Global Environment Facility

GEF/C.24/Inf.10
November 10, 2004

GEF Council
November 17-19, 2004

A CONCEPTUAL DESIGN TOOL FOR EXPLOITING INTERLINKAGES BETWEEN THE FOCAL AREAS OF THE GEF

(Prepared by the Scientific and Technical Advisory Panel)

Scientific and Technical Advisory Panel to the GEF

A conceptual design tool for exploiting interlinkages between the focal areas of the GEF

A report focusing on the needs of the Global Environment Facility

(Pre-publication draft: to be published as a GEF working paper)

November 2004

A conceptual design tool for exploiting interlinkages between the focal areas of the GEF

A report focusing on the needs of the Global Environment Facility (GEF)

Edited by Habiba Gitay

Prepared by members of the Scientific and Technical Advisory Panel of the GEF:

Dennis Anderson, Julia Carabias, Habiba Gitay, Peter Hennicke, Brian Huntley, Saleemul Huq, Anne Kapuscinski, Alexei Maximov, Leonard Nurse, Anjali Shanker, Cristian Samper, Peter Schei, Shinsuke Tanabe, Timothy Williams, Xiao-bai Xu

Technical and scientific editor: An Van den Borre

Table of Contents

Foreword

Over the last decade, there has been increasing interest in analyzing and understanding the interlinkages between biodiversity, climate change, land degradation, and freshwater and coastal systems. Of concern is how these interlinkages affect human well-being and sustainable development.

The GEF has begun to embrace interlinkages more explicitly in its recent Operational Programs, such as ecosystem management, and the conservation and sustainable use of biodiversity. The development of new strategic priorities, notably on adaptation to climate change, is further evidence of this. And the UN Environment Programme (UNEP) is now considering how to address interlinkages in relation to the design of its fourth Global Environment Outlook (GEO).

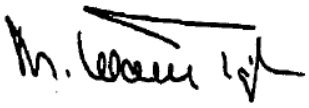
However, we recognize that additional efforts are necessary to incorporate these complex interlinkages into GEF project design, implementation, and monitoring and evaluation. We, therefore, welcome the timely contribution made by this Scientific and Technical Advisory Panel (STAP) report, *A Design Tool for Exploiting the Interlinkages Between the Focal Areas of the GEF*. The report addresses a key question: How can we ensure that GEF projects are designed with interlinkages in mind and that they take full advantage of the additional global environmental benefits at hand, while avoiding the pitfalls of unintended consequences? This question, and the recommendations outlined in the report, make a substantial contribution to improving our understanding of interlinkages.

The process of producing this report has been a valuable lesson for the GEF family. STAP members worked closely with the GEF Secretariat, UNEP, the UN Development Programme (UNDP), and the World Bank, as well as with the UN Framework Convention on Climate Change, the Convention on Biological Diversity, the Convention to Combat Desertification, and the RAMSAR Convention on Wetlands. This has led to a deeper analysis and provided important feedback. A high level meeting between STAP, heads of agencies of the GEF family, and the heads of the Conventions was especially fruitful.

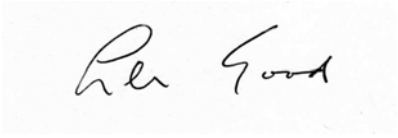
The report provides a brief account of the scientific underpinnings of interlinkages and systematically identifies the most important ones, some of which are not immediately obvious. But its principal innovation is to provide conceptual thinking on a design tool that could enable the GEF to make better use of the synergies between focal areas. The report proposes a simple set of questions to ensure that any possible interlinkages have been properly addressed. It then poses these questions for different types of GEF interventions, e.g., the restoration and rehabilitation of degraded drylands, the management of forested ecosystem management, and the reduction of land-based pollution of inland wetlands. This illustrates the importance of a thorough, systematic examination of potential interlinkages during project design to highlight less obvious interactions, both positive and negative.

We believe that such a design tool could be useful to the GEF, and STAP's report is an important first step in this direction. But further work will be needed in order to make the design tool operational, and in doing so it is essential that additional hurdles are not created. We now need to embrace this report and carefully consider the implications for the way that projects are designed, and how the GEF can ensure that its goals and objectives are met. If we achieve this, and we believe we can, then the GEF will be better positioned to derive global environmental benefits from the funds at its disposal.

We are grateful to STAP for its practical advice on interlinkages. We welcome STAP's continuing help in deciding how best to move forward.



Dr. Klaus Töpfer,
Executive Director,
UNEP,
Nairobi, Kenya



Leonard Good,
Chief Executive Officer/Chairman,
Global Environment Facility,
Washington, DC

Ian Johnson,
Vice President,
Sustainable Development,
The World Bank,
Washington, DC

Shoji Nishimoto,
Assistant Administrator and Director,
Bureau for Development Policy,
UNDP,
New York, NY

5 November 2004

Executive Summary

There has been an emerging recognition of important links between various global environmental issues such as loss of biodiversity, climate change, land freshwater and coastal systems degradation. Actions taken to fulfill human needs have local, regional and global environmental consequences. Hence there are links between human activities and these environmental issues.

The challenge is to understand how the interactions and feedbacks between the various human activities that affect the environment can be better managed to enhance prospects for sustainable development and human wellbeing. From the Global Environment Facility (GEF) perspective, an additional challenge is to ensure that these interlinkages are properly reflected in the design and implementation of its projects.

Acknowledging these challenges, the Scientific and Technical Advisory Panel (STAP) has developed a conceptual design tool to help incorporate interlinkages into project design, and thereby improve the delivery of global benefits and the sustainability of GEF projects. The design tool is a device to help project developers identify what to do, but not necessarily how to do it. We recognize, of course, that many single focal area projects will continue to be important for delivering global benefits.

Our major conclusions are:

1. The GEF in its focal areas, operational programs and strategic priorities, has recently moved towards recognizing some interlinkages, e.g. between the Land Degradation focal area, the Multi-focal Area operational program (OP#12), and Strategic Priority 2 of the Biodiversity focal area (mainstreaming biodiversity into production landscapes). Further, many projects within the International Waters focal area take an integrated approach to addressing interlinkages.
2. The most important linkages, based on recent scientific assessments and of relevance to the GEF activities are:
    a) the impacts of climate change on projects to conserve and sustainably use biodiversity, and vice versa; and
    b) the impacts of projects to reduce land degradation on biodiversity and international water bodies/wetlands.
3. Despite the emerging recognition of these linkages, both in the GEF and the scientific community, recent GEF project documents do not reveal evidence of a systematic approach to incorporating these explicitly in project design. For example:
    - A preliminary analysis of 119 GEF pipeline entry projects (available electronically) was carried out. These projects were submitted in the different focal areas and OP#12. The analysis looked for the inclusion of linkages between climate change and biodiversity, or international waters, or land degradation in project design. Our analysis showed that linkages were mentioned in only about a fifth of the projects, and that only nine of these projects (out of the 119) propose to address or exploit the linkages, e.g. by assessing the impacts of climate change and variability on biodiversity or land degradation.

- Analysis of the 'recent' pipeline entry projects (in March 2004: 12 in the Biodiversity and 2 in the International Waters focal areas) showed that about two-thirds of these incorporated climate change in the project design, when our assessment suggested that they should all have done so. By contrast, out of 8 Land Degradation focal area projects, 7 mentioned climate change, and 5 proposed to address it in project design, with an emphasis on carbon storage.

4. Institutional weaknesses (e.g. thematic silos) and challenges of working with multiple institutions in client countries appear to constrain the inclusion of interlinkages and thereby lead to missed opportunities for exploiting the benefits from such inclusions.
5. An analysis of the existing GEF projects identified four main project types within the GEF projects. These four types represent projects that deal with:
    a) protected areas (terrestrial, coastal);
    b) ecosystem management (arid, semi-arid, managed forests, inland wetlands);
    c) renewable energy (micro hydrodams, biofuels, solar, wind); and
    d) international waters (freshwater basins, large marine ecosystems).
6. In addition, some projects, by their nature, can have positive impacts on the other focal areas and no obvious negative impacts. These include:
    a) projects in the Strategic Priority on mainstreaming biodiversity into production landscapes
    b) projects that deal with energy efficiency and reducing emissions from the transport sector
    c) demonstration projects in International Waters, dealing with environmentally friendly and innovative practices and technologies
    d) projects within the POPs focal area (e.g. stockpile disposal and vector control)
    e) projects on adaptation to climate change.
7. We developed a conceptual design tool to help recognize the importance of interlinkages and incorporate the major linkages into the project design within the four main intervention types. The design tool consists of a series of questions that the project developers can use as a guide for ensuring that the important linkages have been addressed in the project design, thus ensuring that the project is less likely to have negative impacts on other focal areas and be able to maximize the positive effects from the synergies.
8. In developing this tool, our work suggested that projects that take interlinkages into account would minimize the negative impacts on other focal areas and maximize the positive ones.
9. The GEF needs to systematically capture the synergies between focal areas, to assess any trade-offs, and to avoid negative effects. It can do so by recognizing the importance of interlinkages and including them into project design. There are various ways the GEF can achieve this:
    a) Disseminate and encourage the use and further development of the conceptual design tool.
    b) Develop formal or informal forums within the GEF Secretariat and the implementing agencies that would discuss and incorporate key interlinkages into projects.

c) Facilitate a process through which relevant agencies in a client country, or individuals from different sectors, collaborate on the inclusion of interlinkages into projects.

d) Develop outcome-oriented indicators to see if interlinkages have been included in projects, and to assess if they have contributed to global benefits.

e) Encourage the use of multiple reviewers to identify potential technical weaknesses in the project design.

f) Facilitate a full portfolio analysis of the projects that have incorporated interlinkages, to extract the lessons learnt and which, if any, benefits were maximized and/or negatives minimized.

g) Encourage the development of targeted research projects on key interlinkages and establish a clear mechanism to incorporate the lessons learnt into the GEF portfolio.

h) Initiate pilot projects that aim to disseminate information and methods to incorporate interlinkages into project design and implementation.

1. Introduction

In 1987, the World Commission on Environment and Development emphasized the links between various global environmental issues and development in its report *Our Common Future* (WCED 1987). Subsequently, specific links between global environmental issues (such as climate change, loss of biological diversity, land degradation, stratospheric ozone depletion) and human needs were addressed in the report *Protecting Our Planet, Securing Our Future* (Watson et al 1998). This report concluded that the scale of our demands on the world's resources has now grown so large that we are degrading the ecosystems, upon which our health and livelihood depend, at an unprecedented rate and that, to achieve a sustainable future, there is a need to recognize these links and incorporate them in development policies.

More recently, there has been an emerging recognition of the interlinkages between loss of biodiversity, climate change, land degradation, freshwater and coastal systems, and human activities (see, for example, reports of the Intergovernmental Panel on Climate Change (IPCC 2000, 2001ab, 2002), the Convention on Biological Diversity (CBD) report (Watson and Berghall 2003) and UNEP (2003)). At the global level, human activities have caused, and will continue to cause, a loss and/or a change in biodiversity through climate change, land-use and land-cover change; land and water pollution and degradation (including desertification); air pollution; diversion of water to intensively managed ecosystems and urban systems; habitat fragmentation; selective exploitation of species; introduction of non-native species; and stratospheric ozone depletion. Changes in biodiversity affect human wellbeing, given that biodiversity underlies many services that humans depend on (MA 2003). The underlying causes driving these changes include economic, demographic socio-political, scientific and technical factors.

The challenge is to learn how the interactions and feedbacks between the various human activities can be better managed to enhance prospects for sustainable development and human wellbeing. It is clear that addressing these issues separately does not address the underlying causes that generate them in the first place. However, we recognize that addressing some of the human activities (e.g. climate change) individually will continue to be important.

In this report, the Scientific and Technical Advisory Panel (STAP) has taken a first step towards incorporating the interlinkages between the various environmental issues and human activities into the Global Environment Facility (GEF) project development. We have developed a conceptual design tool to help incorporate interlinkages into project design, and thereby improve the delivery of global benefits and the sustainability of GEF projects. The conceptual design tool is a device to help identify potential negative and beneficial effects; the aim being to reduce the negative effects (i.e. when an objective of one focal area undermines the objective of another) and to increase beneficial ones (i.e. when an objective of one focal area also helps to meet the objective of another). At this stage, the design tool does not incorporate how to *address* these linkages. For this, future work is needed. Such work could perhaps be done in close cooperation with the GEF implementing agencies (IAs) and focus, as a start, on an area of obvious interlinkages, such as adaptation to climate change and the effects of invasive species. Future work could also be extended to include tools and methods that can help how to incorporate the various linkages into the GEF projects.

