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**ENHANCING RESILIENCE TO REDUCE CLIMATE RISKS:
SCIENTIFIC RATIONALE FOR THE SUSTAINED DELIVERY
OF GLOBAL ENVIRONMENTAL BENEFITS IN GEF FOCAL
AREAS**

(A STAP Advisory document)

Scientific and Technical Advisory Panel

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A STAP ADVISORY DOCUMENT

ENHANCING RESILIENCE TO REDUCE CLIMATE RISKS: SCIENTIFIC RATIONALE FOR THE SUSTAINED DELIVERY OF GLOBAL ENVIRONMENTAL BENEFITS IN GEF FOCAL AREAS

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CONCLUSIONS, RECOMMENDATIONS FOR GEF COUNCIL AND FURTHER ACTION

CONCLUSIONS

1. Regardless of near-term successes to mitigate climate change, the globe is now on a trajectory to certain change, and adaptation will be required. For the GEF, the key to the necessary changes to natural and social systems is to enhance resilience¹ with the primary objective of protecting the delivery of Global Environmental Benefits (GEBs), even for GEF-5 and the short term future to 2020. Therefore, **[CONCLUSION 1] the GEF should ensure that every opportunity is used to enhance resilience to climate change in all its projects and programs.**
2. The threats to GEF investments from climate change arise primarily from (1) direct and indirect² effects on the processes that deliver GEBs such as loss of biodiversity³ and reduced fixing of carbon in natural systems; (2) the ability of projects financed by the GEF to tackle climate variability and change; and (3) the demand on the finite resources to address increasingly-expensive climate change risks. "The benefits of strong and early action far outweigh the economic costs of not acting."⁴ Almost all of the GEF focal area objectives and expected outputs are prone to the risks of climate change. Therefore, **[CONCLUSION 2] the GEF needs clearly and urgently to recognize that the threats posed by climate change are a multi-focal challenge, requiring both multi-focal approaches and actions within all focal area projects.**
3. Building resilience to climate change has the potential to ensure the sustained generation of (GEBs) through enhancing the adaptive capacity⁵ of bio-physical resources (forests, soils, waters, agricultural land etc.) as well as local communities subject to climate variability and mitigating the effects of future climate change. Mitigation and adaptation go hand-in-hand. Therefore, **[CONCLUSION 3] GEF investments to deliver GEBs are best protected by adopting approaches that simultaneously address climate risks and the objectives of focal areas. Enhancing ecosystem and community resilience is the entry point for delivering co-benefits for all GEF focal areas while also contributing to sustainable development.**

¹ Resilience is defined by the IPCC as: "The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning,, the capacity for self-organization, and the capacity to adapt to stress and change." It is a broader and more fundamental concept than 'adaptive capacity' of local communities, encompassing a suite of measures ranging from policy changes to technology promotion.

² GEF projects commonly have objectives to strengthen policy contexts, such as for example, enhancing multi-state cooperation for managing transboundary natural resources. Climate change may pose indirect risks, such as the risk of changing hydrology increasing the complexity of developing effective policy for transboundary water management.

³ For example, risks to protected ecosystems due to changing species composition.

⁴ Source: The Stern Review on the Economics of Climate Change (2006)

⁵ Resilience is a synonym to 'adaptive capacity'. A society potentially exposed to hazards adapts by resisting or changing the process in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures. [Source: World Bank Adaptation Guidance Notes -

<http://beta.worldbank.org/climatechange/content/mainstreaming-adaptation-climate-change-agriculture-and-natural-resources-management-project>]

4. Even though the two overarching strategic goals of the GEF in the GEF-5 Programming Document⁶ call for “taking into account the anticipated impacts of climate change”, the focal area strategic objectives make only limited reference to the need for action on climate change risks. For example, the International Waters focal area objectives refer to ‘considering climatic variability and change’. Therefore, [CONCLUSION 4], **there is a strategic imperative to identify the specific risks of climate change and possible technical, policy and institutional interventions in GEF focal area strategies and to include the climate risks in results-based management frameworks.**
5. STAP has conducted an assessment of a portfolio of GEF-4 projects⁷ to gauge how far climate risks have been identified, whether any rigorous scientific data have been collected on climate change, and what adaptation responses have been proposed. In the projects sampled, consideration of climate risks varied substantially and even though many of the projects identified climate risks, very few supported it with analysis and scientific data. Projects that did acknowledge climate risks also proposed generic adaptation responses including no-regrets measures and sometimes targeted investments. Most projects claimed benefits in increased climate resilience, often through support for the enabling environment (institution-building, policy and legal frameworks, and capacity development). However, some projects were judged to lead to maladaptations⁸ or an actual increase in climate risks. An explicit recognition of climate risks at the project development and design stage could significantly improve the resilience of GEF projects to changing climatic conditions. Therefore, [CONCLUSION 5], **a scientific assessment⁹ for climate risks at project design stage of vulnerable projects in RED hot-spot zones (see “Rapid Climate Change Risk Screening Tool” below) is required to ensure climate resilience and the delivery of GEBs under current and potential future climate variability conditions.**
6. The additional resources required to ensure climate-resilient delivery of GEBs is difficult to estimate. The literature on costs of resilience measures and of inaction is limited, but available information suggests that costs may be modest, particularly since many of the interventions are knowledge- or capacity development-based. The ‘precautionary principle’ supports the contention that without additional financial resources for a climate-resilient approach to GEF investments, the delivery of GEBs is at risk. Therefore, [CONCLUSION 6], **the GEF is encouraged to allocate resources using a pro-active approach aimed at increased climate resilience across the portfolio. This may be achieved, *inter alia*, through mainstreaming climate risks into its projects and programs, identifying opportunities in each focal area, adopting ecosystem-based adaptations and explicit linking with climate change adaptation.**

⁶ Strategic Goals 1 and 2: GEF/R.5/31

⁷ A total of 35 non-SPA projects from all focal areas – see Annex 1

⁸ ‘Maladaptation is a trait that has become more harmful than helpful. In the context of climate change, it is an action or process that increases vulnerability to climate change-related hazards. Maladaptive actions and processes often include planned development policies and measures that deliver short-term gains or economic benefits but lead to exacerbated vulnerability in the medium to long-term.

[Source: UNDP Adaptation to Climate Change definitions - <http://www.undp.org/climatechange/adapt/definitions.html>]

⁹ It is anticipated that this would be conducted at the project/program preparation phase.

RECOMMENDATIONS FOR GEF COUNCIL

The following two recommendations arise from an assessment of the scientific literature and STAP-initiated studies shortly to be published. Further, they derive from recommendations made to STAP during a consultation workshop and in meetings with GEF agencies:

1. **Climate change risk assessment and resilience measures to be mainstreamed across the whole GEF-5 strategy and in the project cycle:** The GEF Council is recommended to provide additional support to all relevant GEF-5 Focal Area projects, especially those rated as *highly vulnerable* or located in climate-risk *hot-spot* zones, and to the project cycle processes to identify and assess the risks. The starting point should be where project proponents undertake a structured assessment of risk to GEBs from climate change, for which additional guidance is expected to be needed. The format of Project Information Forms (PIFs) and STAP's screening process may need modification. Further actions by STAP indicated below will provide the tools and processes to accomplish a climate-resilient strategy.
2. **Global and Regional Assessments of Climate Change Impacts and Vulnerability Profiles for GEBs to be constructed.** The GEF Council is recommended to support a proposed detailed scientific study on climate change impacts, vulnerability and resilience at the regional level, focused on the threats to delivery of GEBs.¹⁰ This study is not only needed in the current phase of the GEF, but will be essential in future strategy development for GEF-6.

FURTHER ACTIONS PROPOSED BY STAP

The following further actions and processes relate to the two recommendations above:

1. A Climate-Resilient Strategy

- a. **A “Rapid Climate Change Risk Screening Tool”** to be developed by STAP for the preliminary and rapid assessment of potential risks (GEF/C.35/Inf.7). Based on a vulnerability *hot-spot* analysis, all projects should be assigned a risk flag at the PIF stage, corresponding to low (GREEN), medium (ORANGE) or high (RED) risk. The tool will provide the evidence-base for two annexures to project proposals:
 - i. **Annexure-1** on the potential climate change risks (impacts and vulnerabilities); immediate, short and long term for GEBs.
 - ii. **Annexure-2** on a preliminary illustrative list of measures (technologies, practices and policies) to enhance resilience or interventions to the projected climate variability and climate change risks to sustain GEBs.

¹⁰ Note: IPCC 2014 is expected to review the published literature and present an assessment of likely climate change risks. However, such literature-based assessments have limited utility directly to assess climate change risks and resilience measures for the GEF focal areas of Climate change, Biodiversity, Land degradation, SFM and International waters.

- b. **Assessment of climate change risks to GEBs.** In the case of high (RED) risk projects, STAP suggests that it be mandatory to carry out a comprehensive climate risk assessment during the project development phase. With STAP assistance in developing appropriate generic terms of reference, the risk assessment exercise will include, *inter alia*, the consideration of possible appropriate risk management strategies.
- c. **Technical and investment assistance to design resilience measures.** In the case of severe risk to GEBs being confirmed, STAP will assist the GEF agencies involved to develop resilience measures to sustain GEBs in the face of climate change.
- d. **Capacity development.** To support programs to develop capacity in GEF Implementing Agencies, country focal points and Executing Agencies, STAP proposes to advise on appropriate curricula to enable assessment of climate change risks and resilience measures.

2. Impact and Vulnerability Profiles for GEBs.

The intention here is to identify climate change risks and **hot spots** for different GEBs at the regional level (e.g. sub-Saharan Africa, South Asia and large countries); for critical ecosystems (e.g., mountains, evergreen forests, Alpine grasslands, coral reefs, wetlands, semi-arid cropland); and for critical socio-economic circumstances (e.g. forest-dwellers; small-scale subsistence farmers; nomads and pastoralists), by:

- a. Selecting appropriate regions, scales and systems for assessment.
- b. Assessing risk using climate change and impact assessment models.
- c. Assessing current climate variability / Short term (2030s)/ and Long term (2070 to 2100) periods.
- d. Developing vulnerability profiles and ranking regions for vulnerability.
- e. Designing illustrative climate change resilience measures for different risks to GEBs at the regional level.
- f. Proposing a strategy to mainstream resilience measures in GEF projects.

