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A SCIENCE VISION FOR GEF-5 PROPOSALS FROM THE SCIENTIFIC AND TECHNICAL ADVISORY PANEL

(Prepared by the Scientific and Technical Advisory Panel)



A Science Vision for GEF-5

Proposals from the Scientific and Technical Advisory Panel

Introduction

1. The work of the Global Environment Facility is based on a number of factors but the Scientific and Technical Advisory Panel (Science Panel) concentrates on ensuring that strategic directions of the GEF as well as the actual projects are scientifically and technically sound. That means understanding the current knowledge of whatever aspect of the environment is involved so that it is not only reflected properly in the project in question, but also in the work of the GEF in general. The Panel should also identify important aspects of the environment not included in the relevant conventions and attempt to anticipate new aspects of the environment as revealed by events and science. As science is by nature dynamic, the work of the Panel has to be forward looking, drawing not just upon the actual Panel members but larger networks of experts.

Background

2. Planning for the fifth replenishment of the GEF is taking place in a period of unprecedented environmental change, with recent global assessments (IPCC-4, GEO-4, MA, IAASTD) confirming extremely rapid rates of loss of biodiversity, accelerating climate change, degradation of ecosystems, need for accelerated and sustainable agriculture, fisheries and forestry production and consequent impacts upon livelihoods. These challenges call for responses and resources that are orders of magnitude larger than the likely resources to be made available under the GEF. The Science Panel has therefore looked at the opportunities for GEF to innovate and to catalyze further actions, bearing in mind the increasing focus on national determination of the use of GEF resources under the Resource Allocation Framework (RAF), and the likely inclusion of all focal area resources within the RAF.
3. The Science Panel convened a meeting in Nairobi during April 2008, hosted by UNEP, at which it, together with many GEF Agencies¹, the GEF Secretariat, GEF Evaluation Office and representatives of MEA secretariats participated in a science stock-take of the existing phase of GEF, that led to a series of plenary and break-out discussions about the priorities for GEF attention in its next phase of replenishment – GEF-5. The proceedings of that meeting are available on the Science Panel website²
4. The science-based recommendations of the Science Panel to inform the next replenishment of the GEF, taken from the April 2008 Science Panel meeting, are presented in this document, and are intended to provide a foundation for the work of the Panel within the Technical Advisory Groups to be convened by the GEF Secretariat during 2008³. The Science Panel acknowledges that the priorities for the work of the GEF are set by a complex mix of constraints and opportunities, which are also informed by what science assessments and analysis can provide as guidance. Therefore the purpose of this paper is not to duplicate the guidance provided to the GEF by Conventions for which the GEF is a financial mechanism, but to show at a higher level what gaps and opportunities remain and also to attempt to make connections (interlinkages) between the work authorized within the focal areas that might otherwise result in wasteful overlaps or lack of synergy.

¹ Agencies represented at the meeting were UNEP, UNDP, World Bank, IFAD, FAO, UNIDO

² See <http://stapgef.unep.org/> and follow links for the April 2008 meeting

³ See GEF Council information paper GEF/C.33/Inf.7 describing the proposed process for development of GEF-5 strategies

5. The Science Panel, in setting out its Vision in this document, has, as far as is practicable, taken evidence from a number of sources, including from the relevant convention secretariats, which have provided guidance documents. The Panel Members have also canvassed widely within their networks to obtain diverse and broad-based views and evidence that assisted them to outline their ideas within the Science Panel meeting, and which were subsequently tested in the series of panel and break-out discussions held in Nairobi.
6. To reduce the danger that the focal area “pillars” unduly dominate these proposals from the Science Panel, each of the focal area sections contains a cross-cutting summary of proposals that draw on the other focal areas from the perspective of that focal area, and in addition, a separate cross cutting section summarizes the major interlinkages and potential for innovation and synergy in the work of the GEF.