There will remain a bigger challenge on how to bring the complexities of various interlinkages into all stages of the GEF project, such as design, implementation, and monitoring and evaluation. Thus, there may be a need to develop a scientifically grounded and practicable 'Interlinkages Assessment Process' that could guide project design, implementation, and monitoring and evaluation. Such an assessment process would explicitly incorporate a cost–benefit analysis for addressing interlinkages and a means of carrying out a trade-off between the different options.

Beyond the GEF projects, and to help incorporate the interlinkages between environmental issues and human activities into national sustainable development agenda, it may be helpful to look at the usefulness of the Millennium Ecosystem Assessment framework (MA 2003), which links the underlying causes (or drivers of change), to ecosystem services and human wellbeing. The link between ecosystem services and human wellbeing can also be seen to be a useful tool to promote the ecosystem approach of the Convention on Biological Diversity (CBD), which is compatible with the Millennium Ecosystem Assessment‘s conceptual framework. This, in turn, is likely to lead to greater synergy among the environmental conventions and more coordinated work at the national and regional level. However, there will continue to exist the need for projects in each of the focal areas. A long-term and effective option to address these issues would also be to incorporate them in the strategic environmental assessment, and subsequently monitor and evaluate them through the national state of the environment reports. We recognize that in many countries, the lack of data and information will continue to pose major challenges for years to come when addressing linkages between the environmental issues and development.

The need for addressing interlinkages is recognized in the GEF and the multi-lateral environmental conventions. For example, the Overall Performance Study 2 (OPS2) of the GEF states that there is a need for the 'integration of global environmental issues into the mainstream development agenda'. In addition, GEF is moving into more multi-focal areas and strategic priorities in its second and third phase, all aiming to address some aspects of interlinkages; for example, the ‘strategic priority on mainstreaming biodiversity into production landscape' — under the Biodiversity focal area — and the recently agreed Strategic Priority on Adaptation to Climate Change. The Third Overall Performance Study (OPS3) and the work to be undertaken by the focal areas studies that will feed into OPS3 should also look into the issue of the integration of environmental issues and find ways to promote interlinkages at the local and national level. Within the environmental conventions (e.g. the Convention on Biological Diversity — CBD, the United Nations' Convention on Combating Desertification — CCD, and the Ramsar Convention on Wetlands) there are a number of joint work programs, specifically dealing with aspects of interlinkages.

This report is aimed at the GEF as its target audience, but also addresses issues that are relevant to the environmental conventions (CBD, UNFCCC, CCD and the Ramsar Convention on Wetlands). In this report we:

- provide a brief overview of how the GEF operates, and how it has evolved to address the interlinkages between focal areas (section 2);
- based mainly on existing assessments, briefly summarize our scientific understanding of the interlinkages between climate change, loss of biological diversity, land and water degradation, stratospheric ozone depletion and persistent organic pollutants (section 3);
- present a preliminary analysis of the extent to which interlinkages have appeared in the GEF’s recent portfolio (section 4);

- present a design tool to conceptually incorporate interlinkages in GEF projects — an interlinkages design tool (section 5); and
- recommend some actions that would help the GEF systematically incorporate interlinkages into future project design (section 6).

The main thrust of the report is in section 5, while the preceding sections provide a background.

2. Evolution of GEF programming in relation to interlinkages

In 1991, the GEF was set up as a financing mechanism for the various environmental conventions. The GEF provides grants to support the goals and objectives of the conventions and is a catalytic institution. Its funds are replenished every four years, with the 2002–2006 budget being about US$3 billion.

2.1 GEF focal areas

The GEF funding is provided through small grants, medium-sized projects and regular projects. The projects are dispersed through implementing agencies (IAs), which are the World Bank (WB), the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP). Projects are generally developed within focal areas (see below). The GEF also funds enabling activities (grants for fulfilling reporting requirements of the Parties to the Conventions) and capacity building activities.

The GEF projects are funded through one of the following focal areas:

- Biodiversity (has concentrated on protected areas and specific ecosystems)
- Climate Change (mostly mitigation activities, although from 2004 on it will include adaptation projects)
- International Waters (includes rivers, lakes, aquifers, coastal and inland wetlands, and large marine ecosystems — LMEs)
- Ozone Depletion (reduction of methyl bromide in this phase)
- Persistent Organic Pollutants (POPs) (added in 2002, presently concentrating on capacity building and non-combustion disposal technologies)
- Land Degradation (added in 2002, although some eligible projects were previously covered in other focal areas).

In the case of the Biodiversity, Climate Change and International Waters focal areas, they are divided into a number of operational programs (Table 1). Table 1 lists the specific operational programs (OPs) within each of the focal areas. In addition to the focal areas, there is also the Multi-focal Area operational program (OP#12), which deals with integrated ecosystem management. Projects in this area often form part of initiatives to address issues of land degradation, climate change, conservation and sustainable use of biodiversity.

Table 1 Focal areas, their respective reference number (OP), the operational programs that exist within the focal areas, and the date of their approval by the GEF Council

Focal area	OP	Description of Operational	Date
Biodiversity	1	Arid and Semi-Arid Zone Ecosystems	1995
	2	Coastal, Marine, and Freshwater Ecosystems	1995
	3	Forest Ecosystems	1995
	4	Mountain Ecosystems	1995
	13	Conservation and Sustainable Use of Biological Diversity	2000
Climate Change[1]	5	Removal of Barriers to Energy Efficiency and Energy Conservation	1995
	6	Promoting the Adoption of Renewable Energy by Removing Barriers	1995
	7	Reducing the Long-Term Costs of Low Greenhouse Gas Emitting Energy Technologies	1995
	11	Promoting Environmentally Sustainable Transport	2001
International Waters	8	Waterbody-based Operational Program	1995
	9	Integrated Land and Water Multiple Focal Area	1995
	10	Contaminant-Based	1995
Multi-focal Area	12	Integrated Ecosystem Management	2000
Persistent Organic Pollutants	14	Draft elements of OP for reducing and eliminating the releases of POPs	Not yet approved
Land Degradation	15	Sustainable Land Management	2003

Sources: http://www.gefweb.org/operprog/outline.htm; http://gefweb.org/Documents/Council_Documents/council_documents.html; GEF Secretariat.

The GEF has a large portfolio of investments within each of the focal areas, and there are a growing number of projects that cut across the focal areas. Table 2 summarizes the portfolio of operations over the period 1991–2002, clearly illustrating the amount of funds that have been allocated to the longer-established portfolios of focal areas of global benefit, such as Biodiversity and Climate Change.

Table 2 Summary of GEF investments by focal area, 1991–2002

Focal area	GEF investments, US$ millions
Biodiversity	1485.8
Climate Change	1407.4
International Waters	550.8
Multi-focal Area (namely OP#12)	210.0
Persistent Organic Pollutants (POPs)	20.9
Ozone Depletion	169.9

Source: GEF Annual Report, 2002.
Note: No allocations are indicated for Land Degradation, as this focal area was approved in 2003. POPs allocation was mainly for enabling activities.

[1] From July 2004–07, projects under a Strategic Priority on Adaptation to Climate Change are being funded.

2.2 Cross-focal area approach — recognizing interlinkages

In the May 2000 Council Meeting, GEF proposed to develop strategic partnerships and programmatic approaches in Biodiversity, Climate Change and International Waters. This approach goes beyond stand-alone projects and aims to have a broader and longer-term impact. It may also support a phased approach to funding. There is also a move towards using strategic priorities within the focal areas, such as 'mainstreaming biodiversity into production systems', that cuts across the operational programs (GEF 2001b).

The GEF operations were organized into focal areas in order to respond to the guidance of the global environmental and regional conventions, and as a management tool. This method of organization is sometimes thought to hold the danger of compartmentalizing the operations into tightly defined focal areas; if so, this would indeed inhibit the emergence of operations that would be capable of addressing interlinkage issues. However, as discussed in the GEF's Operational Strategy in 1996 (GEF 1996), and in its report on land degradation and the GEF focal areas (GEF1999), there is, as a point of principle, no objection to projects that cross focal-area boundaries. All the implementing agencies have long recognized the importance of interlinkages, both positive and negative, in their operations. Efforts in operational work to allow for interlinkages between focal areas — for example between Climate Change and Biodiversity, or between Land Degradation and Biodiversity, or between POPs, International Waters, and Land Degradation — can be expected to lead to a richer, and more beneficial, portfolio of investments.

Although the present structure of the GEF's operational programs is oriented toward focal areas, the portfolio is continually evolving in response to guidance from the various conventions, namely UNFCCC, CBD, CCD, and more recently the Stockholm Convention. As regards International Waters, GEF support occurs under the umbrellas of numerous regional conventions, treaties, and agreements. All the operational programs of the GEF reflect the priorities of these conventions and form the basis of the evolution of the portfolio. Similarly, important influences on the evolution of portfolios are exerted by the reviews and post-evaluations of operations provided by the GEF Secretariat (GEF Sec), its implementing agencies, and the client countries; the Assessment Reports of the IPCC; the STAP reviews and workshops; and the external peer reviews and research. Since 2000, new operational programs have been introduced: Conservation and Sustainable Use of Biological Diversity (mainly agrobiodiversity — OP#13), Promoting Environmentally Sustainable Transport (OP#11), Draft elements of OP for reducing and eliminating the releases of POPs (OP#14), Integrated Ecosystem Management (OP#12), and Sustainable Land Management (OP#15). A new Strategic Priority on Adaptation to Climate Change has also been introduced, under which projects are funded from July 2004. Recent GEF activities[2] especially with regard to the Capacity Development Initiative (CDI) and National Capacity Self Assessments (NCSA) are designed to address interlinkages at the national level (UNDP 2003).

[2] GEF's Capacity Development Initiative (CDI) was launched in January 2000. The assessment phase of the CDI resulted in a series of regional assessment reports on the needs and priorities of countries and a proposed strategic framework for putting the resulting recommendations into effect. The National Capacity Self Assessments (NCSAs) are enabling activities involving multiple focal areas, including Biodiversity, Climate Change and Land Degradation. The National Adaptation Programme of Action (NAPA) focuses specifically on adaptation. Interlinkages, also referred to as 'cross-cutting environmental issues' are central to efforts under the NAPAs that are being developed and also in the NCSA.

These developments notwithstanding, dealing with interlinkage or cross-cutting issues is a complex and evolving subject, and poses new challenges for both the scientific research community and all the institutions that wish to develop an operational response. In the past, recognition of this challenge was the reason for introducing the operational program on Integrated Ecosystem Management (OP#12). STAP, in preparing this report, recognizes that the GEF has both the opportunity and the need to make further efforts to take interlinkages into account. Although it is recognized that much can be done under the existing operational programs and strategies, there may eventually need to be some institutional changes — as will be discussed further in sections 5 and 6 of this report. However, the GEF family will need to continue to strive to support inter-disciplinary operations that address both the threats and the opportunities provided by interlinkages. This will require a further evolution of its ongoing policies and institutional programs. This is, of course, not simply a task for the GEF and its implementing agencies; most of all it is a task for its client countries, where institutional arrangements can be a source of resistance to collaborative and cooperative efforts. However, the GEF family must press on, produce viable examples, and catalyze the broader vision within countries that the analysis of interlinkages requires.

3. Science behind interlinkages

Interlinkages are the cause-and-effect relationships that link many of the human activities (pressures or drivers of change), including climate change, land-use and land-cover change, and land and water degradation. Loss of biodiversity is often the outcome of these drivers of change. In some cases, the relationship between the drivers of change and the outcome can be direct (e.g. the effect of climatic extremes on land degradation) and in others indirect and complex (e.g. the effect of climate change on intensity and frequency of fires affecting land cover and thus land degradation, which can indirectly affect water bodies due to sediment flow). These linkages often manifest at one or more temporal and spatial scales with time lags, cumulative effects across a region, and thresholds adding to their complexity.