1 Introduction

1. The rationale for this STAP Information Document is to support the GEF's overall objective of delivering sustained Global Environmental Benefits (GEBs) in the face of the increasing risks posed by climate change and the increased understanding of the scientific concept of 'resilience'. It provides scientific backing for the evaluation of the GEF's Strategic Priority for Adaptation (SPA), completed by the Evaluation Office (GEF/ME/C.39/4). The study has three inter-linked objectives: (1) Identify the risks posed by climate change to the delivery of GEBs; (2) Track scientific and technical lessons from a select number of GEF-4 projects in terms of climate risk accounting; and (3) Highlight appropriate responses by the GEF to enhance resilience.
2. In 2009 WMO stated that the first decade of the 21st century has been the warmest decade since the early 1850s when measurement began¹¹. Global mean summer temperatures in 2010 were the highest on record¹². Most of the measured increase in global mean temperatures since the mid-20th century arises from the effect of anthropogenic emissions of greenhouse gases (GHGs)¹³. The planet may already be committed to a 2.4°C (1.4-4.3°C uncertainty) increase in global mean temperature above pre-industrial levels caused by accumulated atmospheric GHGs¹⁴. The average threshold of about 2.4°C could be reached in two to four decades, and 4°C by the end of the century or as early as the 2060s in worst case scenario projections.
3. The consequences for the global environment will be dramatic. Climate change demands immediate action from governments, private sector and civil society alike. The Global Environment Facility (GEF) empowers these stakeholders, particularly in the developing countries, to find effective ways to respond through mitigation and adaptation interventions. A two-pronged project approach is adopted to assist developing countries: mitigation of climate change by reducing GHG emissions; adaptation to climate change to reduce the adverse impacts¹⁵.
4. The GEF assists countries to generate global environmental benefits (GEBs) and to support the multilateral environmental accords. The funding for projects from the GEF Trust Fund is organized in focal areas: biodiversity; climate change; land degradation; international waters; and chemicals. A cross-cutting topic is sustainable forest management. Two UNFCCC funds administered by the GEF – the Least Developed Countries Fund (LDCF) and Special Climate Change Fund (SCCF) - support actions aimed at the integration of adaptation measures into development policies. These are not required to generate GEBs.

¹¹ WMO Statement on the status of the global climate in 2009 (2010). Available at: http://www.wmo.int/pages/publications/showcase/documents/1055_en.pdf

¹² NOAA (2010). State of the climate: global analysis available at: <http://www.ncdc.noaa.gov/sotc/>

¹³ Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (2007). Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.).

¹⁴ V. Ramanathan and Y. Feng (2008): PNAS 105(38): 14245-14250.

¹⁵ GEF (2006), Linking Adaptation to Development, GEF, Washington DC

5. The GEF-5 Programming Document recognises that the impact of climate change on the delivery of GEBs is an important issue.¹⁶ However, the Fifth Replenishment discussions as well as the GEF's Programming Strategy on Adaptation¹⁷ specifically state that the GEF Trust Fund **should not** provide direct support to adaptation activities. Financial resources should instead be channeled through the specialized LDCF and SCCF funds. Nevertheless, the two overarching strategic goals of the GEF in the GEF-5 Programming Document¹⁸ call for anticipated climate change and climatic variability to be accounted for in GEF activities:

Strategic Goal 1 – Conserve, sustainably use, and manage biodiversity, ecosystems and natural resources globally, taking into account the anticipated impacts of climate change; and

Strategic Goal 2 – Reduce global climate change risks by: 1) stabilizing atmospheric GHG concentrations through emission reduction actions; and 2) assisting countries to adapt to climate change, including variability.

6. Consequently the GEF Trust Fund has supported measures to take into account climate risks in its operations. In GEF-4, project proponents were required to consider climate-related project risks that might prevent the achievement of project objectives and to include risk mitigation measures at the project design stage (Project Information Form (PIF)). No specific guidance was provided on how to assess climate risks. Further, the GEF Business Plan FY08-10¹⁹ called for "Tools to Assess the Impact of Climate Change on Project Results and Sustainability" to support the GEF to undertake steps to mitigate the risk to the sustainability of GEF projects from the impacts of climate change. An interim paper from the Secretariat resulted: "Incorporating Climate Change Adaptation into GEF Projects"²⁰. The same Business Plan specified that: "... Beginning FY09, all GEF project proposals would be expected to be climate-proofed in accordance with the Council-approved guidelines".
7. After reviewing current scientific evidence and consulting widely, the STAP advises that climatic variability and future climate change place Global Environmental Benefits at risk. The GEF's Strategic Goals need immediate action and practical measures for their observed climate risks to be addressed. Changing baseline conditions, increased stress on ecosystems and altered biophysical processes will make the successful outcome of GEF projects problematic at best and impossible at worst. Future GEBs may be reduced and increased efforts will increasingly be required to attain successful outcomes. To achieve the strategic goals set for the GEF in the current phase and beyond, the GEF partnership needs to find ways **to make the concept of resilience to climate change, including climate variability, operational in order to deliver GEBs.**

¹⁶ See Section on "The imperative of an Integrated Approach to Global Environmental Goods".

¹⁷ GEF/LDCF.SCCF.8/Inf.4

¹⁸ GEF/R.5/31

¹⁹ GEF/C.31/9

²⁰ GEF/C.35/Inf.7

2 Observed and anticipated climate impacts on global environmental benefits relevant to the GEF

8. The IPCC AR4 provides the most current authoritative assessment of the potential consequences of climate change. Of particular significance to the GEF are those consequences that are likely *(i) to affect the outcomes of GEF interventions and (ii) to create greater demands on the resources to be delivered by the GEF for achieving agreed levels of global environmental benefits*. The AR4 concluded that anthropogenic warming over the last three decades has likely had a discernible influence at the global scale on many physical and biological systems. More complete attribution of observed natural system responses to anthropogenic warming is currently prevented by the short time scales of many impact studies, greater natural climate variability at regional scales, contributions of non-climate factors, and limited spatial coverage of studies. There are direct and immediate risks to GEF projects due to the present-day changes in climate, as well as from the risks to project outcomes posed by climate change in the future.
9. Further useful insights into the extent and nature of the risks posed by climate change are to be found in four IPCC frameworks. They use the concept of “reasons for concern” as a tool to advance the consideration of dangerous anthropogenic interference, the operative objective of Article 2 of the UNFCCC. These four “reasons for [GEF] concern” are ***(i) observed changes in natural systems attributed to climate change; (ii) climate risks to unique and threatened systems, (iii) “tipping elements” in the Earth system, and (iv) the concept of “planetary boundaries”*** as a means of identifying a “safe operating space” for humanity.
10. Melting glaciers and ice caps as well as diminishing Arctic Ocean ice are the most startling examples of the continuing global warming. Most recently, the area of sea-ice cover in the Arctic region was the smallest on record, creating increased vulnerability of the region to future anomalous cyclonic activities, dramatic effects on ecosystems and indigenous and other communities that depend on the ice cover. Warming in the Arctic has already contributed to increased emissions of carbon dioxide and methane as well as degassing of submarine methane deposits. These ongoing climate changes have important implications for current and future GEF projects in the polar regions.
11. Oceans have absorbed some one-third of total carbon emissions since the industrial revolution. Now after 150 years of serving as a global buffer, oceans are becoming increasingly acidic with consequent effects on marine life, fisheries and coral reefs. Seasonal ocean acidification is now a common phenomenon on the North American continental shelf. In 2005, warmer-than-average ocean temperatures in the Caribbean contributed to record-breaking mass coral bleaching, with 50-95% of coral colonies being severely affected. Warming in 2010 has already caused mass coral bleaching and mortality in Southeast Asia and the Coral Triangle. Research suggests that by 2020 large-scale acidification will expand to polar and sub-polar regions²¹. Many GEF projects are extremely vulnerable to acidification (for example, in

²¹ M. Steinacher et al. (2009): Biogeosciences 6: 515-533.

management of coral reefs and fisheries) and should be designed to anticipate acidification impacts and effects on ecosystem services.

12. The tropical belt is expanding at a rate of about 110 km per decade²², resulting in the displacement of subtropical zones to higher latitudes²³. This has impacts on large-scale circulation systems, precipitation (water and snow), agricultural productivity and water availability. Many of the existing water-scarce areas in southern and northern Africa, the Mediterranean, most of West Asia, and a broad band running from Central Asia to the Indian subcontinent are projected to suffer from persistent drought and water scarcity shortly²⁴. The GEF has a significant portfolio of projects in these geographic zones in the land degradation and international waters focal areas.
13. Wetlands, peatlands and thawing permafrost are major stores of carbon and are especially sensitive to climate change. Containing some 30% of all terrestrial carbon, peatlands have been disappearing through deforestation, drainage, fire and agriculture, including biofuel developments. About half of the South East Asia peatlands have been deforested and most have been drained²⁵. This has resulted in about 3% of current global carbon dioxide emissions from combustion of fossil fuels.
14. The earlier timing of spring and the poleward shifts in plant and animal ranges are confidently linked by science to recent warming. In some marine and freshwater systems, shifts in ranges and changes in algal, plankton and fish abundance are associated with rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels and circulation. Of the more than 29,000 observational data series from 75 studies showing significant change in many physical and biological systems, more than 89% are consistent with the direction of change expected as a response to global warming.
15. The occurrence of multiple drivers for deforestation makes climate change attribution difficult. However, evidence suggests that the frequency of dry events in southern Amazonia, a phenomenon itself linked to climate change, have greatly increased and will likely continue causing substitution of rainforest by seasonal forests. In places of deforestation and fragmentation caused by water stress and more frequent fires, these seasonal forests could themselves be replaced by fire-dominated low biomass forests²⁶. In the Amazon Basin, strategies to halt deforestation and measures of fire prevention will help to prevent a die-back of the Amazonian forest as a whole.
16. Temperature ranges are continuing to increase. Hot and cold extremes affect not only precipitation but also the frequency of drought. The increase in hurricane cyclone activity recently, primarily caused by rising sea surface temperatures, is widely reported. The higher frequency of wildfires in dry “Mediterranean” climates

²² T. Reichler (2009): In: Climate Change: Observed Impacts on Planet Earth, pp. 145-164.