Climate Change

7. Firstly, climate change priorities for the GEF are normally informed by guidance provided by the CoP of the UNFCCC for which the GEF acts as the financial mechanism. Full consultation with the secretariat of the UNFCCC was not possible to arrange prior to the Science Panel meeting, and therefore further consultation will be arranged by the Science Panel regarding scientific and technical issues. Secondly, scientific and technological developments including the economic factors contribute to the development of priorities of GEF.
8. The year 2007 was monumental in global efforts to address climate change. In large part, this is due to two defining events that occurred and will have long-term implications for mitigation and adaptation policies. They are: 1) the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report on mitigation and adaptation, and, 2) the Bali Action Plan, arising from the Meeting of the Parties to the UNFCCC, which will also affect mitigation and adaptation policies, as well as future funding decisions on climate change.
9. As a result, more is known about climate change and its effects on the global environment as the GEF enters its fifth phase (GEF-5), than when entering GEF-4. New and additional technology and policy options are available for policy-makers to address climate change. GEF should consider, therefore, the findings from the IPCC scientific community, and the agreements made in Bali, as it begins to strategize how to strengthen its niche in actions to address climate change. Scientific and technological developments are occurring at a fast pace and new developments are reported even post-IPCC 2007 reports and GEF should be made aware of these developments on the scientific and technological aspects.
10. The GEF is also grappling with more immediate challenges – some of which may influence climate change indicators in GEF- 5. For example, an immediate challenge is to define methodologies to estimate CO₂ mitigation in transportation projects. In April 2008, the GEF Secretariat submitted to the GEF Council a manual for estimating avoided CO₂ in renewable energy and energy efficiency proposals to assess the GEF-4 target for avoided CO₂ equivalent. However, it does not include CO₂ quantification guidelines for GEF projects in transportation. The same is true for land use, land-use change, and forestry (LULUCF) projects. As GEF begins to wrap up its fourth phase, and begins to identify targets and indicators for avoided greenhouse gas emissions through GEF projects, acceptable methods will be necessary.
11. Reducing emissions from deforestation and ecosystem degradation (REDD) is recognized by the Science Panel as an important priority for the GEF’s future work – as a way of addressing in parallel climate and biodiversity global environmental benefits. The Science Panel considered briefly REDD in its “Guidance for Implementing the Sustainable Forest Management Program”, by raising points for consideration by the GEF, mainly – establishing baselines for REDD projects; designing the institution that will facilitate payment transfers and monitoring (who is permitted to make payments and for what?); assessing and measuring of “degradation”, and other issues. However, the Science Panel is cognizant that until further guidance from the Conference of the Parties (COP) is received by the GEF, REDD cannot be discussed in earnest. Thus, the Science Panel will await the COP discussions at Copenhagen

in November – December 2009 to fully explore REDD in the GEF, but nevertheless recommends that the GEF adopt early action within GEF-4 in advance of this date to be ready to support REDD in GEF-5.

12. The IPCC Fourth Assessment, the Millennium Ecosystem Assessment and Global Environmental Outlook - 4 (UNEP) attest to the complex, dynamic and multiple relationships between climate change and ecosystem change. The Science Panel fully endorses these findings, and believes that more cross-sectoral work can be achieved in GEF-5 between climate change (mitigation & adaptation) and natural resource management. Agriculture and its potential for linked mitigation and adaptation benefits emerges as a priority. This addresses mitigation of greenhouse gas emissions in agriculture through reduced emissions, and/or enhanced carbon sinks. The implications of climate change mitigation activities (including GEF programs) on food security, biodiversity and broader sustainable development needs also needs to be addressed. An immediate priority would be that of biofuels and their implications for food security and biodiversity.
13. Adaptation, and in particular increasing the adaptive capacity of vulnerable rural and urban communities, should be emphasized more strongly within the climate change focal area for GEF, linked to national planning on adaptive capacity of human and natural systems to climate change. In this regard, the development of tools and methodologies for site-specific impacts of climate change on a given ecosystem, are also needed.
14. Other topics considered briefly as potential issues for GEF-5 include the following: 1) climate proofing GEF investments; 2) develop a differentiation of GEF strategies according to regional needs and based on a scientific rationale; and, 3) develop a strategy on methane emissions.

Cross-cutting issues primarily linked to climate change

- Resource efficiency – interlinkages between Climate Change and other Focal Areas, and the global environment
- Implications of the IPCC Fourth Assessment, – on sustainable development –what are the implications of sustainable development on mitigation and adaptation?