The scientific understanding of the interlinkages of relevance to the GEF focal areas is summarized in this section. Some linkages are comparatively well studied and/or assessed. For example, the links between climate change and biodiversity are well studied and have been assessed in various publications (see for example reports of the IPCC (2000, 2001ab, 2002) and Watson and Berghall (2003)), whereas the studies that look at the effects of human activities on water bodies are few. Thus, there is a lack of quantitative and, in many cases, qualitative information on the latter link.

To summarize our current understanding of the interlinkages, we have drawn mainly on the IPCC reports, including the full third assessment report of the IPCC Working Group II (IPCC 2001ab, individual chapters are not cited), the CBD report on biodiversity and climate change (Watson and Berghall 2003), Berry and Olson's (2001) report on land degradation prepared for the GEF, van Dam et al's (2003) paper on wetlands and climate change prepared for the Ramsar Convention, and Watson et al's (1998) report on general linkages that summarized the then understanding of interlinkages. The intergovernmental consultations on strengthening the scientific base of UNEP in January 2004 identified the need to assess and/or update the work on interlinkages (UNEP 2003), and UNEP is now considering how to address this need in relation to the design of its fourth Global Environment Outlook (GEO). This GEO could provide a more extensive update on interlinkages beyond the GEF focal areas and the scope of the present report. One other possible emerging effect that has not been considered in this report is the effect of the introduction of genetically modified organisms into production systems. This will hopefully be addressed by the International Assessment of Agricultural Science and Technology for Development (which also includes a GEF-targeted research project).

We have categorized the linkages into four types, and summarized them in subsequent subsections:

- key (or strongest) linkages
- intermediate linkages
- weak linkages
- multiple-way interactions.

3.1 Key linkages

Among the key interlinkages, the strongest, and thus the most important ones, are (illustrated in dark blue or thick bold lines in Figure 1):

1. **Climate change and biodiversity**. Climate change and climate variability has affected, and is projected to continue to affect, individuals, populations, species and ecosystem composition and function. Climate change affects biodiversity both directly (e.g. through increases in temperature and changes in precipitation and, in the case of aquatic systems, changes in water temperature, sea level, etc.) and indirectly (e.g. through changing the intensity and frequency of disturbances such as wildfires). The impacts of climate change will depend on other significant processes, such as habitat loss and fragmentation (or unification; for example, previously isolated water bodies in landscapes), and the introduction of non-native species (especially invasive species). More details about the effect of climate change on biodiversity are summarized in Box 1.
2. **Climate change and land degradation.** Climate change affects land degradation through changes in vegetation and soils, and through changes to the hydrological cycle. However, climate change also alters farming and grazing systems, particularly in the arid, semi-arid and sub-humid areas, as a response to higher rainfall variability, and to changes in the frequency and intensity of droughts and floods. The response can include shortening of fallow periods, extension of cropping into marginal rangelands, and increases in irrigated cropping. Thus, the interactions between climate change and farming practices can further exacerbate land degradation.
3. **Climate change and water degradation.** Climate change can intensify the global hydrological cycle and can have major impacts on regional water resources, affecting both the surface and groundwater supply for domestic and industrial uses, irrigation, hydropower generation, navigation, in-stream ecosystems and water-based recreation. The variability of the hydroperiod (through changes in frequency and intensity of precipitation) and changes to the frequency and intensity of extreme events (e.g. floods and droughts) can affect water bodies and their biodiversity. However, other variables related to climate may play important roles in determining regional and local impacts on water degradation, including increased temperature and altered evapotranspiration, altered biogeochemistry, altered amounts and patterns of suspended sediment loadings, fire, oxidation of organic sediments, and the physical effects of wave energy. Increased frequencies and intensities of some extreme weather events, such as floods and droughts, have already been observed and are likely to increase with further warming, thus affecting water flows and quality, and increasing the risk of invasive species. Many coastal areas are expected to experience increased levels of flooding, accelerated erosion, degradation of coral reefs (e.g. due to increased sea water temperatures and increased atmospheric concentration of CO_2, and due to changes in water quality) and mangroves, and seawater intrusion into freshwater sources as a result of climate change. Migratory and resident animals such as birds and fish may lose important coastal staging, feeding and breeding grounds, and this loss can in turn affect the size of the populations of these species. Sea level rise may affect a range of freshwater wetlands in low-lying regions. Thus climate change is likely to affect water-based systems directly and indirectly (see Table 3 for specific examples).

4. **Land degradation and biodiversity**. Land degradation affects biodiversity both directly and indirectly. In terrestrial land systems, physical and chemical processes of land degradation can destroy soil biota (earthworms, rhizobia, mycorrhizae) and alter and/or reduce vegetative cover. In aquatic and coastal systems, land degradation can affect the sediment flow and can thus indirectly affect the biodiversity of these systems, especially of coral reefs, mangroves and sea grasses. In some cases, this effect is exacerbated by the pollutants, including POPs, that might be absorbed to soil particles. There are also further feedbacks. For example, decreased productivity on farmlands due to land degradation can force farmers to clear additional areas of natural habitats to maintain production, while changes in biodiversity (e.g. introduction of exotic species, or of species that become invasive) can contribute to further land degradation (in Figure 1, illustrated as green arrow).
5. ***Water degradation and biodiversity***. Water resource management practices, for example water withdrawals and the re-routing of inflows, affect biodiversity and the productivity of lands (especially agricultural) and watersheds. Water degradation (pollution, siltation, canalization and water abstraction) adversely affects biodiversity by changing the ecological conditions, such as flow regimes and turbidity, under which species have evolved. Water degradation often makes environmental conditions more hospitable for tolerant or aggressive invasive aquatic species (including in marine and coastal waters), which then competitively displace or prey on native species. Eutrophication of water bodies (freshwater and coastal rivers, lakes, reservoirs, coastal and inland seas) adversely affects their biodiversity, and fisheries. The worldwide decrease of marine and coastal biodiversity, especially many fish species, as a result of economic activities (overfishing, mining and the subsequent pollution or degradation) in large marine ecosystems and coastal areas is of special concern and leads to degradation of marine and coastal ecosystems.

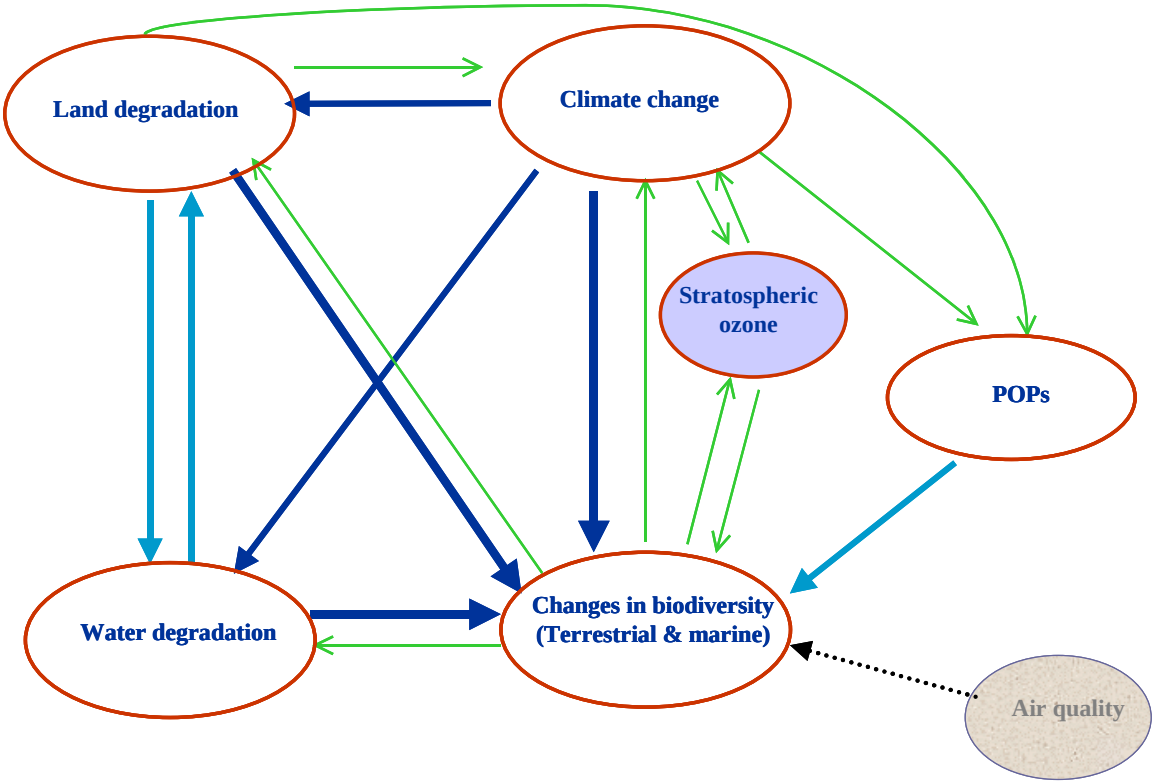


Figure 1: Interlinkages between environmental issues of interest to the GEF. The thickness of arrows, as well as the color, indicates current understanding of the strength of the linkages. The dark blue arrows indicate the strongest links, the lighter blue arrows the intermediate-strength links, and the light green arrows the least strong links. Air quality, although not a direct area of interest to GEF, is included here to illustrate the local effect it can have, especially on biodiversity, through for example acid rain, heavy-metal pollution, etc. Climate change largely acts on the other areas of interest (arrows flowing out), whereas biodiversity is affected by these other factors (arrows flowing in).

Box 1: Summary of the effect of climate change on biodiversity

These conclusions are extracted from the IPCC (2001b, 2002) and the CBD (Watson and Berghall 2003) reports on the interactions between biodiversity and climate change.

- Human activities have already resulted in loss of biodiversity, with the rate and magnitude of species extinction far exceeding normal background extinction rates. The rate and magnitude of climate change induced by increased greenhouse gas emissions has affected, and will continue to affect, biodiversity, either directly or in combination with other drivers (which might even be outweighed by climate change in the future).
- Species will be affected differently by climate change, and will migrate at different rates through fragmented landscapes; however, ecosystems dominated by long-lived species (e.g. long-lived trees) will often be slow to show evidence of change. Thus, the composition of most current ecological communities is likely to change, as species that make up an ecological community now are unlikely to shift together in the future. This will disrupt established ecological communities and create new assemblages of species that may be less diverse and include more 'weedy' species (i.e. those that are highly mobile and can establish quickly).
- The most rapid changes are expected where ecosystems are affected by changes in natural and anthropogenic non-climatic disturbance patterns.
- Changes in the frequency, intensity, extent, and location of disturbances will affect whether, how, and at which rate, the existing ecosystems will be replaced by new plant and animal assemblages. Disturbances can increase the rate of species loss and create opportunities for the establishment of new species.
- The impact of sea-level rise on coastal ecosystems (e.g. mangrove or coastal wetlands, seagrasses) will vary regionally and will depend on erosion processes from the sea, and on depositional processes from the land. Some mangroves in low-island coastal regions where sedimentation loads are high and erosion processes are low may not be particularly vulnerable to sea-level rise.
- El Niño events already affect many terrestrial and marine systems. Changes in frequency and intensity of El-Niño-like events will continue to affect the productivity of these systems, including changing the upwelling of marine systems and causing large changes in the food chains of these systems.
- Species with limited climatic ranges and/or restricted habitat requirements and/or small populations are typically the most vulnerable to extinction. Such species include the endemic mountain species and the biota that are restricted to islands (e.g. birds, invertebrates), species restricted and specialized to some bioclimatic regions (e.g. the Cape region), or coastal areas (e.g. mangroves, coastal wetlands, and coral reefs). In contrast, species with extensive, non-patchy ranges, long-range dispersal mechanisms, and large populations are at less risk of extinction. While there is little evidence to suggest that climate change will slow species losses, there is evidence it may increase species losses. In some regions there may be an increase in local biodiversity, usually as a result of species introductions — the long-term consequences of which are hard to foresee.
- Where significant ecosystem disruption occurs (e.g. the loss of a dominant species or a high proportion of species — thus much of the redundancy), there may be losses in net ecosystem productivity (at least during the transition period). However, in many cases, loss of biodiversity from diverse and extensive ecosystems due to climate change does not necessarily imply loss of productivity, as there is a degree of redundancy in most ecosystems. The contribution to production by a species that is lost from an ecosystem may be replaced by another species. Globally, the impacts of climate change on biodiversity, and the subsequent effects on productivity, have not been estimated.