²³ J. Issac and S. Turton (2009): Expansion of the tropics: Evidence and implications (at http://cms.jcu.edu.au/idc/groups/public/documents/media_release/jcuprd_048832.pdf)

²⁴ UNEP Year Book 2010. Available at: <http://www.unep.org/yearbook/2010/>

²⁵ A. Hooijer et al. (2009): Biogeosciences Discuss. 6(4): 7207-7230.

²⁶ Y. Mahli et al. (2009): PNAS 106(49): 20610-20615.

as well as of thunderstorms is also attributed to anthropogenic climate change²⁷. The increased number of climate-caused natural disasters represents the major source of risk to the world's poor, particularly in the least developed and small island developing states.

17. There is, therefore, strong evidence of the observed ***impacts of climate change on unique and threatened systems (such as wetlands, mangroves, coral reefs, high latitude and altitude (mountain) communities and ecosystems)***. There is a medium confidence that ~20–30% of known plant and animal species are likely to be at the increased risk of extinction if increases in global average temperature exceed 1.5 °C to 2.5 °C over 1980–1999 levels²⁸.
18. Human pressures on the climate system, the oceans, the stratosphere, and the biosphere have now reached a scale where planetary-scale deleterious impacts for human development cannot be excluded²⁹. These risks are amplified by the growing realisation that systems on Earth may cross tipping points resulting in non-linear, abrupt and potentially irreversible changes. Lenton et al. (2008) developed a shortlist of nine 'tipping elements' with a high probability that all will be reached within the next 100 years: melting of Arctic sea-ice (in about 10 years); decay of the Greenland ice sheet (more than 300 years); collapse of the West Antarctic ice sheet (more than 300 years); collapse of the Atlantic thermohaline circulation (about 100 years); increase in the El Nino Southern Oscillation (ENSO) (100 years); collapse of the Indian summer monsoon (1 year); greening of the Sahara/Sahel and disruption of the West African monsoon (10 years); dieback of the Amazon rainforest (50 years); dieback of the Boreal Forest (50 years). *These tipping elements – the third reason for concern (see #9 above) – are of particular interest to the GEF with its investments in places such as Amazonia and in areas subject to large-scale climatic phenomena such as the Indian summer monsoon and ENSO.*
19. *The fourth 'reason for concern' (see #9 above) is that humanity has already transgressed three out of nine 'planetary boundaries': climate change, rate of biodiversity loss, and human interference with the global nitrogen cycle. Such transgressions risk undermining the resilience of major biophysical systems on Earth³⁰. The nine planetary boundaries with their respective earth-system processes and thresholds correspond closely to the various focal areas of the GEF. If boundaries are crossed, unacceptable environmental change would be generated. This is why STAP argues that building climate resilience is a cross-focal area challenge if the GEF is to sustain the delivery of GEBs.*
20. Finally, of particular significance in the context of GEF operations is the finding of the AR4 that ***the world is already committed to a significant level of climate change***

²⁷ I. Allison et al. (2009): The Copenhagen Diagnosis, 2009: Updating the world on the latest climate science.

²⁸ J. Smith et al. (2009): PNAS 106: 4133–4137.

²⁹ T. Lenton et al. (2008): PNAS 105(6): 1786–1793; H.-C. Schaeffer et al. (2008): Glob. Ecol. Biogeogr. 17: 38–49; PNAS Tipping elements in Earth Systems Special Feature 2009 106 (49).

³⁰ J. Rockström et al. (2009). Nature 46: 472–475.

and adaptation is required regardless of the level of mitigation efforts. This underscores the imperative that every opportunity should be explored to build resilience to existing climate variability and future climate change. The primary benefit of incorporating resilience considerations is to ensure continued generation of GEBs from GEF investments. The generation of adaptation to climate change is a co-benefit. The emerging concept of ecosystem-based adaptation aimed at the increased resilience and reduced vulnerability of societies to climate change through conservation, restoration and management of ecosystems is particularly relevant for the GEF with its core mandate to support sustained delivery of GEBs. Not only does local society benefit, but ecosystem processes and functions will be maintained. The adoption of a proactive approach towards climate resilient delivery of GEBs in the GEF programming will strengthen further its contribution to the sustainable development agenda.

3 Climate Change Risks for GEF-5 Focal Area Strategies

21. There is only a cursory mention of the in The GEF-5 focal area descriptions make scant mention of the need to take climate change into consideration. Therefore, STAP has undertaken an analysis of climate risks by focal area taking account of strategic objectives, expected outcomes, core outputs and project types. Risks were identified through a review of the scientific understanding of projected climate change and the secondary impacts on ecosystems, plant and animal species, economic activities, and human livelihoods. Since the analysis was done at the strategic level, the evaluation of risks is generalized.
22. Two categories of focal area strategic objectives exist. The first comprises objectives that promote specific activities, such as resource management or technology development, which may be impacted by climate change. Climate risks for these are direct (e.g. risks to protected ecosystems due to changing species composition). The second category focuses on creating effective policy contexts, such as enhancing cooperation for managing transboundary natural resources. For these objectives, the climate risks are similar but indirect (e.g. the risk of changing hydrology increases the complexity of developing effective policy for transboundary water management).

Biodiversity

23. Climate change is an additional stressor and a compounding factor to the ongoing loss of biodiversity. Climate change impacts on biodiversity are manifested by species migration, extinctions, and opportunities for new species. Most optimistic estimates indicate that 10% of species are destined for extinction for each 1°C increase in temperature; many others will decline³¹. While many of the changes are forecast for boreal and desert areas where biodiversity is naturally low, many biodiversity hotspot areas will also suffer important ecosystem shifts caused by climate change³².

³¹ W. Foden et al. (2008). In: J.-C. Vié, C. Hilton-Taylor and S.N. Stuart (eds). The 2008 Review of the IUCN Red List of Threatened Species.

³² World Development Report 2010: Development and Climate Change.

24. **Annex 1** lists climate risks in relation to Biodiversity Focal Area objectives and core outputs. First order risks relate to the changing climate; second order to the impacts of a changing climate. For example, first order risks include changes in the phenology of many species as a result of shifts in maximum and minimum temperatures, the length and timing of seasons, and moisture availability; second order risk may follow, such as increased pest outbreaks and invasive species. Additional secondary impacts relate to long-term changes in local ecosystems and potential changes in the viability and continued existence of biomes, resulting in, for example, the migration of species and ecosystems. Changes in hydrological systems and water availability will influence species composition and ecosystem boundaries in both terrestrial and marine systems.

Climate Change Mitigation

25. Climate change impacts will also affect the focal area itself (see **Annex 1**). Mitigation options likely to be the most climate-sensitive include hydroelectricity, bioenergy and wind energy. These options are integral to many renewable energy (RE) strategies. To the extent that GEF interventions are aimed at promoting the growth of RE, the potential risks need to be considered and, if necessary, suitable risk management strategies should be developed. Evidence shows important regional implications of climate change for hydropower generation, highlighting the need to consider climate change projections in the design and operation of hydroelectric systems³³. Wind energy is the fastest growing renewable energy technology that is potentially affected by changes in wind patterns³⁴. Low carbon energy grids, transportation, and urban systems will be exposed to a variety of stressors. Changes in temperature cause higher energy demands on energy systems for heating and cooling. The increased frequency of extreme events, changing wind patterns and speeds, changes in water availability, sea level rise and storm surges all present risks to the built environment. Thus new (and old) infrastructure will be at risk. Biofuel production and LULUCF-related interventions are dependent on conditions for agriculture and agro-forestry. Thus risks to these sectors include changes in water availability of ground and surface water; and increases in extreme events that may reduce biomass productivity. Overall, GEF interventions for mitigation that are based on the above climate-sensitive sectors would need explicitly to address issues of future climate change, and incorporate strategies to reduce the risk to climate mitigation outcomes.

26. The future level of adaptation depends critically on the speed and extent of mitigation actions. Mitigation actions have the potential to generate adaptation co-benefits, and vice-versa. A conclusion of the IPCC AR4 was a call for an integrated view of adaptation and mitigation³⁵. The GEF may wish to consider the implications of this on the composition of its climate change mitigation portfolio as a result of its greater emphasis on programmatic approaches in GEF-5. Modifications may allow for significant generation of co-benefits, whether for climate change adaptation or for other GEBs. At the same time, since some mitigation options depend on

³³ B. Lehner et al.(2005): Energy Policy 33(7): 839-855; G. Harrison (2000). Climate change impacts on hydroelectric power.

³⁴ S. Pryor et al. (2005): Climate Research 29: 0183-198. P. de Lucena et al. (2010): Renewable Energy 35: 904-912.

³⁵ AR4 Synthesis Report, available at: http://www.ipcc.ch/publications_and_data/ar4/syr/en/contents.html

technologies or interventions that are climate-sensitive (or that are done in climate-sensitive sectors), the anticipated outcomes and benefits from mitigation interventions may be at risk due to future climate change.

Land Degradation

27. Land degradation affects some 2.6 billion people in 100 countries, resulting in diminished ecosystem functions³⁶ which are critical to the provision of environmental, economic, social and non-material benefits to society³⁷. Land degradation alters the productive potential of all major land uses (rain-fed, arable, irrigated, rangeland, forest), farming systems and land's value as an economic resource³⁸. Climate variability and change including long-term changes in precipitation and temperatures affect all the underlying processes of land degradation³⁹. Climate change-induced land degradation will occur through changing length of seasons, recurrence of droughts, floods and other extreme weather events, changes in precipitation and temperatures affecting water availability, vegetation cover and soil quality and changes in land use practices⁴⁰ (**Annex 1**).
28. Land Degradation focal area objectives face multiple risks from climate change. For instance, biome shifts along with changes in precipitation patterns threaten the number of reliable crop growth days. Arid- and semi-arid lands are expected to expand; forests may be subject to more disturbances (fires, pests, and invasive species); rangelands are likely to have higher water erosion rates because of lower vegetation cover. The crossing of critical thresholds could occur in all biomes. The increased frequency of extreme events such as droughts and floods will place additional pressure on already-degrading landscapes. At highest risk are arid and semi-arid lands (**Annex 1**).