Chemicals

15. Two focal areas, POPs and Ozone Depletion support the chemicals work of the GEF, which also adopted for GEF-4 the Sound Chemicals Management Framework Strategy. This itself is a cross-cutting approach to the issues faced in environmental management of toxic chemicals.
16. The focal area has POPs as its key component and it is expected to continue in response to the guidance from the Stockholm Convention COP. In doing so, interlinkages must be built with other focal areas (e.g., climate, international waters) and with other emerging chemicals issues (e.g., mercury).
17. There is an important role for science in providing global data to meet the needs of the GEF focal areas. The effectiveness evaluation under the Stockholm Convention requires collection of POPs data from environmental and human media, but there are important gaps at the regional level. There is a need for cost-effective means of collecting meaningful and comparable data. The GEF should support efforts to bridge the gap between existing conventional data gathering systems and newer/more innovating approaches to provide confident to policy makers and others about the validity of the data.
18. The cross cutting strategy on chemicals management in GEF-4 was seen as a positive development but it was noted that there was no funding/activity under it. There is a need to consider how best to address chemicals issues beyond the Stockholm Convention and particularly in relation to chemicals-related strategy priorities in the international waters and other focal areas. Lessons learned and priority setting

for the area of chemicals management in GEF-5 can be drawn by the ongoing experience in the projects of the SAICM Quick Start Programme, specifically from the national chemicals profiles developed.

19. As conditions change in other focal areas, so too does chemical use, transport and fate patterns. These changes need to be considered by the Science Panel and the GEF in formulating strategies for GEF-5.

Cross-cutting issues primarily linked to Chemicals

- Projects supporting studies on transboundary transport of POPs (e.g., with IW focal area) will help to inform future GEF interventions
- Science-based regional projects based on regional priorities should be supported. There is already a good basis in GAPS and GMP. Stronger emphasis on POPs hot-spots is needed
- GEF should take more pro-active and anticipatory approach to candidate POPs and focus more than now on emerging chemical contamination issues
- GEF is advised to develop a targeted research project on global approach to predicting and documenting contamination by PBT chemicals

Biodiversity

20. The GEF-5 strategy should continue and extend GEF-4 work on (a) expanding and strengthening protected areas (comprehensive, representative, resilient and effectively managed), particularly marine protected areas, (b) experimenting with different types of protected areas governance, and (c) experimenting with mainstreaming interventions and ways of leveraging development finance. It should also explore alternative ways to protect marine biodiversity in addition to marine protected areas.
21. Biodiversity priorities for GEF attention are informed by guidance provided by the CoP of the UNCBD, for which the GEF acts as the financial mechanism. Prior to the Science Panel meeting, the CBD Secretariat provided document UNEP/CBD/COP/9/24, containing guidance to the financial mechanism for the period 2010-2014. The Annex to this document is particularly relevant and contains 23 proposed outcomes organized within four priority program areas. In addition, the recent CBD-COP9 meeting produced a number of additional specific decisions with scientific content that are relevant to the GEF program.
22. The GEF-5 strategy should be designed with a solid understanding of the evidence base and especially the incentive structures for commonly proposed interventions to achieve biodiversity conservation goals. In cases where the evidence base is weak, the GEF-5 strategy should make explicit the need to design the biodiversity portfolio to learn about the effectiveness of the types of interventions frequently funded by the GEF. The Science Panel notes that such learning is particularly needed for interventions attempting to mainstream biodiversity in productive sectors, to use markets to achieve biodiversity goals, to use alternative ecosystem management institutions (e.g., community-base management rather than state management), and to build civil support for biodiversity.
23. Environmental advocates, scientists and institutions (e.g. UNEP, UNCBD) have called for the GEF to organize its biodiversity strategy around an “ecosystem approach” (similar to that used in the Millennium Ecosystem Assessment). The GEF-5 strategy should consider how such an approach can be advanced and its implied changes for the way in which the GEF currently invests in biodiversity protection.
24. The GEF-4 portfolio to date has proposals to expand or strengthen protected area systems, and proposals for mainstreaming biodiversity in the productive sector, however, proposals that contain actions in both protected and productive spheres are rare. Given the protected and productive spheres are not separate, the GEF-5 strategy should consider if and how the GEF can encourage a more integrated approach to ecosystem management across protected and productive ecosystems (terrestrial and aquatic).