3.2 Intermediate linkages

Linkages considered to be of intermediate importance (light blue arrows in Figure 1) include:

- **The effect of land degradation on water bodies and vice versa.** Land degradation can disrupt the hydrological cycle and soil structure, leading to a decline in productivity and an undermining of food security, while accentuating poverty and social instability. Land degradation, through sedimentation, agrochemical pollution and flooding can reduce the productivity of transboundary aquatic systems. Although these consequences are well known qualitatively, the challenge of how to quantify these impacts and their feedback interactions on land-use systems remains. Apart from these direct effects, land degradation can also have a negative impact on water-related initiatives such as hydroelectric power generation, supply of potable water, and irrigation systems, through changing the quantity, quality and timing of water flow.
- **The effect of POPs on biodiversity**. The widespread and extensive effects of POPs on biodiversity are becoming apparent. POPs have been implicated in major adverse impacts on animals at the genetic, population, species and community/ecosystem level. Impacts include endocrine disruption, reduced disease resistance, reduced fertility rates, increased tumor incidence, and declines in population sizes (including outbreaks of mass mortalities, see also Box 2). Due to biodiversity being affected by POPs at very low concentrations and through bioaccumulation, the long-lasting effect of POPs on biodiversity is not fully known.

3.3 Weak linkages

There are also weaker linkages that can nevertheless be important. These include:

- the effect of land degradation and biodiversity on climate change through changes in albedo and a potential decrease in carbon sequestration from land-based activities
- the effect of land degradation on POPs through the release of POPs in contaminated soils
- the effect of changes in biodiversity on land degradation, e.g. through the establishment of invasive and exotic species increasing the demand for land and thus the use of marginal land (see point 4 in section 3.1 above)
- the effect of stratospheric ozone depletion on climate and vice-versa (see Box 3)
- the effect of changes in climate on POPs, e.g. changes in the ocean circulation can change the distribution of POPs in the marine systems
- the effect of stratospheric ozone depletion on biodiversity, due to increased UV-B exposure. Potential consequences of the effects of elevated UV-B on marine ecosystems include a decrease in marine phytoplankton productivity, and thus a reduced uptake of atmospheric CO_2 and a reduction in the ocean component of the carbon sink or biological pump.

Box 2: Persistent organic pollutants (POPs) and their effect on biodiversity

Exposure to POPs, especially during critical periods of life, can alter the immune system of birds and mammals; induce abnormal thyroid function in fish, mollusks and mammals; decrease fertility rates in many animal species; and also cause disruptions in the sex characteristics of the individual animals (masculinization of females and feminization of males), thus altering the sex ratios of the population as well as the population size. Organochlorine compounds such as DDTs, PCB, dioxins etc. can mimic sex hormones and decrease the quality of semen. These compounds can increase incidences of testicular, prostate and breast cancer, and thus impair the reproductive capabilities of the affected animal.

The known transport pathways for POPs include ocean currents and animal migrations, run-off into surface waters, and leaching through soils into sub-surface waters, and through the atmosphere. In densely populated coastal zones, POPs are concentrated in the surface micro layer of seawater due to the run-off of pollution from land. POPs are also easily transferred into the atmosphere through the formation of aerosols. Recent studies indicate that the volume of marine aerosol-borne POPs in coastal megapolises is higher than aerosol-borne POPs in continental areas. From the available scientific information, it is known that all such water bodies in the world are now polluted by all 12 POPs that have been earmarked by the Stockholm Convention as pollutants for which immediate action and remedial measures against their contamination is needed.

There is growing evidence that biota in remote regions of the globe are adversely affected by POPs, even when there are no major sources of these compounds within a thousand kilometers. For example, POPs have been detected in the eggs and body tissues of penguins of the Antarctic region and in polar bears of the Arctic region. This detection raises concern that POPs are harming many resident polar species (including marine plankton, algae, mammals and birds), as well as migratory species, that spend part of their lives at the poles and part in other regions, including the tropics.

The persistence and highly bioaccumulative nature of POPs increases the serious threat they pose to biodiversity. Further increases in the levels of POPs and allied chemicals could exacerbate the problem by weakening the conditions of several species of animals that are already under threat due to other reasons. In particular, species already under stress due to climate change and habitat destruction may easily fall prey to an increase in POP levels in their ambient environment. Aquatic animals, especially those occurring in coastal waters, are at high risk of population reduction and species extinction, because seas and oceans are our planet's final recipients and reservoirs of POPs.

Changes in the occurrence of vector diseases (e.g. malaria) may induce some countries to use some of the 'dirty dozen[3]' to minimize the occurrence of the vector and reduce the impact of the disease on human health, but could increase the concentration of POPs in the environment. The same could apply to changes in the occurrence of pests of crops as a response to climate change.

[3] The dirty dozen fall into three categories: pesticides, industrial chemicals, and unintended by-products of combustion and industrial processes. They are: aldrin, chlordane, DDT, dieldrin, dioxin, endrin, furans, heptachlor, hexachlorobenzene, mirex, polychlorinated biphenyls (PCBs), and toxaphene (source: http://www.chem.unep.ch/pops).

3.4 Multiple-way interactions between environmental issues

Apart from the two-way interactions mentioned above, there are also multiple-way interactions (e.g. biodiversity, land degradation and climate change) and emerging drivers of change, such as invasive species. These can be summarized as follows in relation to the focal areas of the GEF:

- ***Land degradation, biodiversity, international waters, climate change and POPs***. Land degradation involves soil loss; loss of biodiversity and productivity of the area (including agricultural and forest); loss of vegetation cover, and thus of carbon stocks, as well as a reduction in the carbon sequestration capacity of the land; disruption of the hydrological cycle, including increased surface run-off which can carry POPs and other pollutants, cause damage to investments in the watersheds and downstream areas; and changes in the micro-climate. Restoration of degraded lands, for example through afforestation, reforestation, agroforestry and related projects, can have appreciable benefits. It can reduce land degradation, have a positive influence on the condition of international waters, the biodiversity and the livelihoods of the regions (both within and beyond the project areas), and would also be beneficial for climate change mitigation and adaptation. Sustainable management of watersheds can be beneficial to both surface and groundwater resources in transboundary areas.
- ***Climate change, biodiversity and land degradation***. Climate change and climate variability affect biodiversity (at genetic, species and ecosystem level), land degradation, hydrological cycles, and thus surface, ground and international waters. Projects aimed at land-based mitigation activities and adaptation will therefore be beneficial to other focal areas (see also Vorosmarty et al 2000).
- ***Biodiversity, land degradation and international waters***. Biodiversity is vulnerable to climate change, land degradation and also to POPs. Policies and projects for the protection of biodiversity itself are also crucial to other focal areas. For example, they can benefit adaptation to climate change, and the restoration of degraded lands, watersheds and groundwater resources. Conservation and sustainable-use policies are also fundamental for protecting the earth's gene pool, and for providing many of the services that humans depend on for their wellbeing, e.g. food, clean water and medicines.
- ***POPs, biodiversity, land degradation and international waters***. POPs have major impacts on biodiversity, on human health, and on our capacity to sustain the productivity of land and water. In animals, which are already under stress by other factors such as infectious diseases (e.g. seals), the immunosuppressive actions of POPs can enhance the severity of diseases, and thus affect biodiversity. Large stockpiles and continued usage of POPs (including 'the dirty dozen') in certain parts of the world add to the extent of land degradation and reduce the groundwater quality of local areas. In areas that share common international waters (e.g. Mediterranean Sea, Mekong river delta), POPs used in one of the countries may severely affect or damage the biodiversity of the surrounding regions.

Table 3 Projected impacts from climate change on some key water-based systems and water resources under temperature and precipitation changes approximating those of the IPCC Special report on Emission Scenarios (SRES)

Variable	Projected impacts by the end of 21st century
Coral reefs	extensive coral death due to increased sea surface temperatures (interacting with local pollution) reduced species biodiversity and fish yields from reefs
Coastal wetlands and shorelines	extensive loss of coastal wetlands and erosion of shorelines
Ice environments	retreat of glaciers, decrease sea-ice extent, thawing of some permafrost, longer ice-free seasons on rivers and lakes by 2025 extensive reduction in Arctic sea ice, benefiting shipping but harming wildlife (e.g. seals, polar bears, walrus) ground subsidence, leading to changes in some ecosystems and substantial loss of ice volume from glaciers, particularly tropical glaciers
Water supply	shifts in peak river flow from spring toward winter in basins where snowfall is an important source of water by 2025 decreases in water supplies in many water-stressed countries, increases in some other water-stressed countries
Water quality	degradation in water quality due to higher temperatures changes in water quality because of changes in water flow volume increases in salt-water intrusions into coastal aquifers due to sea level rises
Water demand	increases in demands for irrigation as temperatures increase
Floods and droughts	increases in flood damage (several-fold higher) than under a 'no climate change' scenario further increases in drought events and their impacts

Source: modified from IPCC (2001) and van Dam et al. (2002)

Box 3: Links between stratospheric ozone depletion and climate change

Stratospheric ozone depletion and climate change are linked, but stratospheric ozone depletion is not a major cause of climate change. Many of the gases (e.g. the chlorofluorocarbons — CFCs, and the hydrocholorofluorocarbons — HCFCs) that affect the ozone layer are also greenhouse gases. Use of hydrofluorocarbons (HFCs) and HCFCs as substitutes for CFCs would cause the greenhouse-warming contributions of these new compounds to increase. Global observations of many HFCs and HCFCs, as well as of hydrogen fluoride (HF), confirm that these contributions are currently increasing. Reductions in emissions of HFCs can be part of the solution to climate change, and they are seen as a desirable alternative to ozone-depleting substances, in particular, HFCs are the preferred alternative to CFCs in industrial processes and products. HFCs and CFCs are to be phased out by 2040 and 2010, respectively, in developing countries. The Multilateral Fund under GEF will not pay for the phase-out of HCFCs, leaving developing countries with no incentives to do so, even when there are many possibilities to 'leapfrog' from HCFCs (over HFCs) to new technologies that would protect the ozone layer and not have an adverse effect on climate change.

4. Examination of GEF projects for inclusion of interlinkages

We have already highlighted that the GEF in its focal areas, operational programs and strategic priorities, has recently moved towards recognizing some interlinkages, e.g. in the Land Degradation focal area, the Multi-focal Area operational program (OP#12), the Strategic Priority on Mainstreaming Biodiversity and the Strategic Priority on Adaptation to Climate Change. Further, many projects in the International Waters focal area take an integrated approach to addressing interlinkages.

In this section we present a preliminary analysis of projects and assess if the recognition of interlinkages is reflected in recent project design and implementation. We accept that this is an historical analysis, that it is preliminary, and that further analyses of this type would have to be done should the GEF need more insights from past experiences.

In March 2004, we downloaded 119 GEF pipeline entry projects from the GEF website that could potentially address interlinkages. These included projects within the Biodiversity, International Waters, and Land Degradation focal areas and in OP#12. The Climate Change focal area was excluded, as most of its projects were dealing with non-land-based mitigation activities, and were not considered to need to address interlinkages. For the 119 projects, given the importance of some linkages, we looked specifically at linkages between the following:

- biodiversity and climate change
- biodiversity and land degradation
- international waters and climate change

Interlinkages were mentioned in only about one-fifth of the projects; for example, in the 'background' section of the project, climate change was mentioned as one of the factors that affects the project area, or in the 'links to other projects' section, there was a list of projects that dealt with climate change. Only 9 projects out of the 119 proposed to use interlinkages in their design, e.g. by assessing the impacts of climate change and variability on biodiversity, on protected areas, or on international waters.