International Waters

29. Demand for freshwater has increased steadily, leading to greater competition for access to scarce water resources, a trend compounded by deteriorating quality of surface and groundwater resources. In the oceans, overfishing and pollution are resulting in depletion of biodiversity and degradation of marine ecosystems with adverse impacts on human and ecosystem health, food security and social stability. Global climate change is an additional stressor on water systems with processes such as melting glaciers, sea-level rise and variations in precipitation in turn causing flooding and soil erosion. Acidification of ocean waters is projected to have global impacts on the mere existence of coral reefs, change marine food chains and other ecosystem parameters with globally significant consequences for fisheries and coastal livelihoods depending on ocean services.

³⁶ UNDP, <http://www.undp.org/climatechange/adapt/maps/land.html>

³⁷ GEF/R.5/31

³⁸ M. Stocking & N. Murnaghan (2001). *Land Degradation - Guidelines for Field Assessment*. Earthscan, London

³⁹ UNDP, <http://www.undp.org/climatechange/adapt/maps/land.html>; T.G. Huntington. Climate-induced intensification of hydrological cycle: An assessment of the published record and potential impacts on agriculture. In: *Advances in Agronomy*, vol. 109: 1-53.

⁴⁰ *Ibid.*

30. At least three of the international waters focal area objectives are challenged by changing climate and increased variability. First, multi-state cooperation will be exposed to risks from changes in hydrology and the availability and seasonality of water supply from freshwater and groundwater reservoirs. Reduced availability of water sourced from snow pack and glacier melt is one example. Transboundary agreements will become more difficult to negotiate. Secondly, support for sustainable alternative livelihoods to fishing and improvement of the management of fisheries and coastal areas are likely to be directly affected by climate risks, such as: the availability and seasonality of water; increased pollution loads; and changes in the ocean surface pH. Thirdly, the protection of marine biodiversity and deep-sea species, including migratory species, will be affected by climate-driven biophysical changes in the ocean systems. These risks include coral reef die-offs due to temperature increase; increased coastal erosion and sedimentation; contraction of sea-ice; and increased ocean salinity.

Chemicals

31. The chemicals focal strategy promotes sound management of chemicals throughout their life-cycle in ways that lead to the minimization of adverse effects on human health and the global environment. Its first objective ensures that exempted Persistent Organic Pollutants (POPs) are used safely and that contaminated sites are managed in an environmentally sound manner. The risks posed by climate change occur in the life-cycle of chemicals and their transport, especially in the potential increase in volatility of POPs. Its third objective relates to sound chemical management and mercury reduction, where climate change poses a direct threat by increasing the risk of higher levels of stored mercury being released to the global environment (**Annex 1**).

SFM/REDD+ Program

32. The climate risks posed by the above focal areas are also risks facing SFM/REDD+ Program. They primarily relate to increased disturbance regimes (fires, pest, invasive species); the risk of biomes shifting from forest to grasslands; changes in ecosystem species composition, resulting in reduced biodiversity; and reduced precipitation and drought limiting the primary productivity of forests.
33. Therefore, this qualitative analysis of climate risks by GEF focal area unambiguously concludes that there are substantial challenges posed to the ultimate delivery of Global Environmental Benefits caused by climate change and climate variability. Every GEF project faces a unique set of circumstances and requires specific consideration of climate risks.

4 Analysis of Climate Change Risks and Adaptation Strategies in GEF-4 funded projects

34. To understand how GEF-4 projects dealt with climate risks in the absence of dedicated technical and financial incentives (non-SPA projects), 35 projects from the GEF-4 portfolio have been examined. Issues explored included:

- a. Were risks from climate change addressed in the project documentation?
- b. Did the STAP screen acknowledge climate change risks to the project?
- c. How much climate change risk does the affected resource face?
- d. How much climate change risk does the proposed project face?

The analysis had two specific objectives: (i) to understand how non-SPA projects dealing with a climate sensitive resource or global environmental benefit (GEB) accounted for climate change risks; and (ii) to analyze the nature of climate risk accounting and adaptation response measures in non-SPA GEF projects. The assessment was not aimed at the entire GEF portfolio, but rather in understanding how far GEF-4 projects had dealt with climate-sensitive resources and GEBs in their project design. The methodology and results of the analysis are presented in **Annex 2**.

35. The analysis concluded that 63% of the selected projects have low to moderate climate risks that may potentially affect the delivery of GEBs. Projects not directly facing climate risks nevertheless have implications for the return on GEF investments where climate change should still be considered as a factor in design and management. Many of these were on capacity building activities.
36. Despite the climate risks, nearly a third of projects did not explicitly address climate variability or climate change despite the request to do so in the project information form (PIF). Of the remaining two-thirds, it was unclear how much consideration was given to climate change. For example, only 34% of projects explicitly acknowledged climate risks by citing reports of the Intergovernmental Panel on Climate Change (IPCC) or other peer-reviewed literature, or even by making a qualitative case for climate risks to the project. Only 20% of projects provided scientific evidence to support their claim of climate risks.
37. Despite the apparent shortcomings in the explicit and scientifically-justified treatment of climate risks, 94% of projects were judged potentially to provide some provisions for dealing with climate change risks, often through assistance for improved governance capacity and better resource management. On the other hand, nearly one-third (31%) of projects were judged to lead to possible maladaptation (i.e., the possibility that a project or project component could actually increase risks from climate change). This indicates that simply improving foundational governance capacity is not enough to ensure the sustainable delivery of GEBs under changing climate conditions. **This conclusion calls for systematic and thorough accounting of climate risks at the project design stage to ensure climate resilience and the delivery of GEBs under a variety of current and potential future climate conditions.**
38. Fully 75% of projects that identified a climate risk proposed some kind of adaptation measure. Of these, 78% proposed no regrets⁴¹ adaptation measures. However, a

⁴¹ No regrets measures are those for which benefits, such as reduced energy costs and reduced emissions of local/regional pollutants equal or exceed their cost to society, excluding the benefits of climate change mitigation. They are sometimes known as measures worth doing anyway. [Source: IPCC]

significant 39% of these projects proposed targeted investments justified only by climate considerations. 17% of projects proposed both types of adaptations. This suggests that by mandating the explicit consideration of climate risks, more projects might include appropriate investments that would increase their resilience to changing climate conditions.

39. Each GEF-4 project has undergone a screening process⁴² at the PIF stage led by the STAP. Of the screens examined, 71% did not address climate issues. While this assessment did not produce sufficient information to determine why this is the case, there appears to be an opportunity for increasing the consideration of climate change risks through the improvement in the STAP screening process.
40. Many GEF-4 projects should, and many actually do, consider the effects of climate variability and climate change on their activities. This consideration of climate occurs despite the lack of financial and other incentives such as those provided by SPA. However, the consideration of climate risks varies significantly between projects and is often not supported by scientific data. This not only signals a need for greater consistency to dealing with climate risks in the GEF portfolio but also provides an opportunity to create a framework to ensure that climate variability and climate change do not unnecessarily diminish the effectiveness of GEF-funded projects and limit the delivery of GEBs.

5 Potential Adaptation Options to Reduce Climate Risks and Enhance Resilience

41. Adaptation options to reduce climate risks and enhance resilience exist across GEF portfolio and may be implemented in some sectors at low cost or with favorable benefit-cost ratios. Various typologies of adaptation measures have been suggested in the literature, depending on the mode of response (anticipatory or reactive), the responding entity (public or private) and the nature of the intervention ('hard' or 'soft')⁴³. For example, adaptation practices refer to the actual adjustments and/or to changes in decision or policy environments. Thus, investment in coastal protection infrastructure to reduce vulnerability to storm surges and anticipated sea-level rise is an example of a 'hard' intervention involving actual adjustments. The development of climate risk screening guidelines, making downstream development projects more resilient to climate risks, is an example of a change in the policy environment, or a 'soft' intervention.
42. From a temporal perspective, adaptation to climate risks may be viewed at three response levels: current variability (which also reflects learning from past adaptations to historical climates); observed medium and long-term trends in climate and; planning in response to model-based scenarios of anticipated long-term climate change. Responses to each level may be inter-linked. Thus, actions to

⁴² STAP screens are not full reviews; rather, they are based around a brief analysis of submitted PIFs for specified scientific and technical issues such as project methodology, baselines and identification of GEBs.

⁴³ "Hard" adaptation measures usually imply the use of specific technologies and actions involving capital goods, such as dikes, seawalls and reinforced buildings, whereas "soft" adaptation measures focus on information, capacity building, policy and strategy development, and institutional arrangements. [Source: World Bank *Adaptation Guidance Notes*]

counter the effects of current climate variability are already sensible given the certain evidence of their adverse impacts on economic development. Even when impacts of climate change are not yet discernible, scenarios of future impacts may already be of sufficient concern to justify building some adaptation responses into planning. This sort of anticipatory planning requires the ability to generate and use the appropriate climate information.

43. Much of the adaptation and resilience literature focuses on the enhancement of adaptive capacity.⁴⁴ The presence of adaptive capacity has been shown to be a necessary condition for the design and implementation of effective adaptation strategies so as to reduce the likelihood and the magnitude of harmful outcomes resulting from climate change. Adaptive capacity also enables sectors and institutions to take advantage of opportunities or benefits from climate change, such as a longer growing season or increased potential for tourism.
44. Adaptation is an ongoing process that learns from emerging information about climate change impacts. It requires the ability to identify, document and disseminate best practices, and to learn from emerging experiences with adaptation strategies and actions. This reinforces the importance of adaptive capacity and suggests that targeted capacity-building efforts could play an important role for enhancing resilience to climate change.
45. Three broad-based categories of interventions are relevant for GEF to respond to the need for enhancing climate resilience in projects:
 - *Knowledge-based*: generating and using relevant information including the assessment of risk and vulnerability
 - *Capacity-based*: creating the internal capability within target communities and organizations to perceive and evaluate climate risks and to formulate responses
 - *Ecosystem-based*: designing and implementing specific measures to manage risk and enhance resilience in the context of ecosystems; including 'hard' and 'soft' interventions

The choice of the appropriate intervention depends on the level of risk associated with individual projects and the potential costs of intervening. Some representative adaptation options are provided in Annex 3 for illustrative purposes.

