

Innovations in Evaluating the Impacts of Environmental Interventions: Approaches and Findings from Independent Evaluation at the Global Environment Facility

This article presents new tools and methodologies developed by the Independent Evaluation Office of the Global Environment Facility to better evaluate the longer term outcomes, transformative impacts, value for money and sustainability of the GEF's interventions, with a focus on the nexus between the environment and human and social factors.

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Introduction

The Global Environment Facility (GEF) was set up in 1991 as an international partnership to address pressing global environmental problems. Since then, the GEF has provided over \$17.9 billion in grants and mobilized an additional \$93.2 billion in co-financing for more than 4,500 projects in 170 countries. Projects focus on biodiversity, chemicals and waste, climate change, land degradation and international waters. The sixth replenishment of the GEF was recently completed in 2018 under the auspices of a dramatically changing environmental finance landscape (IEO, 2018a).

In the last decade, new funds, such as the Climate Investment Funds and the Green Climate Fund, and new agencies, such as the Asian Infrastructure Investment Bank and the New Development Bank, have been established; while existing multilateral institutions have invested significant resources to address climate change. In addition, targets for the Sustainable Development Goals have been established which reflect the interrelationships between environmental, social and economic goals. GEF programming has also shifted to create greater integration in the capture of synergies across various focal areas, while maintaining the obligations to the Conventions it serves.

Against this backdrop, independent evaluation by the GEF has also evolved, developing and applying a broad spectrum of tools and methodologies to better evaluate the GEF's longer term outcomes, transformative impacts, value for money, and sustainability. This article demonstrates the application of qualitative evaluation approaches combined with remote sensing, to address important evaluation questions

on the relevance, effectiveness and efficiency of GEF interventions drawing on recently completed evaluations by the Independent Evaluation Office (IEO) of the Global Environment Facility. The IEO is increasingly applying remote sensing and geospatial analysis methods to evaluate environmental outcomes, thus utilizing the opportunities made possible by satellite data, effectively combining this with qualitative information and field verification. Geospatial approaches have helped us address several limitations in our evaluations: they provide basic location data of the intervention, fill gaps in baseline data availability, and provide outcome information on important environmental variables over long term trends at a relatively low cost. Drawing on the existing literature, we also present a framework we developed for evaluating transformational change, which is increasingly being applied ex-ante to determine projects' potential for transformative change. Finally, we present the "value for money" analysis that we developed to examine the returns to GEF investments, and improved methods for examining the sustainability of GEF interventions.

"Geolocating projects can provide valuable insights into whether interventions are being implemented in areas which need them the most".

Addressing Relevance with Geospatial data

Geolocating projects can provide valuable insights into whether interventions ➤

Figure 1: Geolocations of GEF Biodiversity projects and Key Biodiversity areas



Study the impact of GEF support to 1292 global protected areas across 147 countries.

► are being implemented in areas which need them the most. Figure 1 shows the location of GEF protected areas overlaid with important biodiversity areas, carried out as part of an IEO study of GEF support to 1292 global protected areas across 147 countries. The results depict the number of GEF protected areas which fall in areas with significant biodiversity, and in this case suggest that GEF biodiversity projects are relevant and are mainly implemented in key biodiversity areas.

environmental impact (Lech et al, 2018). They provide reliable and cost-effective baseline information, help detect changes over time, and track progress toward the achievement of convention targets. We present the findings from GEF interventions in Lake Victoria as well as biodiversity activities in Jordan. Given scarce resources and time constraints, remote sensing and geospatial data and tools are valuable in complementing other evaluation methods. These tools have the potential for use in ecological forecasting, which can then be used in ex-ante assessments of forest cover, habitat quality, and carbon sequestration at a fine scale.