25. The GEF-5 strategy should consider increasing the GEF's focus on freshwater biodiversity. Some estimates imply that freshwater ecosystems contain 25% of global vertebrate diversity. Yet little of the GEF biodiversity portfolio is dedicated to freshwater ecosystems.
26. The GEF-5 strategy for Biosafety should explicitly consider the way in which biosafety is produced among neighboring nations and what that implies for GEF investments.
27. The GEF-5 strategy will have to more explicitly tackle the issue of optimal investments in biodiversity protection under climate change uncertainty. Rather than investing to maximize expected biodiversity gains, the GEF will increasingly have to invest to maximize risk-adjusted expected gains. This process, started in GEF-4, will require the GEF to address the trade-off between expected gains and the variability of gains (i.e., the risk-return trade-off) through such mechanism as the construction of protected area portfolios and the management of corridors that are chosen based on scientific knowledge of future climate scenarios
28. A persistent issue facing the GEF is the contrast between biodiversity science, which emphasizes the long-term nature of investments and outcomes in biodiversity conservation, and the funding realities of the GEF, which emphasizes four-year horizon and short-term investments. The GEF-5 strategy should consider the scientific case for longer-term horizons in its biodiversity portfolio and how such horizons might be operationalized in the administrative context that the GEF inhabits.
29. The GEF has made great strides in monitoring its investments through the adoption of tracking tools, particularly the most recent version of the Management Effectiveness Tracking Tool (METT), which can be uniformly and rapidly applied to all projects. However, the METT has little empirical evidence to support its implicit assumptions about the relationships between the measured indicators and the environmental outcomes that are desired. GEF-5 offers opportunities to test the METT (the empirical relationships between the measures and outcomes), make it more effective and perhaps complement it with other tools. The GEF-5 strategy should also consider ways to structure METT reporting requirements to ensure the reports provide accurate portrayals of program effectiveness.
30. Members of the scientific community who are engaged in conservation planning research believe that the GEF agencies and partners should be using systematic conservation planning approaches to orient investments in GEF-5. Such approaches were argued to bring rigor and comparability across the portfolio.

Cross-cutting issues primarily linked to Biodiversity

31. Biodiversity proofing with respect to climate change.
32. The GEF-5 strategy should have a clear policy on biofuels investments in its CC portfolio as they relate to biodiversity impacts, and an understanding of how biofuel development is affecting, or will affect, its biodiversity investments.

International Waters

33. Although not directed by a single international convention, the International Waters focal area is guided by several regional conventions. In addition, the UNCBD and the Ramsar Convention have agreed on successive Joint Work Plans to deliver actions under the CBD programmes of work for inland waters, coastal and marine waters, creating potential synergies for scientific and technical co-working with these MEAs.
34. In GEF-4, the IW programme is moving from predominately assessments – transboundary diagnostic analyses (TDA) and strategic action plans (SAP) - to principally an implementation phase. GEF-5 will therefore call for full support for implementation. For assessing new regions, the Transboundary Diagnostic Analysis (TDA) process has the opportunity to build on past experience and upgrade and improve its use as an implementation guide. TDA's could be broadened to include links to all the services that water provides, beyond the current focus on water quality and fish production, and using the

Millennium Assessment guide to ecosystem services. The TDA's should also attempt to better identify linkages between pollution sources and the impacts and results in the environment, recognizing that, in the case of non-point sources of pollution, the remedial action needed are particularly difficult