Knowledge-based measures

46. The synthesis and dissemination of lessons and best practices is an adaptation measure in itself. It is an essential step in reducing overall risk to climate change in all focal area strategies. Such actions are vital for two reasons. First, uncertainty exists in all predictions but this does not justify inaction. Uncertainty needs to be addressed through monitoring and evaluation of system conditions. Secondly, while there may be no relevant experience upon which to base actions, current information on the state of the environment will help to ensure that shared

⁴⁴ Adaptive capacity is the ability or potential of a system to respond successfully to climate variability and change, and includes adjustments in both behavior and in resources and technologies.

information is used to inform management practice. For example, in the chemicals focal area the most important adaptation at this time is to improve understanding of the life-cycle and transport of POPs and mercury. This means that monitoring of contaminants must be conducted with a systems approach that includes climate-related factors. Focal area strategies provide specific opportunities for building knowledge platforms and sharing information, such as:

- Synthesis of project lessons and processes that led to successful adaptations;
- Development of climate risk assessment and decision support tools;
- Development of monitoring tools for resource and program managers;
- Monitoring of ecosystem responses to management practices;

Capacity-building based measures

47. Capacity-based measures seek to enhance the ability to perceive, analyze and respond to risks. They are appropriate to facilitate the development of environmental and regulatory frameworks, and cooperative agreements, particularly in transboundary areas. In these situations, flexibility, communication and conflict resolution are essential in management systems. Five critical elements need to be addressed: the policy, legal and institutional settings, information management, and financing systems. Adaptations that address these elements. Specific important opportunities include:

- Legal frameworks not limiting management options, but instead offering incentives to alter management actions to changing circumstances;
- Promotion of conflict resolution practices for the management of transboundary resources by governmental and non-governmental stakeholders;
- Compatible data sources for information exchange between managers;
- An Equal Distribution of Benefits (EDB) framework for resource allocation;
- A shift to demand management rather than supply.

Ecosystem-based measures

48. Ecosystem-based measures include both 'hard' and 'soft' responses, with some adaptations involving aspects of both. Maintaining biodiversity while at the same time protecting ecosystem services delivers co-benefits and helps other adaptation processes. The integrated management of ecosystems involves both the application of technologies ('hard') and appropriate policy responses ('soft'). This ecosystem-based approach fits well with current GEF focal area strategies. However, it requires changes in approach to ecosystem management because climate risks to ecosystems are outside human control (e.g. changing biomes). Therefore, project objectives need to be assessed for climate risk, and may need to be adjusted accordingly, especially with regard to working at larger scales and across regions. Ecosystem-based management does not reduce the need for concerted efforts to maintain biodiversity and ecosystem services.

49. Focal area strategies that are concerned with ecosystems - agro-ecosystems; natural ecosystems; forests or marine - all need to reduce direct risk related to changes in

disturbance patterns, biome shifts, and changes in species composition. Actions to reduce impact of climate risks are probably the only approach for large-scale marine ecosystems. The following set of adaptations is compatible with a larger ecosystem-based approach:

- Maintaining the integrity of ecosystems in the long-term through considering long-term shifts in plant and animal distributions, natural disturbance regimes, and precipitation patterns;
- Reducing the impact of other threats, such as habitat fragmentation, pollution, alien species, eutrophication, desertification, and acidification;
- Developing species mixes across landscapes that reduce spread of fire, pests and invasive species;
- Implementing forestry management systems designed for uncertainty: afforestation, reforestation, agroforestry and avoided deforestation, for example.

50. Agricultural production regimes are a vital part of ecosystem-based measures. They must be concerned with climate changes and consequent impacts on, for example:

- *Farming systems*: mixed farming; livestock systems; multi-cropping; irrigation; new varieties and species;
- *Water management*: resource efficient irrigation⁴⁵; water harvesting infrastructure;
- *Land management*: soil and water conservation; forest management; micro-climate influence on crops; soil organic matter management to reduce flooding, drought and erosion
- *Support services*: agricultural extension; index insurance policies; seasonal climate forecasts

51. Adaptive fisheries management will need investment in adaptable technologies and processing chains and the opportunity for alternative livelihoods during difficult times.

52. Strategies concerned with biodiversity could employ the following adaptations:

- Mosaics of interconnected terrestrial, freshwater and marine multiple-use reserves;
- Viable, connected and genetically diverse populations;
- Protection reserves, including networks with connecting corridors to provide dispersal and migration routes for plants and animals;
- Captive breeding, ex-situ conservation for plants and translocation programs for vulnerable or sensitive species;
- Biodiversity activities with broader objectives for sustainable development.

53. Strategies – for example, climate change and international waters - concerned with infrastructure, such as energy grids and transportation, may include both ‘hard’ and ‘soft’ options:

- *Location issues*: major capital infrastructure for varying exposure to climate risk;

⁴⁵ Irrigation must take account of long-term changes in water availability to avoid long-term maladaptations.

- *Codes and standards*: amend to address climate parameters, such as wind, temperature, sea level rise, storm surges, precipitation;
- *Temporal issues*: Focus on longevity and resilience of infrastructure rather than short term commercial interests;
- *Insurance*: products to protect vulnerable stakeholders.

Costs of measures to enhance resilience

54. The estimation of costs of adaptation often use a method developed by the World Bank,⁴⁶ where a ‘mark-up’ factor is applied to the fraction of current investments that are climate sensitive to reflect the cost of ‘climate-proofing’ those investments. An instructive example is an OECD study of the costs of adapting to climate change for water-related infrastructure⁴⁷. The analysis separated the costs of: (a) maintaining service standards for a baseline projection of demand and; (b) changes in water use and infrastructure as a consequence of changing climate patterns. Engineering estimates focused on the direct capital and operating costs of adaptation without economic incentives to affect patterns of water use. On this assumption, the costs of adaptation were 1–2% of baseline costs for all OECD countries, the main element being the extra cost of water resources to meet higher demand for municipal water. The study concluded that the overall costs of adaptation are small relative to other future costs of infrastructure. Furthermore, costs of adaptation may be reduced drastically if an economic approach (i.e. using financial incentives) to adaptation is followed rather than an engineering approach.
55. The issue of cost-effectiveness in supporting climate resilience of GEF interventions is important. Most existing analyses of adaptation costs deal with the cost of “hard” measures such as infrastructure to protect against floods. “Soft” enabling options such as many ecosystem-based adaptations, early warning and preparedness systems, community awareness and capacity building activities are rarely costed, yet they may be more relevant for GEF investments. It is often assumed that “soft” options are more cost-effective than “hard” because they potentially bring multiple benefits. However, there are substantial opportunity costs in choosing one or other option in a resource-constrained world and “soft” measures may hold higher risks for maladaptations.
56. Annual environmental costs from human activities are estimated at US\$6.6 trillion in 2008 or 11% of global GDP and are projected to increase to about US\$30 trillion (or 18% of GDP) assuming a “business as usual” scenario⁴⁸. Rising GHG emissions and impacts of climate change account for up to 70% of environmental costs. These estimates may be conservative since they do not encompass growing ecosystem sensitivity and increased scarcity of resources. The costs of sustainable use of natural resources and pollution prevention are far lower than environmental damage costs.

⁴⁶ World Bank (2006). Managing climate risk: Integrating adaptation into World Bank Group operations, available at: <http://siteresources.worldbank.org/GLOBALENVIRONMENTFACILITYGEFOPERATIONS/Resources/Publications-Presentations/GEFAdaptationAug06.pdf>

⁴⁷ G. Hughes et al. (2010): Utilities Policy 18(3): 142-153.

⁴⁸ UNEP (2010). Universal ownership: Why environmental externalities matter to institutional investors, available at: <http://www.unepfi.org/>

Much higher savings could be achieved if policies and technologies for use of natural capital take into account climate change impacts. The World Bank EACC analysis (2010)⁴⁹ concludes that adaptation should be a core element of economic development that cannot be pursued simply as 'business as usual'.

57. Environmental mainstreaming into development could be the most cost-effective measure of enhancing climate resilience. If well-designed, GEF investments could not only be 'no-regret' measures but simultaneously contribute to poverty reduction and adaptation. For the GEF, the costs of enhancing resilience may more appropriately be considered as a form of insurance to protect future GEBs, rather than as an adaptation measure *per se*. Proactive and reactive responses to climate change should start by addressing existing climate risks in systems that can cope effectively now such as storm protection, and measures to deal with water shortages in arid areas, urban floods and others. There is a strong need to identify such opportunities for GEF interventions across all focal areas, with the primary benefit being the continued flow of future GEBs.