The analysis of the pipeline entry projects posed some problems. The projects included those that were first developed in mid to late 1990s; those that made little or no progress, but were left there; projects that were still concept notes, etc. Given that interlinkages may not have been a priority until recently, we subsequently decided to concentrate on an analysis of the 'recent' pipeline entries. Of the recent pipeline entries of March 2004, there were 12 projects in the Biodiversity focal area, 2 in International Waters focal area and 8 in the recently approved Land Degradation focal area under OP#15. Of the 12 projects in the Biodiversity focal area, 8 incorporated climate change in the project design, while our analysis of the documents and the aims of the project suggested they should all have included it. Of the two projects in the International Waters focal area, neither had included climate change, while the project aims clearly suggested that climate change was relevant. Of the projects in the Land Degradation focal area, five of the eight projects in OP#15 proposed to incorporate climate change in their project design, despite the emphasis of the projects being on carbon storage (two mentioned climate change). However, our analysis suggested they should all have incorporated the actual and potential effects of climate change on the project area.

Clearly, there are differences in the way interlinkages are being addressed in the focal areas, with focal areas such as Land Degradation and Biodiversity mostly recognizing and including the effects of climate change and the potential benefits from carbon storage, while others are less inclined to do so. This inclusion of interlinkages in projects in the Land Degradation focal area may in fact have been partly a result of a review carried out by Berry and Olson (2001, see also Box 4).

Thus, overall, despite the emerging recognition of these linkages, recent project documents do not reveal evidence of a systematic approach to explicitly incorporate interlinkages in project design.

Box 4: Incorporation of interlinkages in projects in the Land Degradation focal area

Prior to October 2002, when land degradation was designated as a focal area, land degradation issues were not directly addressed as the primary focus of intervention of GEF projects, but were only indirectly included in programs, as they affected other focal areas of Biodiversity, International Waters and Climate Change. Berry and Olson (2001) reviewed 103 projects that had linkages with land degradation and found that only 39 of these projects had strong land degradation linkages. Of these, 27 (69%) were in the Biodiversity focal area, 6 were in International Waters focal area, and 6 in the Climate Change focal area. However, further analysis of these projects revealed that the linkages that provided the *raison d'être* for these projects did not reflect the full range of possible links between land degradation and the other focal areas, and that, in some cases, the linkages were not consistently established because:

- Project activities were mainly based on focal area priorities, rather than on linkage activities that explore the relationships between land degradation and the other focal areas. For instance, of the 27 projects with land degradation linkages in the Biodiversity focal area, 77% were located in or near protected areas where land degradation is not usually a major concern, leading to project activities of importance to biodiversity, but not necessarily addressing significant land degradation problems. Similarly, the primary focus of most of projects in the International Waters focal area was on institutional and water pollution issues, rather than on land degradation mitigation through flood and catchment management activities.
- There were problems in defining an appropriate baseline against which to measure the incremental costs of land degradation control activities, due to the multiple benefits — at local and global levels — that such activities generate. These problems also hampered the establishment of strong linkages in projects. The issue of how to estimate the incremental costs of projects involving many interlinkages remains an important topic that needs to be examined.

Overall, linkages between land degradation and the other focal areas were strongest in those projects where land degradation was identified as a central part of the problem early in the design phase. Conversely, when land degradation was not initially perceived as a threat to the focal areas, the land degradation linkages were poorly addressed.

5. Conceptual interlinkages design tool

From our preliminary analysis, it is clear that there is a need for a systematic approach to include the linkages between the environmental issues. In this section, we present a design tool, a tool to help project developers working in the different focal areas to conceptually take these linkages into account. We first provide our approach in developing the design tool, and then its conceptual application to the major project types that the GEF funds. While the design tool is a device to help focal areas identify what to do, it is not a tool that shows them how to do it — an equally important issue that we hope will be addressed within the GEF family sometime in the near future and be an extension of this work.

Some of the focal areas or operational programs of the GEF are considered to be environmental issues or drivers of change, such as Climate Change, Land Degradation and Ozone Depletion, whereas others are not. For example, if the Biodiversity focal area is seen to be the common use of biological diversity, then it can be a service (biodiversity underlying the goods and services that humans depend on), whilst ‘changes in biodiversity' can be viewed as a consequence of other drivers of change (e.g. climate change, land degradation and POPs) and in turn be driver for other focal areas (e.g. Land Degradation). The International Waters focal area is also complex in the sense that it includes biodiversity as well as hydrological processes (quantity, seasonality and quality), and affects water bodies across political boundaries. We first discuss how we moved from the scientific understanding of the linkages between the drivers of change to dealing with the complex and varied nature of the focal areas within the GEF. We then summarize the major types of projects that are currently funded by the GEF, and subsequently describe how interlinkages could in the future be better incorporated.

5.1 Approach taken in developing the interlinkages design tool

In section 3 we summarized the strength of interactions between the various environmental issues. However, the GEF focal areas do not map directly onto these environmental issues. We therefore saw a need to identify the general frequency and types of projects funded by the GEF and their potential impacts on other focal areas. The effect of projects funded by GEF in each of the focal areas on other focal areas is illustrated in Figure 2.

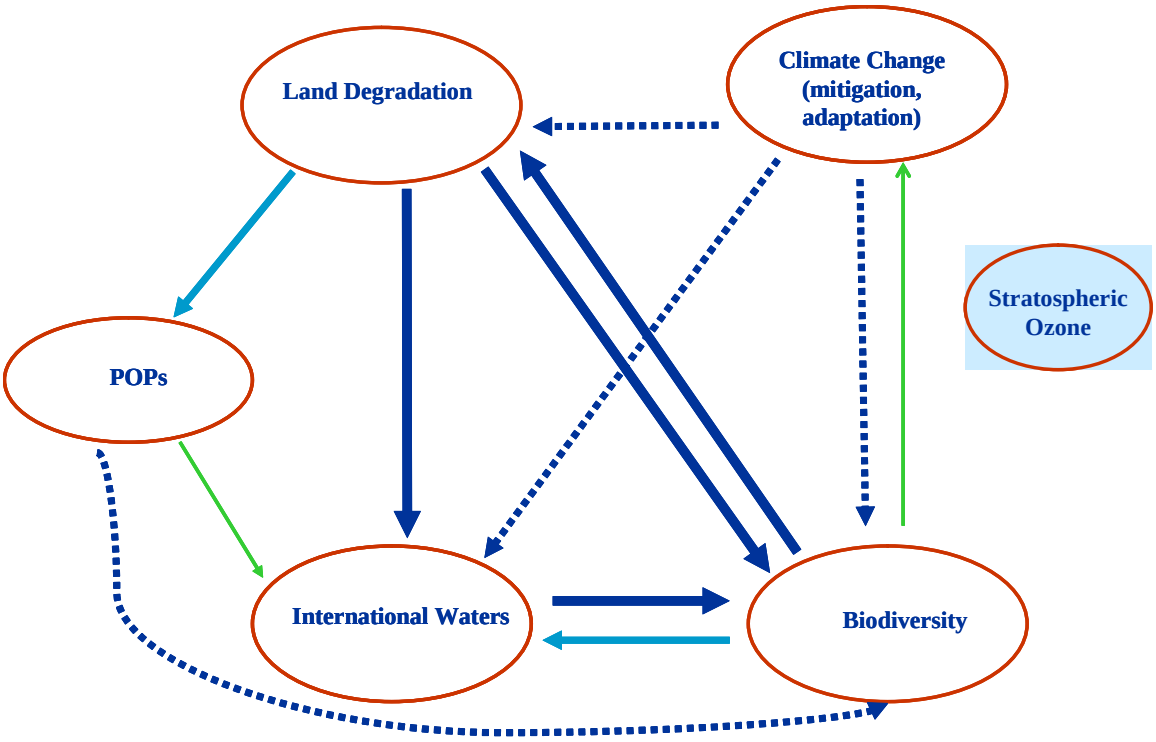


Figure 2: Effects of the activities of one GEF focal area on another. The arrows represent the potential impacts (positive and negative) of activities of projects in one GEF focal area on other focal areas. The importance of the impact is illustrated by the following thickness and color code of the arrows: very important (thick dark blue); important (lighter blue), less important (thin, light green). The solid and the dashed arrows represent direct and indirect actions taken as part of projects, respectively. Direct actions (full arrows) imply that GEF activities take the interlinkages that exist between focal areas into account and do not add to the existing pressures, e.g. activities in the Biodiversity focal area would be aimed to minimize or avoid further land degradation. The dashed arrows indicate adaptation, which, broadly speaking, can be actions to reduce the impact of climate change and is addressed in the new strategic priority on adaptation.

There are some marked differences between interlinkages that exist between the environmental issues (or drivers of change) depicted in Figure 1 (climate change, changes in biodiversity, land and water degradation, stratospheric ozone depletion and POPs) and those between the corresponding focal areas of the GEF. For example, climate change can have strong effects on biodiversity (represented by a thick bold arrow in Figure 1), but in terms of the GEF activities there is only a weak linkage (represented by a dashed arrow in Figure 2), as many of the projects funded in the Climate Change focal area address mitigation and only a small component of these (mostly OP#12 and, more recently, OP#15 address land-based mitigation activities and the recently introduced Strategic Priority on Adaptation) affect the objectives of the Biodiversity focal area. In contrast, in Figure 2 many of the projects in the Biodiversity focal area address the need for reducing land degradation or restoring degraded lands. Hence the interactions between the Land Degradation and Biodiversity focal areas are represented by a strong interaction (thick bold arrow) in Figure 2, while there is only a weaker interaction between the corresponding environmental issues (reflecting the scientific understanding), which is shown weak linkage (thin green arrow) in Figure 1. Similarly, many of the projects in the Land Degradation focal area are designed to reduce the sediment flows to International Waters, hence the link is illustrated as a strong one in Figure 2, but as an intermediate linkage for the corresponding environmental issues in Figure 1.

We subsequently examined a range of projects that are funded by GEF within the focal areas, operational programs and strategic priorities. From our examination, we developed a list of broad types of interventions (irrespective of focal areas that are frequently used by the GEF):

1. protected areas — terrestrial and coastal; see section 5.3.1
2. ecosystem management — arid and semi-arid areas, managed forests, inland wetlands; see section 5.3.2
3. mitigation options: renewable energy — micro hydrodams, biofuels, solar, wind; see section 5.3.3
4. international waters — management of freshwater basins, large marine ecosystems (LMEs); see section 5.3.4

These four main types of interventions incorporate mainly regular projects, including those considered to be targeted research. They exclude capacity building and enabling activities.

In addition, some projects can, by their nature, have positive impacts on other focal areas and have no obvious negative ones. These include:

- adaptation to climate change (see Box 5)
- mainstreaming biodiversity into production landscapes and seascapes (see Box 6)
- energy efficiency and urban transport (barrier removal, reducing emissions from the transport sector (see Box 7)
- demonstration projects in international waters, dealing with environmentally friendly and innovative practices and technologies (see Box 8)
- POPs — stockpile disposal and vector control (see Box 9).

5.2 Description of the interlinkages design tool

Our conceptual design tool is analogous to assessing the risk of a given project on other focal areas, i.e. projects can be assessed as having negative, positive or neutral effects on the goals of other focal areas. The tool is not intended to be comprehensive. Its main intention is to encourage interdisciplinary analysis of interlinkage effects. The conceptual design tool incorporates some of the components included in environmental impact assessment. However, the appropriate wider tool that may be of relevance is strategic environmental assessment (SEA — see also Box 10). SEA would allow client countries (or regions) to address multiple environmental issues in their development plans — the main goal of the interlinkages tool, but at the project level. Realistically, this is a long-term process given that very few countries have attempted to carry out a strategic environmental assessment.

The conceptual design tool consists of a series of questions that the project developers can use as a guide. The questions in the checklists have to be seen as being indicative rather than exhaustive. If the response to each question is positive, it means that the project design addresses the relevant issues that deal with interlinkages, that the project is less likely to have negative impacts on other focal areas, and is able to maximize the positive impacts.

The basic questions are:

- Has the project design taken into account potential interlinkages specifically addressing means of minimizing the negative effects and maximizing the positive impacts on other focal areas?

- What trade-offs, if any, are necessary? (In many cases there will obviously be some trade-offs that would need to be considered when project developers take account of interlinkages. Many of these trade-offs will be social issues, such as the needs of the indigenous and local peoples within protected areas, and would need to be given careful considerations).