35. Persistence: GEF-IW has impressive and significant achievements and, in GEF-5, should consolidate its gains rather than branching into too many new areas. Experience inside and outside GEF shows that SAPs take considerable time to be implemented. Recognizing this and subject to suitable reviews, GEF-5 should follow-through on promising projects from its existing/past portfolio. New regional platforms such as the Pacific Alliance for Sustainability and the Coral Triangle Initiative offer the chance to put many past lessons into practice. GEF-IW is encouraged to undertake comparative governance and institutional analyses across suitable projects.
36. The IW focal area will need to be well prepared in the event that the GEF decides to move all of its focal areas to the RAF. Such preparation will include developing rigorous approaches to the RAF allocations to countries for IW and communicating to government the value-added of multi-country approaches.
37. Moving beyond IW's history: some external experts have challenged the continuing centrality of the LME (large marine ecosystem) units for IW coastal projects, noting that the concept does not lend itself automatically to problem-centered approaches, that some LMEs can be challenged by new alternative bioregionalisations, and the fact that LMEs do not cover all IW areas, especially the high seas. The LME approach could be softened in GEF-5, without losing the the good progress that GEF has made in turning the LME approach into a practical means for examining common fisheries and socio-economic issues among adjacent countries that share resources and marine ecosystems. A suggested approach is for the IW-TAG to look with fresh eyes at the advantages and disadvantages of using the LME approach and advising on how GEF-5 can adapt to new knowledge on shared ecosystem management.
38. Importance of IW in GEF-5: Noting that IW received a reduced allocation in GEF-4, and yet seas, river basins and coasts are the centers of the most major economic development, GEF-5 needs to strive to provide governments with better ways and means of environmental sustainability while achieving economic and societal sustainability in IW areas.
39. GEF Knowledge: GEF knowledge should be made much more publicly accessible. The GEF website and project websites are frequently canvassed for information. The GEF website, while adequate, could be further improved. Project websites such as the SCS IW project site were particularly appreciated and concerns expressed as to what happens with such websites after the projects finish. The UN Atlas of the Oceans project could act as a long term repository of GEF-IW information.
40. New areas to be considered for GEF-5 are suggested as follows:
 - GEF should continue supporting contributions to the Global Taxonomic of the CBD (see COP9) and ensure that aquatic life is also well covered. Major global projects such as the Census of Marine Life, EoL and Barcode of Life are showing means for more efficient taxonomic efforts using genetic and information technology to augment core taxonomy.
 - More is required on fresh water and especially fresh water biodiversity conservation: Freshwaters are arguably the most endangered, fragile and critical ecosystems on the globe. This imperative has also been emphasized by COP9 and suggests that a cross-cutting freshwaters initiative should be considered in GEF-5.
41. Other priorities include:
 - Ocean acidification and its implications: Evidence is mounting of the impact that ocean acidification will have on marine life, ecosystems and their services. The role of GAF-IW in addressing this would be for projects to maintain current with emerging impacts and to ensure that the climate mitigation and adaptation work in GEF addressed the issue.

- Management of alien invasive species introduced through aquaculture and aquariums: Focus on monitoring, risk assessment, management tools such as eradication methods and capacity building in fisheries departments which are often unaware of the dangers of introductions. This issue was addressed by CBD-COP9 which drew it to the attention of FAO.
- Reducing nutrient over-enrichment: in addition to relevant IW projects, all land degradation projects should include activities to reduce nutrient over-enrichment of waters. GEF-5 should examine what it can do further to prevent the formation, spread and persistence of dead-zones in marine and inland waters.
- GEF-5 should support the global strategies for routine observation of marine life using newly available and emerging technologies: routine global marine biological observations are now becoming possible. Examples include nearshore biodiversity monitoring (e.g., to track impacts of climate change), archival and satellite ocean tracking of larger animals and coastal tracking of migratory species; DNA sequencing of microbial populations and cylindrical acoustics for assessing biomass over large areas. These technologies are helping fill in the unknown biologies of even our most important utilized species as well as many others that provide indirect ecosystem services.
- Gaps in sustainable financing mechanism to implement the IW SAPs, including the role of public-private partnerships should be addressed in GEF-5.
- Sustaining fisheries: GEF-5 should place more emphasis on the science of sustainable fisheries, but note and learn from existing FAO investments in this area, including more emphasis on the science of fisheries management, means of preventing over-harvesting and restoring fish stocks and managing sustainability and social justice dimensions in small-scale fisheries. Tools beyond Marine Protected Areas should be explored, including the *refugia* approach of the GEF South China Sea project
- Open IW learning network to non-GEF practitioners to improve the accretion of lessons learned, including from the Targeted Research activities of GEF. A special focus should be on governance lessons learned. GEF-5 should complement the IW projects currently developing “lessons-learned” and management tool-kits with hypothesis-based comparative analysis of current governance and institutional arrangements. GEF should encourage academics to analyze GEF-IW projects on a grand scale.
- Aquaculture an important issue and its growth it presents major challenges to the environment. GEF should look to address these challenges in conjunction with expert agencies.
- GEF-5 should address conservation needs on the high seas.