⁴⁹ World Bank (2010). The economics of adaptation to climate change, available at: <http://beta.worldbank.org/content/economics-adaptation-climate-change-study-homepage>

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ANNEX 1. IDENTIFIED CLIMATE RISKS BY GEF FOCAL AREAS

1.1. Biodiversity.

Objectives	Expected outcomes	Core outputs	Climate risks
Objective 1: Improve Sustainability of Protected Area Systems	Outcome 1.1: Improved management effectiveness of existing and new protected areas	Output 1. New protected areas (number) and coverage (hectares) of unprotected ecosystems Output 2. New protected areas (number) and coverage (hectares) of unprotected threatened species (number)	Changes in phenology are expected in many species, making management more difficult and uncertain Species and components of ecosystems will migrate at different rates Species habitats will move poleward.
Objective 2: Mainstream Biodiversity Conservation and Sustainable Use into Production Landscapes, Seascapes and Sectors	Outcome 2.1: Increase in sustainably managed landscapes and seascapes that integrate biodiversity conservation Outcome 2.2: Measures to conserve and sustainably use biodiversity incorporated in policy and regulatory frameworks Outcome 2.3: Improved management frameworks to prevent, control and manage invasive alien species	Output 1. Policies and regulatory frameworks (number) for production sectors Output 2. National and sub-national land-use plans (number) that incorporate biodiversity and ecosystem services valuation	Geographically restricted ecosystems and those species with limited climatic ranges are the most vulnerable Changes in freshwater ecosystems through alterations in hydrological processes Beaches and barriers are expected to erode further negatively impacting biodiversity
Objective 3: Build Capacity for the Implementation of the Cartagena Protocol on Biosafety (CPB)	Outcome 3.1 Potential risks of living modified organisms to biodiversity are identified and evaluated in a scientifically sound and transparent manner	All remaining eligible countries (about 60-70 depending on programming for rest of GEF-4) have national biosafety decision-making systems in place	Increased occurrence of pest outbreaks and invasive plants Loss of endemic montane species Changing biomes, soil and vegetation structure

1.2. Climate Change.

Objectives	Expected outcomes and indicators	Core outputs	Climate risks
Objective 1: Promote the demonstration, deployment, and transfer of innovative low-carbon technologies	Technologies successfully demonstrated, deployed, and transferred Indicator: Percentage of technology demonstrations reaching its planned goals	Innovative low-carbon technologies demonstrated and deployed on the ground National strategies for the deployment and commercialization of innovative low-carbon technologies adopted	Shortages of water sufficient to enable production of biomass energy sources Reduced summer precipitation and drought limit primary productivity in some areas
Objective 2: Promote market transformation for energy efficiency in industry and the building sector	Appropriate policy, legal and regulatory frameworks adopted and enforced Sustainable financing and delivery mechanisms established and operational GHG emissions avoided	Renewable energy policy and regulation in place Renewable energy capacity installed Electricity and heat produced from renewable sources	Increases in extreme events such as droughts and rain/flooding events leading to land degradation Increased temperatures leading to increased power demands
Objective 3: Promote investment in renewable energy technologies	Favourable policy and regulatory environment created for renewable energy investments Investment in renewable energy technologies increased GHG emissions avoided	Cities adopting in low-carbon programs Investment mobilized Energy savings achieved	Increased temperatures, frequency of extreme events, sea level rise creating significant risk for urban infrastructure including transport and energy systems
Objective 4: Promote energy efficient, low-carbon transport and urban systems	Sustainable transport and urban policy and regulatory frameworks adopted and implemented Increased investment in less-GHG intensive transport and urban systems	Cities adopting in low-carbon programs Investment mobilized Energy savings achieved	
Objective 5: Promote conservation and enhancement of carbon stocks through sustainable management of land use, land-use change, and forestry	Good management practices in LULUCF adopted both within the forest land and in the wider landscape Restoration and enhancement of carbon stocks in forests and non-forest lands, including peatlands	Carbon stock monitoring systems established Forests and non-forest lands under good management practices	

1.3. International Waters.

Objectives	Expected outcomes and indicators	Core outputs	Climate risks
Objective 1: Catalyze multi-state cooperation to balance conflicting water uses in trans-boundary surface and groundwater basins while considering climatic variability and change	<p>Outcome 1.1: Implementation of agreed Strategic Action Programmes (SAPs) incorporates transboundary IWRM principles (including environment and groundwater) and policy/legal/institutional reforms into national/local plans</p> <p>Outcome 1.2: Transboundary institutions for joint ecosystem-based and adaptive management demonstrate sustainability</p> <p>Outcome 1.3: Innovative solutions implemented for reduced pollution, improved water use efficiency, sustainable fisheries with rights-based management, IWRM, water supply protection in SIDS, and aquifer and catchment protection (greater scaling up in \$6.5 Billion scenario)</p> <p>Outcome 1.4: Climatic variability and change as well as groundwater capacity incorporated into updated SAP to reflect adaptive management</p>	<p>National and local policy and legal reforms adopted/ implemented</p> <p>Cooperation frameworks agreed with sustainable financing identified</p> <p>Types of technologies and measures implemented in local demonstrations and investments</p> <p>Enhanced capacity for issues of climatic variability and change and groundwater management</p>	<p>Effects of extreme temperature changes that kill organisms and change biological processes will be least in the tropics and pronounce in high latitudes</p> <p>Changes in freshwater ecosystems through alterations in hydrological processes</p> <p>Decreased availability of melt water from glaciers and snow packs</p> <p>Changes in the function and operation of water infrastructure and water management practices</p> <p>Exacerbated water pollution</p> <p>Changes in average annual runoff and the seasonality of river flows</p> <p>Changes in groundwater recharge rates</p> <p>Increased risk of floods and droughts</p> <p>Increased ocean uptake of</p>

<p>Objective 2:</p> <p>Catalyze multi-state cooperation to rebuild marine fisheries and reduce pollution of coasts and Large Marine Ecosystems (LMEs) while considering climatic variability and change</p>	<p>Outcome 2.1: Implementation of agreed Strategic Action Programmes (SAPs) incorporates ecosystem-based approaches to management of LMEs, ICM principles, and policy/legal/institutional reforms into national/local plans</p> <p>Outcome 2.3: Innovative solutions implemented for reduced pollution, rebuilding or protecting fish stocks with rights-based management, ICM, habitat (blue forest) restoration/conservation, and port management and produce measureable results (greater scaling up in \$5.5 and \$6.5 Billion scenarios for on-the-ground impact)</p> <p>Outcome 2.4: Climatic variability and change at coasts and in LMEs incorporated into updated SAP to reflect adaptive management and ICM principles (including protection of “blue forests”)</p>	<p>Agreed commitments to sustainable ICM and LME cooperation frameworks</p> <p>National and local policy/legal/institutional reforms adopted/implemented</p> <p>Types of technologies and measures implemented in local demonstrations and investments</p> <p>Enhanced capacity for issues of climatic variability and change</p> <p>Industry partnerships with Earth Fund</p>	<p>CO₂ reduces surface ocean pH</p> <p>Coral reefs will be impacted if sea surface temperatures increase by more than 1⁰C over seasonal maximum</p> <p>Beaches and barriers are expected to erode further due to sea level rise and increases in wave height negatively impacting coastal productivity</p> <p>Contraction of highly productive sea-ice biome by 42%</p> <p>Reduced ocean salinities and shifts in distribution of biomass of the major constituents of Arctic food webs</p> <p>Saline intrusion in coastal aquifers</p>
<p>Objective 4:</p> <p>Promote effective management of Marine Areas Beyond National Jurisdiction (ABNJ) directed at preventing fisheries depletion --joint with GEF Biodiversity Focal Area</p>	<p>Outcome 4.1: ABNJ (including deep-sea fisheries, oceans areas, and seamounts) under sustainable management and protection (including biodiversity)</p> <p>Indicator 4.1: Marine Protected Areas (MPAs) sustainably managed; ABNJ demo plans implemented; improved flag and port state enforcement of practices</p>	<p>Demonstrations for management measures in ABNJ, (including deep-sea fisheries, ocean areas) with institutions</p>	

1.4. Land Degradation.

Objectives	Expected outcomes and indicators	Core outputs	Climate risks
1. Maintain or improve flow of agro-ecosystem services to sustaining the livelihoods of local communities	<p>Outcome 1.1: An enhanced enabling environment within the agricultural sector.</p> <p>Outcome 1.2: Improved agricultural management.</p> <p>Outcome 1.3: Functionality and cover of agro-ecosystems maintained</p>	<p>Country level policy, legal and regulatory frameworks that integrate SLM principles developed</p> <p>Diverse sources of investment for SLM interventions at multiple scales (e.g. PES)</p> <p>Hectares of tree cover in agro-ecosystems</p>	<p>Risks exist from changes in mean climate as well as extremes</p> <p>Forests have high vulnerability to climate change particularly if disturbance regimes such as changes in temperature and precipitation cross critical thresholds</p>
2. Generate sustainable flows of forest ecosystem services in drylands, including sustaining livelihoods of forest dependant people	<p>2.1: An enhanced enabling environment within the forest sector in drylands</p> <p>2.2: Improved forest management in drylands</p> <p>2.3: Functionality and cover of forest ecosystems in drylands maintained</p>	<p>Country level policy, legal and regulatory frameworks that integrate SFM principles developed</p> <p>Diverse sources of investment for SFM interventions (e.g. PES, small credit schemes, voluntary carbon market)</p> <p>Hectares of forest cover in production landscapes</p>	<p>Loss of forest diversity, particularly in tropical forests</p> <p>Biome shifts</p> <p>Increased occurrence of wildfires, pest outbreaks, and invasive plants</p> <p>Reduced summer precipitation and drought limit primary productivity in some areas</p>
3. Reduce pressures on natural resources from competing land uses in the wider landscape	<p>Outcome 3.1: Enhanced enabling environments between sectors in support of SLM</p> <p>Outcome 3.2: Good management practices in the wider landscape demonstrated and adopted by relevant economic sectors</p>	<p>Government agencies collaborating on SLM initiatives across sectors and at multiple scales</p> <p>Number and types of investment sources in SLM from successfully tested sustainable finance reflow schemes</p> <p>Information on SLM (wider landscape) technology and good practices disseminated</p>	<p>Changes in growing period</p> <p>Reduction in Reliable Crop Growth Days due to reduction and increased variability in rainfall</p> <p>Increases in extreme events such as droughts and rain/flooding events leading to increased soil erosion</p> <p>Geographically restricted ecosystems and those species with limited climatic ranges are the most vulnerable</p> <p>Increased risk due to land used, habitat fragmentation, and other pressures</p>

