Support for "Spatial Planning for Protected Areas Response to Climate Change (SPARC)"

Dear Ms. Spijkerman,

On behalf of the Commonwealth Scientific and Industrial Research Organisation (CSIRO), I am pleased to commit $USD 24,584 as in-kind co-financing to Conservation International in support of the GEF Funded Project, "Spatial Planning for Protected Areas Response to Climate Change".

This in-kind co-financing will support Component 1, *Global data compilation and analysis of protected area vulnerability to climate change*, and Component 2, *Regional assessment and research-to-policy briefs*, during the 2016 calendar year.

This contribution as described above is intended to qualify as co-financing should the project proposal be successful. In addition, CSIRO will make available our pre-existing intellectual property (in the form of GDM-based modelling) valued at $USD 160,000 at no cost to the project or collaborators.

CSIRO brings to this collaboration a deep commitment to sustainable land management and a track record of investing in global data and technology infrastructure supporting regional biodiversity assessments, such as protected area representativeness and vulnerability in a rapidly changing world. Over the last seven years CSIRO has proven to be the world leader in community-level biodiversity modelling.

Dr Simon Ferrier and his team will contribute the generalised dissimilarity modelling component of the work plan. Dr Ferrier's team conducts research in partnership with stakeholders to customise the information needed for influencing change in current practice and future options for biodiversity planning and management. CSIRO's continuing commitment to this science underpins our capacity and interest to work with research and application-based partners like Conservation International on novel user-focussed projects such as SPARC.

Yours sincerely,

Ian Cresswell

Dr Ian Cresswell
Research Director
Ian.Cresswell@csiro.au
Phone: +61 3 6232 5213

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