Cross-cutting issues primarily linked to International Waters

42. International Waters projects need to be more closely linked with relevant Biodiversity, Climate Change and Land Degradation focal area projects. Given that the IW projects tend to be multi-disciplinary, they have tended to be self-contained. Especially in view of the reduced budget for IW in GEF-4, more funds could be obtained for BD, CC and LD aspects through multi-focal area projects.
43. Toxic chemicals – there are no water strategies in GEF-4 and yet most toxic chemicals are transported in water systems and/or end up in the water and thus affect aquatic ecosystem services.

Land Degradation

43. Land and related freshwater resources face multiple and complex demands from society, ranging from the provision of 'food, fuel and fiber' to recreation. Yet land resources are finite, vulnerable to damage and subject to a number of degradation drivers, not least of which is the growing demand for goods and services provided by the terrestrial environment for the benefit of developing societies and nations. Land and water resources are, therefore, the subject of many conflicts and competing demands. Land degradation is becoming a truly global issue because not only do the conflicts and demands cross national boundaries but the primary drivers for degradation are closely inter-linked with global forces, such as trade reform, food security, development aid and aspects of global environmental change, such as loss of biodiversity and climate change. The justification for the land degradation focal area being a global concern rests primarily on these complex but all-pervasive inter-linkages.
44. The goal of this focal area is to arrest and reverse current trends in land degradation affecting not only peoples' livelihoods but also the resilience of ecosystems. The GEF-4 strategy set out to accomplish this goal through policies and practices conducive to sustainable land management (SLM) that, simultaneously, generate global environmental benefits while supporting local and national, social and economic development. GEF-5 should continue this goal, through a similar set of policies and practices, strengthening the development of innovative approaches to SLM (SP3 currently) and the linkage of global environmental and developmental benefits.
45. Because land degradation is so common and has many facets, including those primarily of national and domestic concern, the scale of investments required to achieve beneficial change far outstrips potential funding through the GEF. A study for the World Bank and the Global Mechanism⁴ elaborates the potential extent of needed investments to control land degradation. The consensus is that land degradation costs a developing country about 4% of its GDP annually, which for a medium-sized country such as Ethiopia amounts to over USD140 million. This is at least an order of magnitude greater than the finance that could currently be supported through the GEF for high priority countries. GEF-5, therefore, needs to be highly selective, concentrating on a small number of closely-specified issues that optimize global environmental benefits through synergetic effects and delivery of co-benefits for the environment and human development.
46. Land degradation priorities for GEF attention are informed by guidance provided by the CoP of the UNCCD, for which the GEF acts as one of the financial mechanisms. At the Nairobi Science Panel meeting the secretariat of the UNCCD briefed the meeting on new priorities in its 10-year strategic planning that commenced at COP-8 in Madrid in 2007. The UNCCD strategic themes are now articulated in a context of climate change, related food and water scarcity and emerging geo-strategic issues,
47. In the spirit of the CoP guidance, the land degradation focal area should be seen as underwriting the delivery of global environmental benefits in the other natural resource management focal areas (biodiversity, international waters and climate change) through providing systems of land use and management that conserve and protect soil, water, vegetation and land resources. This synergetic and cross-cutting role of the focal area should receive enhanced attention in GEF-5, specifically to support the GEF-wide goal of optimizing impact of GEF investments.
48. In addition to the cross-cutting role of investments in land degradation control and sustainable land, water and forest management, a small number of high priority topics that have possible GEF comparative advantage are suggested. These include:
 - a. Strategic policy issues at the national level: identification of pre-eminent policy drivers that relate directly or indirectly to land degradation (e.g. climate change, incentives and regulation, food security); how to achieve multiple objectives from land and water through investments in land degradation control; mainstreaming of sustainable land management in

⁴ Berry, L, Olsen, J. and Campbell, D. 2003. Assessing the Extent, Cost and Impact of Land Degradation at the National Level: Findings and Lessons Learned from Seven Pilot Case Studies. Study Commissioned for the Global Mechanism with support from the World Bank - http://info.worldbank.org/etools/snc/doc/t_ecosystem/Cost_%20Land_Degradation_CaseStudies.pdf

current national institutional architecture; types of incentive system or tax regimes to recover and reinvest land resource rents and to promote SLM.