1.5. Chemicals.

Objectives	Expected outcomes and indicators	Core outputs	Climate risks
Objective 1 Phase out POPs and reduce POPs releases	<p>Outcome 1.1 Production and use of controlled POPs chemicals phased out</p> <p>Outcome 1.2 Exempted POPs chemicals used in an environmentally sound manner</p> <p>Outcome 1.3 POPs releases to the environment reduced</p> <p>Outcome 1.4 POPs waste prevented, managed, and disposed of, and POPs contaminated sites managed in an environmentally sound manner</p> <p>Outcome 1.5 Country capacity built to effectively phase out and reduce releases of POPs</p>	<p>Dioxin action plans under implementation</p> <p>PCB management plans under implementation</p> <p>NIPs prepared or updated, or national implications of new POPs assessed</p>	<p>Climate variability and change enhance the volatilization of POPs from reservoirs accumulated in the past</p> <p>Increased transport of POPs from source regions to more pristine regions</p> <p>Release of mercury stored in soils due to increased fire frequency</p>
Objective 2 Phase out ODS and reduce ODS releases	<p>Outcome 2.1 Country capacity built to meet Montreal protocol obligations and effectively phase out and reduce releases of ODS.</p> <p>Outcome 2.2 ODS phased out and their releases reduced in a sustainable manner</p>	<p>Country annual reports to the Ozone secretariat</p> <p>HCFCs phase out plans under implementation</p>	
Objective 3 Pilot sound chemicals management and mercury reduction	<p>Outcome 3.1 Country capacity built to effectively manage mercury in priority sectors</p> <p>Outcome 3.2 Contribute to the overall objective of the SAICM of achieving the sound management of chemicals throughout their life-cycle in ways that lead to the minimization of significant adverse effects on human health and the environment</p>	<p>Development and implementation of management plans for persistent toxic substances and other chemicals of global concern, in particular with respect to mercury, on a pilot basis</p> <p>BAT/BEP demonstrated in priority sectors for release reduction of PTS and other chemicals of global concern, in particular mercury</p>	

1.6. Sustainable Forest Management / REDD+ Program.

Objectives	Expected outcomes and indicators	Core outputs	Climate risks
Objective 1: Reduce pressures on forest resources and generate sustainable flows of forest ecosystem services	<p>Outcome 1.1: Enhanced enabling environment within the forest sector and across sectors</p> <p>Outcome 1.2: Good management practices developed and applied in existing forests</p> <p>Outcome 1.3: Good management practices in the wider forest landscape developed and adopted by relevant economic sectors.</p>	<p>Payment for ecosystem services (PES) systems established (number).</p> <p>Types of services generated from forests</p> <p>Forest area (hectares) under sustainable management, separated by forest type</p>	<p>Forests have high vulnerability to climate change particularly if disturbance regimes cross critical thresholds</p> <p>Biome shift in semi-arid climates to grasslands</p> <p>Loss of forest diversity, particularly in tropical forests</p> <p>Increased occurrence of wildfires, pest outbreaks, and invasive plants</p>
Objective 2: Strengthen the enabling environment to reduce GHG emissions from deforestation and forest degradation and enhance carbon sinks from LULUCF activities	<p>Outcome 2.1: Enhanced institutional capacity to account for GHG emission reduction and increase in carbon stocks</p> <p>Outcome 2.2: New revenue for SFM created through engaging in the voluntary carbon market</p>	<p>National forest carbon monitoring systems in place (number)</p> <p>Innovative financing mechanisms established (number)</p> <p>Carbon credits generated (number)</p>	<p>Reduced summer precipitation and drought limit primary productivity in some areas</p>

ANNEX 2. CLIMATE RISKS FACED BY SELECTED GEF-4 PROJECTS

The purpose of this assessment was to evaluate a selection of projects funded under the Fourth Replenishment of the GEF (GEF-4; November 2006–June 2010) for the extent to which potential climate change risks and adaptation plans were considered and discussed in the project descriptions. This complements an independent review by the GEF Evaluation Office of projects funded under the Strategic Pilot on Adaptation (SPA) that provides financial and technical incentives for climate risks and adaptation. The present study considers how a “typical” GEF project deals with climate risks in the absence of dedicated technical and financial incentives. Issues explored include:

- ▶ Were risks from climate change addressed in the project documentation?
- ▶ Did the STAP screen acknowledge climate change risks to the project?
- ▶ How much climate change risk does the affected resource face?
- ▶ How much climate change risk does the proposed project face?

Two key objective questions are posed. First, do non-SPA projects dealing with a climate sensitive resource or global environmental benefit (GEB) account for climate change risks? Secondly, what climate risk accounting and adaptation response measures are used?

Methodology

On the basis that they deal with climate-sensitive issues and related GEBs, 35 non-SPA projects were selected for evaluation. In order to provide a representative sample, they spanned several GEF focal areas: biodiversity (11); climate change (7); international waters (9); land degradation (3); persistent organic pollutants (1); and sustainable forest management (4).

The project documents examined included the Project Identification Form (PIF) and the STAP screening document, when available. Other items examined included GEF partner and implementing agency project documents, project proposals and chief executive officer (CEO) endorsements. A two-part screening tool, developed in conjunction with the concurrent Evaluation Office assessment of SPA projects, was used. The *objective assessment* focused on questions that are empirically verifiable in the project documentation itself. It describes aspects of the project that require limited or no judgment on the evaluator’s part. The *subjective assessment*, based on available information and scientific opinion, focused on questions that go beyond the content of the project reports. Listed below are the screening tool questions along with the possible form of answers in parenthesis.

Objective assessment

- ▶ What are the climate sensitive resource(s)? (List)
- ▶ Does the project explicitly address climate risks to GEBs? (Yes/No)
- ▶ Does the project explicitly address climate risk to local benefits? (Yes/No)
 - If Yes to either of the above two bullets:
 - Does the project explicitly address current climate variability or risks? (Yes/No/Somewhat/No Evidence, or N/A)

- Does the project explicitly respond to future climate change risks? (Yes/No/Somewhat/No Evidence, or N/A)
- Is the argumentation of climate threats scientifically sound? (Yes/No/Somewhat/No Evidence, or N/A)
- ▶ How are climate risks addressed? (Description)
- ▶ Did the STAP screen acknowledge climate change risks in the proposal? (Yes/No or N/A)
- ▶ Did the “incremental reasoning” take climate variability or change into account? (Yes/No)
- ▶ Does the project propose adaptations to climate risks? (Yes/No)
- ▶ What kinds of adaptations? (No regrets versus targeted investments)
- ▶ Does the project promote capacity building? (Yes/No)
- ▶ Does the project propose results dissemination activities on climate risk? (Yes/No)
- ▶ Does the project identify potential costs from climate risk or adaptations? (Yes/No)

Subjective assessment

- ▶ Will the project address climate change risks regardless of explicit project intention? (Yes/No/Somewhat/No Evidence, or N/A)
- ▶ How much climate change risk does the affected resource face? (None/Low/Moderate/High)
- ▶ How much climate change risk does the proposed project face? (None/Low/Moderate/High)
- ▶ Does the project pose potential mal-adaptations? (No/Unlikely/Possible)

The *objective assessment* was especially important for certain aspects of the study in order to remove potential investigator bias and provide empirically verifiable assessment data. For example, in answering the question, “Does the project propose adaptations to climate risks?” we only answered “Yes” if this was explicitly or logically related to justifications of climate variability or climate change. We did not make our own assessment of whether activities proposed in the project documents would be effective adaptations or not.

The *subjective assessment* put the objective assessment in broader context using a mix of documentation and evaluator judgment. For example, “How much climate change risk does the proposed project face?” is a subjective judgment, requiring the evaluator’s view based on current scientific information. The answer is provisional pending any further information becoming available.

The assessment was based only on available project documentation; it did not use project updates, implementation reports, interviews with staff, or other sources of information that might provide further insights. The findings, therefore, may not be complete on the role climate change played in a project. However, circumscribing the evaluation by examining only project documentation affords a consistent view of how climate change was perceived when the funding decision was made.

Results

Objective Assessment

Responses to the objective assessment questions are in Table 1.

Q: Does the project explicitly address climate risks to GEBs? Does the project explicitly address climate risk to local benefits? How are climate risks addressed?

The questions here refer to “climate risks,” rather than “climate change risks.” At a first level of analysis, separating discussions of climate variability from climate change is unwarranted; the distinction is, however, made in the second question cluster. If a project addressed risks from climate in any way – from historic variability to projected changes – it was deemed to address “climate risks.” Of the 35 projects, 57% address climate risks to local benefits, but only 26% climate risk to GEBs. This result supports the contention that adaptation is more often thought of in local, not global terms. Fully 31% of all projects did not address climate risks to either GEBs or local benefits even though the PIF mentions climate change as a risk factor. Of the remaining projects, 12 (34%) simply mentioned climate risks but did not discuss those risks in any depth, and another 12 (34%) contained some depth of acknowledgement of the risks by citing peer-reviewed literature, the Intergovernmental Panel on Climate Change (IPCC) reports, or by making a qualitative case for climate risks to the project. This indicates a wide discrepancy in attention to climate variability and climate change as an issue potentially affecting projects.

Table 1. Objective assessment questions

	Total ^a	Yes	No
Does the project explicitly address climate risks to GEBs?	35	9 (26%)	26 (74%)
Does the project explicitly address climate risk to local benefits?	35	20 (57%)	15 (43%)
Does the project explicitly address current climate variability or risks?	24	16 (67%)	8 (33%)
Does the project explicitly respond to future climate change risks?	24	22 (92%)	2 (8%)
Is the argumentation of climate threats scientifically sound?	24	7 (29%)	17 (71%)
Did the STAP screen acknowledge climate change risks in the proposal?	21	6 (29%)	15 (71%)
Did the “incremental reasoning” take climate variability or change into account?	33	6 (18%)	27 (82%)
Does the project propose adaptations to climate risks?	35	18 (51%)	17 (49%)
Does the project promote capacity building?	35	35 (100%)	0 (0%)
Does the project propose results dissemination activities on climate risk?	35	7 (20%)	28 (80%)
Does the project identify potential costs from climate risk or adaptations?	35	0 (0%)	35 (100%)

^a. For varying reasons, not all questions were asked of every project, which led to a total of less than the full complement of all 35 projects for some questions. For example, the third, fourth, and fifth questions were asked only of projects that answered yes to either one of both of the first two questions. The STAP screening question was used only on projects for which a STAP screen document was available.