During the development of the design tool and its application to the major types of projects, it appeared that projects that aim to integrate ecosystem management with poverty alleviation are often 'win-win' situations for all focal areas and deliver global and local benefits (see subsequent subsections which illustrate project types that have few or no negative effects). Some projects can include the use of tools such as climate and land-use scenarios as a way to minimize the potential negative impacts on other focal areas. We recognize that addressing the potential negative impacts is not easy, especially at the local or regional level and there is a need for developing pilot projects or program to fill in this knowledge gap. In such cases, pilot projects can be set up to incorporate strategic environmental assessment and adaptive management and focus on regional planning to address interlinkages (see Box 10).

In the next sub-section, we apply the interlinkages design tool to the four broad intervention types we identified in section 5.1.

Box 5: Adaptation to climate change

The general conclusion on adaptation is that it is most likely to be successful when incorporated into development plans and when responses to current climate variability and extremes are incorporated (IPCC 2001ab, 2002, Burton and van Aalst 2004). Thus many of the adaptation responses can be considered to be no-regrets options.

At the international level, there is consensus on the need for addressing adaptation rather than just mitigation, as shown by the UNFCCC COP7 and subsequent COP discussions. In 2003, the GEF Council approved a new Strategic Priority on Adaptation (SPA) to reflect this change. The SPA has become operational in July 2004 and has been allocated US$50M over three years (2004–07). Adaptation is thus a new area upon which the GEF will focus — as GEF projects within the Climate Change focal area concentrated on mitigation in the past.

Projects under this SPA have their own operational guideline (see GEF 2004). The SPA aims to provide systematic learning for adaptation projects. It has to address climate change impacts and vulnerability. The SPA, by its nature, will provide the GEF with a new opportunity to deal with interlinkages. Adaptation to climate change will also be included as an interlinkage issue for projects in other focal areas, especially within the Biodiversity, Land Degradation and International Waters focal areas. In many cases, the only adaptation option that could be available to these projects may well be removing non-climate related pressures, e.g. decreasing pollution and run-off into coral reef systems. Other activities that could be considered as suitable to address adaptation in projects include:

- developing a multi-stakeholder management approach
- incorporating adaptive management to include monitoring of the systems
- providing alternative and sustainable livelihoods for local communities
- creating institutions for management of the systems
- removing perverse incentives for marine and land systems
- including local and/or indigenous peoples in co-management.

Box 6: Mainstreaming biodiversity into production landscapes and seascapes

The Strategic Priority on Mainstreaming Biodiversity is very general. There are a range of activities that can be included under this strategic priority. For example, it can include activities that aim to change the tilling of agricultural crops, or to introduce intercropping to achieve more efficient use of resources. If the mainstreaming ensures an efficient management of resources, more sensitive planning of production activities will result in reduced impacts on soils and vegetation, reduced use and spread of fertilizers, and maintenance of wetland revenue and aquatic habitat. Aspects that can be considered to ensure maximizing global benefits from projects under this strategic priority include:

- addressing resource-use policies that create potential barriers to sustainable use
- incorporating biodiversity conservation into local, regional and national-scale land-use planning
- identifying and involving the key decision makers and stakeholders in the various resource-use and management sectors during project development
- developing effective partnerships to achieve conservation and sustainable landscape management objectives
- assessing capacity, and if necessary developing it, to meet the objectives of conservation and sustainable-use planning and landscape management.

Box 7: Energy efficiency and urban transport

These two intervention types are by and large positive for other focal areas. They reduce pressures on natural resources, but also make renewable energy projects (OP#6 and OP#7) more viable. The same applies to the transport operational program (OP#11). Interlinkage effects also apply to the policy and regulation side of projects for example in:

- energy efficiency and energy market regulation, where enlightened regulation is a force for efficiency; while efficiency, in turn, reduces pressures for new investment in expanding markets
- transport and land-use policies, where enlightened policies may reduce pressures on land use in urban and rural areas
- energy efficiency and transport, where reducing pollution has global and local benefits on both the local environment and on the health of local human populations.

Some activities that can be considered to maximize the synergies between focal areas include assessing the impact on land use, on biodiversity (terrestrial, marine and coastal), and on local people's livelihoods (e.g. through reduced pollution). To ensure that the synergies are maximized, projects under these operational programs should also include monitoring of the emissions (especially NOx, VOCs and particulates, as well as developing means to recycle the waste that could be generated by these projects.

Box 8: International Waters sectoral demonstration projects (OP#10)

Sectors within the International Waters focal area are considered to be shipping, municipal/agriculture/industrial pollution reduction, water use efficiency to address water scarcity/competition, tourism, and mining. The modality is to work in single or multiple countries in different regions. The projects are set up to demonstrate local success with environmentally friendly and innovative practices or technologies and to facilitate replication and sustainability of practices through institutional reforms in that country.

The benefits are many and arise from the reduced pollution in the water bodies, but also from the improved water management. There are also many socio-economic benefits, including improved food production through agriculture and aquaculture (where significant), and provision of freshwater, including cheaper irrigation pumping, reduced risk to human health due to reduction of pollution (e.g. mercury from mining) and possible increases in water availability.

Aspects that can be considered to maximize global benefits from the project include:

- willingness of governments to move beyond demonstration to actual reforms which are necessary to achieve larger-scale positive interlinkages and discourage negative ones
- planning for conservation and sustainable use of biodiversity in the catchment area of the waterbody
- incorporation of solid-waste management in the pollution control
- measuring greenhouse gas emissions from irrigated areas to ensure there is no net increase in their emissions
- incorporation of innovative and environmentally friendly technologies
- incorporation of public-private partnerships
- design of monitoring programs to evaluate the potential benefits.

Box 9: Benefits from removal and disposal of POPs stockpiles, and alternatives to vector control

The aims of the projects under the POPs draft operational program are:

- to remove and dispose of stockpiles of POPs, by non-polluting technologies (e.g. non-combustion technologies), to clean up contaminated soils by *in-situ* remediation, and to avoid further stockpile accumulation.
- to reduce the use of POPs as pesticides, especially in developing countries where they are still being used. This can be achieved by promoting various alternatives such as integrated vector control, provision of mosquito nets, biocontrol of vectors, education programs on the dangers of POPs and the available alternatives etc.

Projects, under both of the aims above, have already been undertaken in developing countries. There is still need for research to assess the various non-polluting technologies and the alternatives to POPs, although many are under way in both developing and developed countries.

POPs are endocrine disrupters and immunosupressors, and hence by banning or reducing their usage the stress on biodiversity and human health can be reduced. Under the Stockholm Convention for the control of POPs, exemptions were given to many developing countries for the use of some pesticides (like DDTs) for diseases control. Many of the POPs are still being manufactured and used globally. Since POPs are transportable via various media, to obtain maximum global benefits through the removal of POPs, projects under this OP should aim to remove discrepancies that can arise under the Stockholm Convention.

Box 10: Strategic environmental assessment and adaptive management for addressing interlinkages

The GEF could focus its attention on promoting pilot projects oriented toward sustainable regional development, especially given its recent move towards programmatic approach. These pilot projects could be developed to represent different ecosystems and, specifically include interlinkages that arise from land-use and land-cover change (including deforestation), the resulting loss in biodiversity, land degradation, decreased water availability, and climate change. The pilot project design would also take into consideration benefits for local populations.

We propose the following step-wise approach, which is a modification of the state-pressures-impacts-response framework embedded in an adaptive management framework thus providing a direct way of learning-by-doing. A complete analysis of the pilot projects would provide a portfolio and regional-wide lessons learnt and global benefits. It draws heavily on the need to develop a strategic environmental assessment. The steps are:

- Identify high-biodiversity priority regions which are at high risk from land-use and land-cover change due to economic pressures, population change (including demographic change) and technological change (Reyers 2004, references therein provide examples of such an approach).
- Identify the overall conservation and development goals through the development of a strategic environmental assessment (SEA) that allows long-term land-use plans, including conservation and sustainable use of biodiversity, and meets national sustainable development goals.

The SEA would include:

a) identification of actions or responses (including those to drivers of change such as climate change, invasive species, and land-use and land-cover changes).
b) Promote inter-sector institutional coordination and social participation policies.
c) Promote institutional and regulatory frameworks that remove perverse incentives (e.g. subsidies for non-sustainable forest management practices) and thus enhance environmental, social and economic outcomes.
d) Promote the development of methodologies for baseline determination, the definition of baselines, and strategies to set regional benchmarks.
e) Monitor environmental, social and economic status with appropriate indicators.
f) Support networking between projects and institutions.
g) Develop methods and systems for valuation of and payment for environmental services (the recognition that landowners do not receive compensation for the environmental services that their land generates has to lead to the development of innovative payment systems).
h) Promote the development of markets, networks that link producers, technology and information.
i) Promote eco-labeling and certification of sustainable forest management that would provide information on the environmental impacts of producing each forest product, assist consumers in making informed decisions, and allow producers access to new markets.
j) Build technical, scientific and regulatory capacities for planning, management and implementation of strategies.

5.3 Application of the interlinkages design tool to intervention types and subtypes

The application of the design tool to each of the broad intervention types and subtypes will be different. In this section we illustrate how the interlinkages design tool can benefit the project development within each of the main intervention types. We look at the effect of a project in a particular intervention type on each of the focal areas: Biodiversity (BD), Climate Change (CC), Land Degradation (LD), International Waters (IW) and Persistent Organic Pollutants (POPs).

Within each of these examples, we present some of the questions or options that need to be considered during the project development, those that could minimize the negative effects on other focal areas, and those that could enhance or maintain the positive ones. Each of these examples is presented, where possible, as a one-page overview and can be used by project developers as a stand-alone example.

5.3.1 Establishment and management of protected areas

Sub-type: Conservation and sustainable use of terrestrial biodiversity

Primary goals:

- conservation and sustainable use of biodiversity
- maintenance of ecological processes and ecosystem services
- socio-economic benefits for local communities.

Positive effects on other focal areas	Negative effects on other focal areas
CC Increased carbon storage, if previously overexploited habitats are restored. Existing carbon storage maintained. ***LD*** Decreased soil loss, reduced chemical degradation, improved water retention and stream flow, if ecosystem restoration is included. ***IW*** Stabilized run-off and reduced flooding, if protected areas adjoin transboundary waters. ***POPs*** No known impacts.	***BD, LD, IW, CC*** Overexploitation of resources and land degradation in other areas, if creation of protected area displaces human populations and their activities and/or attraction of tourism development to the protected area, which can place further pressure on the natural resources and local human populations. ***BD, LD, IW*** If the protected areas or adjoining area lack management of existing invasive species, pests or diseases, these species can adversely impact adjoining areas or the goals of the protected areas. ***POPs*** No known impacts.

Guiding considerations in project and policy design

Have relevant climate change scenarios been considered in project area design? Especially:

- Have altitudinal and latitudinal gradients been incorporated in consideration of projected climate change?
- Has the vulnerability to invasive species been considered in context of climate change?

Has the potential for disturbance in surrounding areas following protected area establishment been included?

Has watershed management (including any potential land degradation) within surrounding and upstream areas been included in the design and management of the protected area?

Have corridors (and perhaps restoration of intervening land) been considered as ways to link protected areas in the system design?

Will management interventions be needed to maintain ecosystem structure and function in response to interlinkages?

Have costs, benefits, incentives and alternative livelihoods for local communities been incorporated?

Sub-type: Conservation and sustainable use of marine and coastal biodiversity

Primary goals:

- conservation and sustainable use of biodiversity
- maintenance of ecological processes and ecosystem services, including improvement in water quality
- socio-economic benefits for local communities.

Positive effects on other focal areas	Negative effects on other focal areas
CC Increased carbon storage, if previously deforested or degraded coastal mangroves are restored. ***IW*** Improved water quality and reduction of POPs, when protected areas are adjacent to a transboundary water body. ***POPs*** Reduced movement of POPs from land to sea, if the protected area acts as a sink. ***LD*** Reduced erosion of coastal land if coastal vegetation stabilization is included.	***IW*** Might increase political difficulty of forging transboundary agreements for management of an international water body. ***POPs*** Protected area could act as a sink for land-derived POPs if it includes restoration of coastal systems (e.g. mangroves). ***CC, LD*** No known impacts.

Guiding considerations in project and policy design

Have relevant climate change scenarios been considered in project area design? Especially:

- impact of sea level rise, sea temperature increase and extreme climatic events on mangroves, coral reefs, sea grasses, coastal areas and small island ecosystems
- vulnerability to invasive species due to effects of climate change.