- b. Valuation and generic market issues: how to overcome the under-valuation of ecosystem services that land and water provide; financial returns from investments in land degradation control; returns to labor in local efforts to promote promising technologies; the role of the market in driving land management reform
 - c. Trade-off issues to optimize the range of ecosystem services from land and water: to include, landscape dynamics and the mix of land utilization types that balance provisioning, regulating and cultural services; the role of new technology vis-à-vis local knowledge in delivery of remedial measures while promoting safe, secure and sustainable development; restoration of degraded environments versus prevention of degradation of currently undegraded environments; management of limited investment resources for sustainable land management in the face of almost-limitless demand.
 - d. Geographic and programmatic issues: one of the UNCCD CoP messages for GEF is the priority attention needed for semi-arid and dry sub-humid areas, with particular focus on the role of reforestation; more generically, the bundling of countries into almost identical approaches to land degradation in programmatic partnerships needs re-evaluation
 - e. Tools and decision-support issues: to include decision-making frameworks to guide policy-makers; project management and monitoring tools for principal global change issues such as biodiversity, total system carbon and poverty.
49. GEF-4 has taken on a specific role in Sustainable Forest Management (SFM) in the face of substantial demand by both developing and developed countries (current SP2). Particular issues that need to be pursued in order to capitalize on GEF-4 investments include forest conservation as a means to protect carbon stocks and avoid CO₂ emissions; enhancement of soil carbon through deliberate introduction of inert carbon from wood stocks (biochar) as a soil amendment.
50. The promotion of biofuels as a means of mitigating climate change has large potential impacts on sustainable land management, especially in its possible consequences for agricultural development, developing economies and competing demands for land and water resources. While the GEF is not recommended to take a particular stance for or against biofuels, data are needed to calculate the trade-off between the protection of soil and land resources through the biomass produced through biofuels and the possible damage to adjacent areas and local economies. The costs and benefits of the judicious introduction of biofuels to increase net primary production in drylands need to be determined
51. To support a particular GEF focus on land degradation, attention needs to be given to methodology:
- There is a need for stronger science in the assessment, measurement and monitoring of land degradation and related components (such as carbon)
 - Inter-linkages of land degradation to ecosystems goods and services require greater precision and clarity, through better valuation and understanding of biophysical process links.
 - The guiding of investment decisions requires improved conceptual frameworks (such as the Millennium Ecosystem Assessment framework) and better targeting of sustainable land management interventions
 - The global environmental benefits arising from investments in land degradation control need urgent attention with guidance to GEF agencies on their specification, estimation, tracking and reporting

Cross-cutting issues primarily linked to Land Degradation

52. As argued already, land degradation and sustainable land management are pre-eminently cross-cutting topics. In GEF4, SP3 - investing in innovative approaches to SLM – has been under-utilized. Direct

approaches to land degradation control, such as the development of technologies is not in the GEF's remit, but indirect approaches employing inter-linkages with other global issues are in GEF's area of comparative advantage in the sense that no other agency has a mandate for this. Any successor to SP3 requires explicit strategic linkage with biodiversity, climate change, international waters and POPs.

53. The Ecosystem Goods and Services framework provides a strategic opportunity to develop nationally-validated examples of the role of land degradation control in delivering 'provisioning', 'regulating' and 'cultural' services, including quantitative valuation to national economies and human development.

Cross-cutting issues and focal area interlinkages

54. The Science Panel has previously advised the GEF on cross-cutting issues / the potential of interlinkages between focal areas, and encourages the GEF to maximize the synergies possible through projects that deliver co-benefits even if the source of finance is derived from just one focal area. The Science Panel considers that best practice in this area is provided by the work of the IPCC and also UNEP through the GEO reports. Both assessments make extensive use of interlinkage analysis, and the Panel's review of the potential of interlinkages⁵ reviewed the literature and explored the risks and opportunities for projects proposed for multiple focal area delivery.
55. In GEF-4 two Framework Strategies were added to the six original focal areas to extend the ability of the GEF to address cross-cutting issues and focal area interlinkages. These were Sound Chemicals Management (reviewed under the Chemicals section above) and Sustainable Forest Management. The former was unfunded and looks for opportunities to deliver cross-cutting work within existing projects, while the latter was funded by drawing on resources from two focal areas.
56. Additionally, the GEF is likely to adopt a strategic framework to organize work on Natural Resource Management and Climate Change, principally on adaptation within GEF-5, and the Science Panel's views on this cross-cutting area are included in this section.