A breakdown by focal area (Table 2) shows that most international waters projects did not address either local benefits or GEBs. Biodiversity and sustainable forest management projects were particularly focused on climate risks to local benefits. Firm conclusions should not, however, be drawn from such small sample sizes.

The relative neglect of climate risks to GEBs is a significant finding for GEF, indicating cognitive or other barriers by project proponents to understanding climate risks to natural systems in terms of their contributions to GEBs.

Q: Does the project explicitly address current climate variability or risks? Does the project explicitly respond to future climate change risks? Is the argumentation of climate threats scientifically sound?

Of the 24 projects that cited climate risks to either GEBs or local benefits, 14 (58%) addressed both climate change and climate variability, 8 (33%) addressed climate change only, and 2 (8%) climate variability only. Therefore, 92% of projects make some mention of climate risks, but only 67% addressed climate variability. The detail in which each project treated these risks varied greatly, however. For example, while 7 (29%) provided scientific evidence of risks, 17 (71%) provided none to support their claims.

Table 2. Climate risks to project benefits by project focal area

Focal area	# projects	Addressed climate risks to GEBs	Addressed climate risk to local benefits	Addressed climate risk to both	Addressed climate risk to neither
Biodiversity	11	36%	73%	18%	9%
Climate change	7	29%	57%	14%	29%
International waters	9	22%	33%	11%	56%
Land degradation	3	33%	67%	33%	33%
Sustainable forest management	4	0%	75%	0%	25%

Q: Did the STAP screen acknowledge CC risks in the proposal?

A STAP screen document was available for 21 of the 35 examined projects. Of these, only 6 STAP screens (29%) explicitly addressed climate variability or climate change risks to the project, while the remaining 15 STAP screens (71%) did not. We also examined the overlap between project documents that addressed climate risks to either GEBs or local benefits and STAP screens that explicitly addressed climate risks. Of the 16 projects where the project documents addressed climate risks, only 5 (31%) of their STAP screens explicitly address climate risks. Of the 5 projects where the project documents failed to address climate risks, only 1 (20%) of their respective STAP screens addressed climate risks. By any of these measures, there is no evidence that the STAP screen played any significant role in promoting the consideration of climate risks.

Q: Did the “incremental reasoning” take climate variability or change into account?

A section on “incremental reasoning” was included for 33 of the 35 projects; the remaining two projects did not have a PIF or similar document available. Of these, 6 projects (18%) included an explicit discussion of climate variability or climate change while 27 (82%) had no discussion of climate risk.

Q: Does the project propose adaptations to climate risks? What kinds of adaptations? Does the project promote capacity building?

Of all 35 projects, 18 (51%) propose some kind of adaptation response. Of these 18, 11 projects (61%) proposed no regrets adaptations only, 4 (22%) proposed targeted investments in specific adaptations only, and 3 (17%) proposed both no regrets adaptations and targeted investments. In many cases, the proposed targeted investments in specific adaptations could not be justified without considering climate variability and/or climate change. All 35 projects (100%), however, promoted capacity building in one form or another. This includes improving governance structures and operating procedures, providing more personnel and training, creating legal frameworks, improving observations or monitoring and evaluation systems.

All 35 GEF-4 projects examined would increase the capacity of the respective country to adapt to climate change simply by improving core governance functions. However, while improved governance better position a country to withstand an environmental disaster, this does not mean that all GEF projects promote climate adaptation by default. General capacity building, while providing benefits relevant to climate, does not systematically assess the risks that climate may pose to local benefits and GEBs. Nor does it address how to manage those risks most efficiently to maximize climate resilience and ensure the delivery of local benefits and GEBs under a variety of potential future climate conditions. In some cases, specific actions to build capacity could prove maladaptive if they reduce, for example, the flexibility of governance structures or legal frameworks to address climate variables. This could increase project risks as discussed in the subjective assessment.

Q: Does the project propose results dissemination activities on climate risk? Does the project identify potential costs from climate risk or adaptations?

Of the 35 projects, 7 (20%) explicitly proposed results dissemination activities related to climate change risk and adaptation, such as lessons learned and awareness-raising. However, no projects identified the potential costs from climate risk or adaptations.

Subjective Assessment

Results for the subjective assessment questions are presented in Tables 3 and 4.

Table 3. Subjective assessment questions I

	Total	High risk	Moderate risk	Low risk	No risk
How much climate change risk does the affected resource face?	35	8 (23%)	20 (57%)	6 (17%)	1 (3%)
How much climate change risk does the proposed project face?	35	2 (6%)	6 (17%)	14 (40%)	13 (37%)

Table 4. Subjective assessment questions II

	Total	Yes	No evidence	No	Unlikely	Possible
Will the project address climate change risks regardless of explicit project intention?	35	33 (94%)	2 (6%)	–	–	–
Does the project pose potential	35	–	–	8 (23%)	16 (46%)	11 (31%)

Q: Will the project address climate change risks regardless of explicit project intention?

33 projects (94%) were adjudged to address climate risks regardless of project intention; 2 (6%) had no evidence. This indicates that most GEF-4 projects addressing a climate-sensitive sector such as land use, water resources or biodiversity propose some relevant actions. These actions range from increasing the governance capacity of those sectors to explicit, targeted investments in “climate proofing.” The 2 projects that have no evidence were small-hydropower energy infrastructure projects. Neither reduce vulnerability to climate change; indeed, they may increase vulnerability through increased reliance on surface water resources that alter under climate change.

These results should not be taken out of context. It is good that 94% of projects address climate risks to some degree. However, it is unclear that climate risks would on balance be reduced under each of these projects. Foundational capacity building such as enhancing governance structures or legal frameworks may in general address climate change risks, but if developed without regard to shifting environmental conditions, such capacity building could increase climate risks to the project as discussed under the maladaptation question below.

Q: How much climate change risk does the affected resource face?

If sufficient information suggested that the climate change risks to a project would be relatively severe, a project was assumed to have high climate change risks. If risks were relatively modest, it was rated low. Otherwise, a project was assumed to have moderate climate change risks. Of the 35 projects, 8 (23%) were rated as having high risk, 20 (57%) as moderate risk, 6 (17%) as low risk, and 1 (3%) as no risk. The single project with no risk dealt with the creation of a legal framework for natural resource valuation and not with a specific resource. While the risks from climate change varied across projects, the resources the projects address tend to have significant risks from climate change.

Q: How much climate change risk does the proposed project face?

This question focuses on the risk faced by the project itself as opposed to the affected resource. For example, a project that proposes developing capacity in a forest management agency on a small island may have no climate change risk to the project activity but high risk to the island forest resource. Theoretically, climate change could have secondary, tertiary, or higher order impacts on systems that would lead to a negative impact on the capacity of a forest management agency. To simplify this assessment, only first order impacts directly on a project were considered. Of the 35 projects, 2 (6%) face high climate change risk, 6 (17%) moderate risk, 14 (40%) low risk, and 13 (37%) no climate change risk. Most that face no climate change risk were entirely on capacity building. Of the remaining projects, a majority have low or moderate climate change risk. While many GEF project interventions themselves may not face much risk, the ultimate objective of the GEF project – the successful delivery of GEBs – may still be at risk from climate. However, it may be tempting to presume that if a project itself does not face climate risks, then there is no reason to consider climate change. The sensitivity of the resource indicates that high or moderate risk exists for fully 80% of all projects. There are therefore downside risks to the delivery of GEBs for these projects, despite low or no climate risk for fully 77% of project interventions.

Q: Does the project pose potential mal-adaptations?

Maladaptations mean the possibility that a project or project component could actually increase risks from climate change. This is a particularly difficult judgment because of the limited information in project documentation on individual project components. For example, a renewable energy system installed on a small island developing state could face significant risks from climate change, but if constructed using climate-proofing measures, the risk of maladaptation could be very low. Similarly, improving irrigation and water efficiency could increase the robustness of a water supply system to climate change, but not if all water conserved is reallocated to other uses. Because of these and other difficulties, the answers to this question for each project represent tentative judgments about the potential for maladaptation in a project. Of the 35 projects, 8 (23%) were judged to pose no potential maladaptation, 16 (46%) were unlikely to lead to maladaptation, and 11 (31%) as possibly leading to maladaptation.

Projects deemed to have no maladaptations generally involved: (1) capacity building unrelated to climate change; (2) addressing resources so vulnerable that any improvement over their status would reduce climate risk; or (3) projects so explicitly focused on climate risks that maladaptation should be impossible. In the broad category of no maladaptation, increased climate risk is possible but unlikely, given that the resource being addressed is either in such a pre-existing poor state or climate risks were accounted for in project design. Projects leading to possible maladaptation involved either those with insufficient acknowledgement of climate risks or projects where climate risks were not accounted.

Annex 3. Illustrative menu of representative adaptations for different focal areas

Focal area	Selection of risks	Representative adaptations
Biodiversity	Species and components of ecosystems will migrate at different rates	Establish mosaics of interconnected terrestrial, freshwater and marine multiple-use reserves
	Increased occurrence of pest outbreaks and invasive plants	Develop species mixes across landscapes to reduce spread of fires, pests, and invasive species
Climate change	Increased temperatures, frequency of extreme events, sea level rise creating significant risk for urban infrastructure including transport and energy systems	The location of capital investments should be assessed in consideration of exposure to climate change risk
Land degradation	Reduction in Reliable Crop Growth Days due to reduction and increased variability in rainfall	Development of climate risk and climate monitoring tools
	Reduced summer precipitation and drought limit primary productivity in some areas	The introduction of new crop varieties or species
International waters	Changes in freshwater ecosystems through alterations in hydrological processes	Development of comparable data sources and information for exchange among managers
	Changes in average annual runoff and the seasonality of river flows	Legal frameworks must offer incentives to alter management actions to changing circumstances
Sustainable forest management	Biome shift in semi-arid climates to grasslands	Monitoring of ecosystem responses to management practices
	Loss of forest diversity, particularly in tropical forests	Actions to reduce other threats, such as habitat fragmentation, pollutions
Chemicals	Climate variability and change enhance the volatilization of POPs from reservoirs accumulated in the past	Monitoring for contaminants must be conducted with a systems approach that includes climate-related factors

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