Have relevant scenarios for land and waterscape developments in surrounding areas (e.g. marinas, aquaculture) been considered?

Have activities upstream that could affect conservation and sustainable use of the area (e.g. pollution and land degradation) been considered?

Has there been a deliberate effort to maximize the potential downstream benefits?

Will management interventions be necessary to maintain ecosystem structure and function?

Have costs, benefits, incentives and alternative livelihoods for local communities been incorporated?

Is there a monitoring program to evaluate the potential benefits for other focal areas?

5.3.2 Ecosystem management

Sub-type: Restoration and rehabilitation of degraded lands in arid and semi-arid areas through replanting of shrubs and/or grasses and grazing management

Primary goals:

- decrease land degradation
- conservation and sustainable use of the biodiversity
- direct socio-economic benefits for local people.

Positive effects on other focal areas	Negative effects on other focal areas
CC Increased carbon storage (but the magnitude could depend on water availability and climatic extremes in the project area), if project is successful. Reduced wind erosion can lead to decreased dust storms, if large areas are planted. ***IW*** Enhanced water flow, reduced flooding, decreased soil erosion of the watershed, decreased fluctuations in seasonal flows, increased productivity of aquatic biota due to improved water quality. ***POPs*** No known impacts.	***BD*** Changes in herbivore communities and fire regime, if there are changes in C_3:C_4 mix, including in the grass:shrub ratio as a response to changes in the atmospheric CO_2 concentration and climate change. Primary biodiversity goals could be undermined if some exotics are used in large single areas. ***IW*** Reduced water-related gains to freshwater bodies, if using species with high water demand. Chemicals could seep into the IW area (mostly coastal) if they are used for restoration activities. ***CC, POPs*** No known impacts.

Guiding considerations in project and policy design

Would there be enhancement of carbon storage?

Is the use of native species being encouraged?

Are multi-species plantings encouraged?

Have the potential effects of changes in the mix of C_3 and C_4 species been fully considered?

Has the potential increase in risk of invasiveness due to the use of certain exotics been assessed?

Have trade-offs between livelihood needs (e.g. firewood), biodiversity goals and reduction in land degradation been considered?

Has the potential increase in water demand posed by use of exotic species been assessed?

If the project includes reconnection of fragmented landscapes through the establishment of corridors, have the implications for the spread of invasive species been considered?

Have property rights (land tenure) and access rights of different users been considered?

Have negative impacts of any chemicals used in the project been assessed? Has integrated pest management been encouraged?

Are there likely to be potential benefits for water quality, quantity and aquatic biota?

Is there a monitoring program to evaluate the potential benefits for other focal areas?

Have climate change and land-use change scenarios been considered?

Sub-type: Forested ecosystem management through afforestation, reforestation, avoided deforestation activities, and reduced forest degradation

Primary goals:

- carbon storage (enhancing the sinks, reducing the emissions)
- provision of biofuels
- sustainable forest management
- direct socio-economic benefits for local people.

Positive effects on other focal areas	**Negative effects on other focal areas**
BD Potential migration of species, if altitude or latitude 'corridors' are incorporated. Biodiversity gains, if natural forest regeneration occurs and sustainable forest management harvesting practices are applied. Gains, if afforestation and reforestation activities are included and: • if natural regeneration is encouraged and native species are used • if clearing of existing vegetation is minimized • if multi-species stands are encouraged • if plantings are done to create diverse landscape units • if fragmentation of habitats is reduced • if rotation lengths are extended • if low-impact harvesting methods are used ***IW*** Enhanced hydrological flows, if native species are used. Enhanced water flow, reduced flooding, decreased soil erosion of the watershed, decreased fluctuations in seasonal flows, increased productivity of aquatic biota due to improved water quality. ***LD*** Improved land productivity, decreased soil erosion, and decreased pressures on adjoining land, if the project is successful. ***POPs*** No known impacts.	***CC*** Carbon storage reduced, if water is limiting. Climatic extremes and fire regimes changed. ***BD*** (The corollaries are not listed, e.g. disruption to migration if appropriate altitudinal and latitudinal corridors are not incorporated) For afforestation and reforestation: • if activities occur on areas where undisturbed or non-intensively managed ecosystems are destroyed • if monocultures and/or of exotic species are used • if sites with special significance for the in-situ conservation of agrobiodiversity are afforested • if there is large-scale soil disturbance (could lose soil flora/fauna and increase the risk of establishment of invasive species) ***IW*** If chemicals are used, they can seep into water bodies and the food chain. ***LD*** Corollaries to positives apply. ***POPs*** No known impacts.
Guiding considerations in project and policy design Are multi-species plantings encouraged? Is the use of native species being encouraged and the use of exotic species minimized? Is natural regeneration being encouraged? Is there consideration for multiple-use within the landscape? Have the risks of an increase in water demand posed by the use of exotic species been considered? Are fragmented landscapes being connected through corridors? Has the risk of invasiveness (within and outside project areas) of species been considered?	

Is fragmentation of habitats discouraged?
Have climate change and land-use change scenarios been considered?
Has there been a consideration of the risks of POPs in the area?
Has the negative impact of any chemicals used in the project been assessed?
Have the integrated pest management (IPM) and integrated vector management been encouraged?
Are there likely to be potential benefits for water quality, quantity and aquatic biota?
Is there a monitoring program to evaluate the potential benefits for the other focal areas?
Have land tenure issues been considered?

Sub-type: Inland wetlands: Reducing land-based pollution to water bodies and improving sustainable water management through pollution control, control of invasive species and encouraging water management

Primary goals:

- conservation and sustainable use of biodiversity
- sustainable water management (quality and quantity)
- water for sustainable livelihoods and trade-offs between different uses.

Positive effects on other focal areas	**Negative effects on other focal areas**
IW Improved hydrological functioning, if there is regulation of upstream/downstream flows. ***LD*** Improved land productivity, decreased soil erosion and decreased pressures on adjoining land, if there is sustainable water management. ***CC and POPs*** No known impacts.	***CC*** Possibly increased methane, if there is flooding of areas leading to anaerobic activity in the root zone. ***BD*** • If there is control of invasive species that may be present: • If project involves use of chemicals • If there is an introduction of a biological control agent becomes a potential invasive species ***LD*** Gains could be reduced and could also lead to increased contamination if certain production activities (e.g. grazing, irrigation in drylands, use of marginal lands) are encouraged. ***POPs*** No known impacts.

Guiding considerations in project and policy design

Have the potential impacts of climate change (e.g. changes in extreme climatic events) been considered?

Has any potential increase in methane been assessed and have plans for reducing the emissions been developed?

Has the potential impact on biodiversity been considered in the methods proposed for control of any invasive species?

Have plans for sustainable and equitable consumption of resources been developed?

Has adequate consideration been given to conservation of wildlife habitats?

Are fragmented landscapes and grazing areas being connected?

Has the risk of invasiveness (within and outside project areas) of species been considered?

Have land-use change scenarios been considered?

Has there been a consideration of risk of POPs in the area?

Has the negative impact of any chemicals used in the project been assessed?

Have the integrated pest management and integrated vector management been encouraged?

Is there a monitoring program to evaluate the potential benefits for the other focal areas?

Have land-tenure issues been considered?

5.3.3 Introducing renewables as climate change mitigation options

Subtype: Small and micro-scale hydropower plants

Primary goals:

- reduce carbon emissions
- bring direct socio-economic benefits (including electricity, water availability) to local people.

Positive effects on other focal areas	Negative effects on other focal areas
BD Potential reduction in the loss of biodiversity, if there is a decrease in biofuel use. Decreased pressure on habitats, if water availability for agricultural production increases. ***LD*** Potential reduction of land degradation, if water availability and distribution improves. ***IW*** Reduction of floods and droughts, if extreme flows are regulated. ***POPs*** No known impacts.	***BD*** Potential loss of biodiversity (aquatic and terrestrial): • if selected sites cover endemic species • if there is a temporal or spatial change in waterflows • if there is a change in sediment regimes • if disturbance created increases the risk of establishment of invasive species • if there is an impediment to migration of aquatic (especially fish) species Potential decrease in biodiversity, if species are dependent on the extreme fluctuation in flows. ***IW*** Potential downstream decreases in flow, if there are diversions. Changes in extreme high and low flows. ***POPs*** Potential increases in PCBs, if transformers and batteries are used.

Guiding considerations in project and policy design

Have the cumulative effects of many small dams (existing or planned) been considered?

Has there been any attempt to reduce undesirable changes in species composition (species types and relative abundance) in aquatic and terrestrial ecosystems?

Does the project design include a POPs management plan, where required?

Has the project taken into account potential benefits for water quality, quantity and aquatic biota?

Have the potential costs and benefits of water usage for agricultural production been considered?

Has the project taken into account the potential changes in carbon storage due to changed patterns of agriculture and water management?

Has the project taken into account the interests of stakeholders with respect to the sharing of benefits of water and electricity availability?

Has the project included the reduction of hydrocarbon use in the cost–benefit analysis?

Is there a monitoring program to evaluate the potential benefits for the other focal areas?

5.3.4 Management of transboundary water bodies (rivers, lakes, aquifers, LMEs)

Sub-type: Improved management of transboundary freshwater basins through assisting countries to identify the problems, agree on priorities for action, collaborate to minimize conflicts and negotiate transboundary water agreements

Primary goals:

- introduce reforms to reduce pollution in water bodies
- develop legislation to improve water-use efficiency (including making distribution equitable, managing water scarcity, responding to extremes such as floods and droughts)
- bring direct local socio-economic benefits (including improved agricultural and aquaculture productions, water availability, human health, recreation, transport, employment etc), if demonstration projects are included.

Positive effects on other focal areas	Negative effects on other focal areas
BD Increases in terrestrial and aquatic biodiversity, if flows downstream increase. Improved biodiversity, if there is reduced pollution. Increased biodiversity, if upstream protected areas are included in the project. ***CC*** Increased carbon storage, if there is management and rehabilitation of forested wetlands. Contribution to increased resiliency to climate change and to adaptation options, if there is improved water efficiency. ***LD*** Decreased soil erosion, secondary salinization, and water-logging, and increased crop yields, if there is improved water-use efficiency in irrigation. ***POPs*** Reduced spread of POPs, if they are addressed in pollution control.	***BD*** Potential reduction in biodiversity (including agrobiodiversity), if improved irrigation supports monoculture. Potential reduction in biodiversity, if enhanced irrigation results in increased use of pesticides. Expected benefits to biodiversity will not occur if gains from water use efficiency go primarily to industrial and irrigation uses. ***CC*** Increased emissions of methane, if there is increase in flooded agricultural areas. Increased emissions, if pumping stations based on fossil fuels are used for irrigation. ***POPs*** Increased use of pesticides which contain POPs, if improved water availability leads to increased agriculture. Potential increases of POPs into groundwater, if there is increased infiltration when POPs are in the area. ***LD*** No known impacts for soil pollution see POPs.
Guiding consideration in project and policy design Have potential benefits and adverse impacts for aquatic and terrestrial biodiversity been considered? Have climate change scenarios been considered? Have responses to actual extreme climatic events (e.g. floods and drought) been included? Have the agreements and legislation being developed encouraged interlinkages amongst the sectors and focal areas, thus maximizing the benefits and minimizing the adverse impacts? Has the potential for carbon storage and emissions been assessed? Has there been an assessment of POPs in the area? Has integrated pest management been encouraged when increased water efficiency stimulates irrigated agriculture?	

Have public–private partnerships been considered in the project design? Is there a monitoring program to evaluate the potential benefits for the other focal areas? Have the socio-economic benefits been evaluated?

Sub-type: Improved management of large marine ecosystems (LMEs) through assisting countries (within the TDA/SAP process) to develop measures for protection, and restoration of the status and production capacity of LMEs.

Primary goals:

- minimize and control land-based and ship-based sources of contaminants
- reduce other stresses (e.g. overfishing, habitat damage, invasive species, physical damage, by-catch)
- contribute to the improvement of the sustainability of global fisheries
- establish public–private partnership for integrated management
- negotiate transboundary LME management agreements.