Sustainable Forest Management

57. Sustainable Forest Management has the status of a strategic framework within GEF-4 drawing on strategic programs and their resources from the Biodiversity and Land Degradation focal areas. The Science Panel provided advice⁶ to the GEF to assist the implementation of this initiative. This included offering its services to develop key issues such as the meaning of mainstreaming biodiversity in forest management; the development of sustainability criteria for biomass production from wood products; and the development of an evidence base for community-based sustainable forest management and other popular approaches to SFM. These priorities remain important within GEF-4 and, together with work on REDD, will form the main focus for Science Panel attention in GEF-5.

Cross-cutting issues primarily linked to Sustainable Forest Management

58. The role of land tenure in contributing to SFM objectives (e.g. the role of community forestry compared to state forestry).
59. Ecosystem services

Natural Resource Management and Climate Change

⁵ A conceptual design tool for exploiting interlinkages between the focal areas of the GEF; 2004, STAP report to the GEF (GEF/C.24/Inf.10). This unpublished report, while not adopted by the GEF Secretariat for official publication remains the basis for STAP's advice in this area of its work.

⁶ Sustainable Forest Management: STAP Guidance on Implementing the new Work Program, November 2007. Paper provided to the GEF Secretariat

60. Climate change is likely to (adversely) impact all natural resources (fresh water sources, grasslands, forests, soil microflora, biodiversity, etc). The livelihoods of a large proportion of the poor depend on the quality of climate-sensitive natural resources. Thus there is direct link between climate change and natural resources with serious implications for poor. Climate proofing of natural resources is critical for sustaining development in many regions. Some of the potential issues to be addressed are as follows:
- Assessment of implications of climate change on natural resources (water, grazing land, forests, cropland, etc) within ecosystems particularly agro-ecosystems at regional level.
 - Analysis of status and dynamics natural resources and the drivers of changes in natural resources. Understanding of ecosystem services provided by the natural resource and extent of dependence of local communities on the natural resources and ecosystem services provided.
 - Develop tools and techniques for assessing impacts of climate change on natural resources and socio-economic implications as well as to develop adaptation strategies.
 - Explore linkages between different natural resources in providing ecosystem services and analyze how climate change impacts on each natural resource affects ecosystem services of other natural resources as well as the human societies depending on them.
 - Integrated natural resource or ecosystem approach potentially could promote mitigation as well as adaptation at the same time sustaining development process by enhancing food production and security, fresh water supply, multiple forest products, etc.
 - Ecosystems or integrated natural resource approach could expand mitigation opportunities by integrating agriculture, forestland, grazing land and livestock maintenance activities, all of which provide mitigation opportunities.
 - Ecosystem or integrated natural resource approach (involving agriculture, forestry, grazing land, livestock, degraded land, etc) provides opportunities for multiple global environmental benefits belonging to all GEF focal areas;
 - Climate change mitigation; - carbon sinks in soil and vegetation
 - Climate change adaptation; soil organic matter enhancement, agro-forestry, shelterbelt etc. stabilize crop yields and farm incomes
 - Biodiversity conservation; protection and conservation of forests, grassland and agro-forestry activities
 - Land degradation; land reclamation of degraded lands through soil and water conservation, agro-forestry, etc.,
61. These cross-cutting issues focus on the relationship between measures to adapt natural resources at various scales to climate change and measures to promote adaptive management of natural resources. Natural resource management is itself a cross-cutting approach to management of resources by sectoral interests working in e.g. water, agriculture, forestry and land use planning. Adaptation to climate change involves risk-based predictive modeling of future change and appropriate response measures.
62. When considering climate change, the Science Panel advises that both mitigation and adaptation measures be considered together in assessing climate change as a driver for impacts on natural resource management. Natural resources are attributes of all the ecosystems present in an area, and the Science Panel uses the MA conceptual framework to relate NRM to ecosystem services.
63. The Science Panel proposes to address this cross-cutting area of work through convening interdisciplinary work focused on specific place-based impacts of climate change on a given ecosystem,

which need tools and methodologies to analyze this and put in place necessary adaptation measures. It is regarded as difficult to look at an ecosystem as a whole and not sub-units.