Positive effects on other focal areas	**Negative effects on other focal areas**
BD Biodiversity gains, if LME goals are achieved and/or protected areas are included. ***CC*** Potential increased carbon storage, if restoration and conservation of systems such as mangroves are included. Potential increased resilience and decreased vulnerability to climate change impacts. ***POPs*** Reduction of POPs contamination, if the management plan includes control or reduction of POPs deposition from land-based sources. ***LD*** No known impacts.	***BD, CC, LD, POPs*** No known impacts.

Guiding considerations in project and policy design

Have potential benefits and adverse impacts on biodiversity been considered?

Have different approaches (including scenarios) and methods for integrated management (including ecological economic) been considered?

Have climate change scenarios been considered?

Have responses to actual extreme climatic events (e.g. storms and hurricanes) been included?

Has the potential for carbon storage and emissions been assessed?

Has the extent and type of pollution been assessed?

Are the measures and strategies developed for pollution control appropriate for the extent and type of pollution?

Has there been an assessment of POPs in the adjoining terrestrial areas?

Have public–private partnerships been considered in the project design?

Have innovative and environmentally friendly technologies been incorporated?

Has a monitoring program to evaluate the project outcomes been included?

Have the impacts of activities in adjacent areas been included?

Have the socio-economic benefits and trade-offs from different potential uses been evaluated (e.g. fishing, mineral extraction, mariculture)?

6. Policy consideration and proposed actions for better incorporation of interlinkages into GEF project design

The GEF needs to be able to capture the synergies between focal areas to assess any trade-offs, and to avoid negative effects. It should do so by systematically taking linkages between the focal areas into account during the project design. This may allow cost-effective GEF-eligible interventions that would provide global environmental benefits in a GEF focal area other than the main focal area of the project proposal.

Systematic inclusion of interlinkages into GEF projects is not an easy task. We recognize the barriers within the client countries, the implementing agencies and the GEF secretariat. We also recognize the technical complexities that would arise, as part of project design and implementation, from the inclusion of interlinkages.

We recognize that there are barriers and disincentives, and challenges in client countries that might hamper the progress of including interlinkages into project design. For example, the divisions of responsibilities between the different ministries or sectors in client countries can create further compartmentalization, and could increase the disincentives for multi-focal projects and policies. Ministries of agriculture, land and forests, energy, water resources, and transport, for example, often lead wholly separate existences, and frequently fail to ‘join-up’ in important cases. This can, of course, only lead to more fragmentation of policies, to major losses of the benefits of including interlinkages, and give rise to adverse impacts that could be avoided if linkages between the environmental issues were recognized.

However, in the past few years, some countries have attempted to establish mechanisms of coordination between different sectors as part of sustainable development initiatives and multilateral commitments. GEF could stimulate and support these efforts by promoting pilot projects that fully incorporate interlinkages and have a goal of integrated ecosystem management and poverty alleviation.

During the preparation of this report, discussion with members of the IAs and GEF Secretariat suggested that there are institutional weaknesses (e.g. thematic silos) that appear to constrain the inclusion of interlinkages into projects and thereby lead to missed opportunities. There also appear to be disincentives at the concept and pipeline entry stages for projects dealing with interlinkages (e.g. projects that combine two focal areas have to gain approval sequentially from both focal areas). These disincentives can be easily overcome.

In terms of the GEF project cycle, given the complexity of the projects that deal with interlinkages, it can also be very difficult to find one reviewer with the right technical expertise in the various environmental issues who might be able to highlight any missed opportunities. In addition, these opportunities are best assessed at an early stage of the project development. Hence, STAP members are therefore prepared to assist project developers in strengthening interlinkages by reviewing projects at the pipeline entry stage. This will at the same time allow the STAP to further develop the interlinkages design tool, so that, in the future, the GEF Secretariat can do this reviewing.

We recognize that in many countries, a potential barrier to the inclusion of interlinkages is the lack of data and information about the effects of many of the environmental issues at the local level. This could continue to pose major challenges for years to come, which would make full application of the conceptual design tool difficult. However, this should not hinder program developers' attempts to address interlinkages within GEF projects and in national development plans.

The conceptual design tool that we have presented here aims to help program developers ***identify*** the interlinkages that need to be incorporated in the project design, but does not necessarily tell them ***how*** they can be incorporated. The interlinkages design tool can be seen to be a useful way to promote the CBD's ecosystem approach, which is compatible with the Millennium Ecosystem Assessment's conceptual framework. This, in turn, is likely to lead to greater synergies amongst the environmental conventions and to more coordinated work at the national and regional level. However, there will continue to exist the need for projects in each of the focal areas.

We see the interlinkages design tool we have presented here as the first part of a longer process that will develop in close cooperation with the IAs and the GEF Sec. As part of this process, STAP suggests the following steps[4]:

- Disseminate, and encourage the use and further development of the design tool.
- Develop formal or informal forums within the GEF Secretariat and the IAs, which would discuss and incorporate key interlinkages into projects from the concept to the formal approval stages, and be reflected in the implementation of the project. An initial step may perhaps be to discuss common goals across focal areas that would need to incorporate interlinkages between environmental issues.
- Facilitate a process through which relevant agencies in a client country, or individuals from different sectors, collaborate on the inclusion of interlinkages into projects. The GEF can play a catalytic role in getting project proponents together across focal areas and sectors (similar to IW:Learn[5]) in order to facilitate discussion at those levels and also break down some of the institutional barriers that exist in client countries.
- Develop outcome-oriented indicators to see if interlinkages have been included in projects, and to assess if these interlinkages have contributed to real global benefits (these could be incorporated in the monitoring and evaluation processes of projects and portfolios).
- Encourage the use of multiple reviewers to identify potential technical weaknesses in the project design and develop mechanisms for their incorporation.
- Facilitate a full portfolio analysis of the projects that have incorporated interlinkages, to extract lessons learnt and which, if any, benefits were maximized and/or negatives minimized.
- Encourage the development of targeted research projects on key interlinkages (e.g. effects of climate change on corridor design for protected area systems, and effects of climate change on international waters, including groundwater) and establish a clear mechanism to incorporate the lessons learnt into the GEF portfolio.
- Initiate pilot projects that aim to disseminate information and methods, to incorporate interlinkages into project design and implementation.

Some of these steps can be a part of the projects and activities in the Strategic Priority on Adaptation to Climate Change, given the need for this strategy to address cross-focal area issues. The projects using the design tool can bring together technical expertise and thus incorporate the interlinkages into the project design and implementation.

---

[4] These were presented and discussed at a meeting, held in New York at the end of April 2004, which included the heads of UNEP and GEF Sec, and the representatives of the heads of the World Bank, UNDP and the Executive Secretaries of the Conventions (CBD, UNFCCC, CCD, Ramsar).

[5] For more information, see http://www.iwlearn.net website.

Acknowledgements

- The authors wish to thank the various members of the implementing agencies, GEF Secretariat, the Convention Executive Secretaries, the subsidiary body chairs for their constructive comments and guidance.
- To the STAP secretariat for their logistical support.

References

Berry, L. and Olson, J. 2001. *GEF Land Degradation Linkage Study*. GEF Working Paper 6. <http://gefweb.org/Outreach/outreach-PUblications/M_E_WP__6.pdf>.

Burton, I. and van Aalst, M. 2004. *Look before you leap*. A risk management approach for incorporating climate change adaptation in World Bank operations. The World Bank.

GEF (Global Environment Facility) 1996. GEF Operational Strategy. <http://www.gefweb.org/public/opstrat/ops.htm>.

GEF (Global Environment Facility) 1999. *Clarifying Linkages between Land Degradation and the GEF Focal Areas: An Action Plan for Enhancing GEF Support*. <http://www.gefweb.org/COUNCIL/GEF_C14/gef_c14_4.pdf>.

GEF (Global Environment Facility) 2001a. *The GEF programmatic approaches: the current understandings*. <http://www.gefweb.org/Documents/Council_Documents/GEF_C17/C.17.Inf.11.doc>.

GEF (Global Environment Facility) 2001b. *GEF's move towards strategic priorities*. <http://gefweb.org/Documents/Council_Documents/GEF_C17/C.17.Inf11.pdf>.

GEF (Global Environment Facility) 2002. *GEF Annual Report 2002*. <http://gefweb.org/Outreach/outreach-PUblications/GEF_Annual_Report_02.pdf>.

GEF (Global Environment Facility) 2004. *GEF assistance to address adaptation*. <http://www.gefweb.org/Documents/Council_Documents/GEF_C23/C.23.Inf.8.Rev.1_Adaptation_Council_paper_FINAL.doc>.

IPCC (Intergovernmental Panel on Climate Change) 2000. Summary for Policy Makers. In: *Land Use, Land-Use Change and Forestry*. Watson, R.T., Noble I.R., Bolin, B., Ravindranath, N.H., Verardo, D.J. and Dokken, D.J. (eds). Cambridge University Press, pp. 1–20. <http://www.ipcc.ch/pub/srlulucf-e.pdf>.

IPCC (Intergovernmental Panel on Climate Change) 2001a. Summary for the Policy Makers. In: *Climate Change 2001: Impacts, Adaptations, and Vulnerability. Contribution of Working Group II to the Thirds Assessment Report of the International Panel on Climate Change*. McCarthy, J.J., Canziani, O.F., Leary, N.A., Dokken, D.J., White, K.S. (eds), pp1–17. Cambridge University Press. <http://www.grida.no/climate/ipcc_tar/wg2/index.htm>.

IPCC (Intergovernmental Panel on Climate Change) 2001b. *Climate Change 2001: Synthesis Report. A Contribution of Working Groups I, II, and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change* [Watson, R.T. and the Core Writing Team (eds.)]. Cambridge University Press, Cambridge, United Kingdom, and New York, NY, USA, 398 pp. <http://www.grida.no/climate/ipcc_tar/vol4/index.htm>.

IPCC (Intergovernmental Panel on Climate Change) 2002. *Climate Change and Biodiversity*. [Gitay, H. Suarez, A. Watson, R.T. and Dokken, D (eds.)]. IPCC Technical Paper V. WMO/UNEP. <http://www.ipcc.ch/pub/tpbiodiv.pdf>.

MA (Millennium Ecosystem Assessment) 2003. *Ecosystems and Human Well-being: A Framework for Assessment*. Island Press, Washington, D.C., 245 pp.

Reyers, B. 2004. Incorporating anthropogenic threats into evaluations of biodiversity and prioritization of conservation areas in the Limpopo Province, South Africa. *Conservation Biology* 118: 521–531.

UNDP (United Nations Development Programme) 2004. <http://www.undp.org/gef/undp-gef_how_to_access_gef_grants/sub_capacity_development.html>.

UNEP (United Nations Environment Programme) 1999. *Synthesis of the Reports of the Scientific, Environmental Effects and Technology and Economic Assessment Panels of the Montreal Protocol. A decade of Assessments for Decision Makers Regarding the Protection of the Ozone layer: 1988–1999*, UNEP.

UNEP (United Nations Environment Programme) 2003. *Report of the Executive Director*. UNEP/SI/IGC/2, Nairobi.

van Dam, R., Gitay, H. and Finlayson, M. 2002. *Wetlands and Climate Change 2003*. Ramsar Convention COP paper. <www.ramsar.org/cop8_doc_11_e.htm>.

Vorosmarty, C. J., Green, P. Salisbury, J. and Lammers, R.B. 2000. Global Water Resources: Vulnerability from Climate Change and Population Growth. *Science* 289 (5477): 284–288.

Watson, R.T. and Berghall, O., (eds) 2003. *Biodiversity and Climate Change*. Convention on Biological Diversity Publication. SBSTTA 9 report of the Ad Hoc Technical Expert group on biodiversity and climate change. <http://www.biodiv.org/doc/publications/cbd-ts-10.pdf>.

Watson, R.T., Dixon, J.A., Hamburg, S.P., Janetos, A.C. and Moss, R.H. 1998. *Protecting Our Planet Securing Our Future. Linkages Among Global Environmental Issues and Human Needs.* United Nations Environment Programme, Nairobi, U.S. National Aeronautics and Space Administration and The World Bank, Washington.

WCED (World Commission on Environment and Development) 1987. *Our Common Future. The Brundlandt Report*. Oxford University Press.

Scientific and Technical Advisory Panel (STAP)
1707 H Street, NW
Suite 300
Washington, DC
20006 USA

tel: 1 (202) 974-1311
fax: 1 (202) 223-2004
www.unep.org/stapgef