Using Remote Sensing to Measure Environmental Outcomes

Remote sensing and geospatial methods are useful, innovative tools for measuring

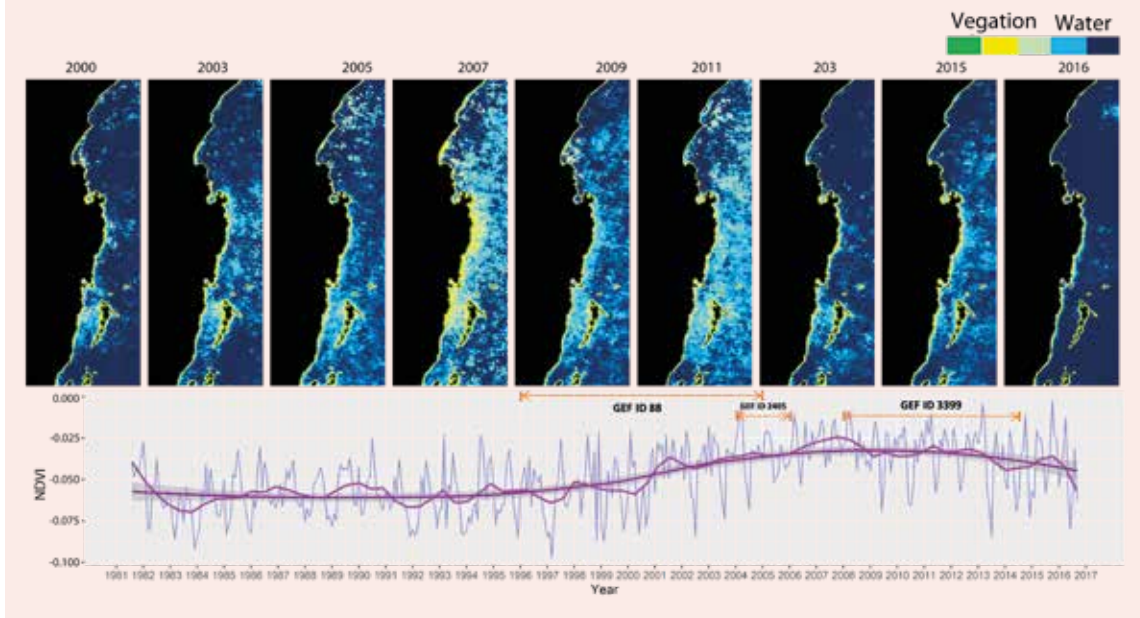
In the evaluation, remote sensing methods were used to observe changes in ►

BOX 1. IMPACT OF GEF INTERVENTIONS IN LAKE VICTORIA

Lake Victoria, with a surface area of about 68,800 km², is the second largest freshwater body in the world. It is a valuable transboundary resource shared by Kenya, Tanzania, and Uganda. In addition, Rwanda and Burundi are part of the upper watershed that drains into Lake Victoria through the Kagera River.

The water hyacinth is an invasive weed that was first reported in Lake Victoria in 1988. It quickly spread across the lake, cutting off communities and putting the economic and food security of millions at risk. Over the past two decades, the GEF has supported Lake Victoria communities by addressing major threats to the lake's ecosystem, including clearing the water hyacinth on site as well as nutrient load management in the upstream areas such that the nutrient load is lessened in the lake.

Figure 2: Vegetation productivity trend around Lake Victoria



► hyacinth infestation (figure 2). By the end of 2016, satellite data observed vegetation productivity - measured in terms of the normalized difference vegetation index (NDVI) – and showed that overall vegetation in Lake Victoria had entered a decreasing phase (IEO, 2016a).

The results show consistent improvement in vegetation cover around all the reserves included in the project. For example, in the Al Hashemiah reserve, the vegetation growth trend has visibly improved since 2013 (figure 2) with the average summer vegetation productivity (NDVI) in 2015 increasing by about 10 percent over pre-project 2012 levels. Overall, the vegetation significantly improved inside the range reserve as compared to outside the range (IEO, 2016 c).

Evaluating Transformational Change

The GEF 2020 vision and strategy identified the need for transformational change to address environmental pressures in order to enhance GEF’s impact. We developed an evaluative approach to assess GEF interventions which were transformative - defined as those which helped achieve deep, systemic, and sustainable change with a large-scale impact in an area of global environmental concern (IEO, 2017). We applied four criteria that permit a differentiation between transformational interventions from engagements that are “merely” highly successful, complex or large in size (World Bank Group, 2016): ►

BOX 2. IMPACT OF GEF INTERVENTIONS IN BIODIVERSITY IN JORDAN

The Badia region in Jordan is a desert ecosystem spanning 80 percent of the country’s area; it is administratively divided into northern, middle, and southern parts. The Badia Ecosystem and Livelihoods Project (BELP) is designed to enhance ecosystem sustainability and local livelihoods through a number of strategic interventions. These include investing in ecotourism and land use planning in the north, in addition to developing water harvesting infrastructure, rangeland reserves, and diversification of livelihoods in the south where livestock is the primary income-generating activity. To observe progress in the rangeland revegetation program around these reserves, dense time-series remote sensing data from NASA satellites was analyzed.

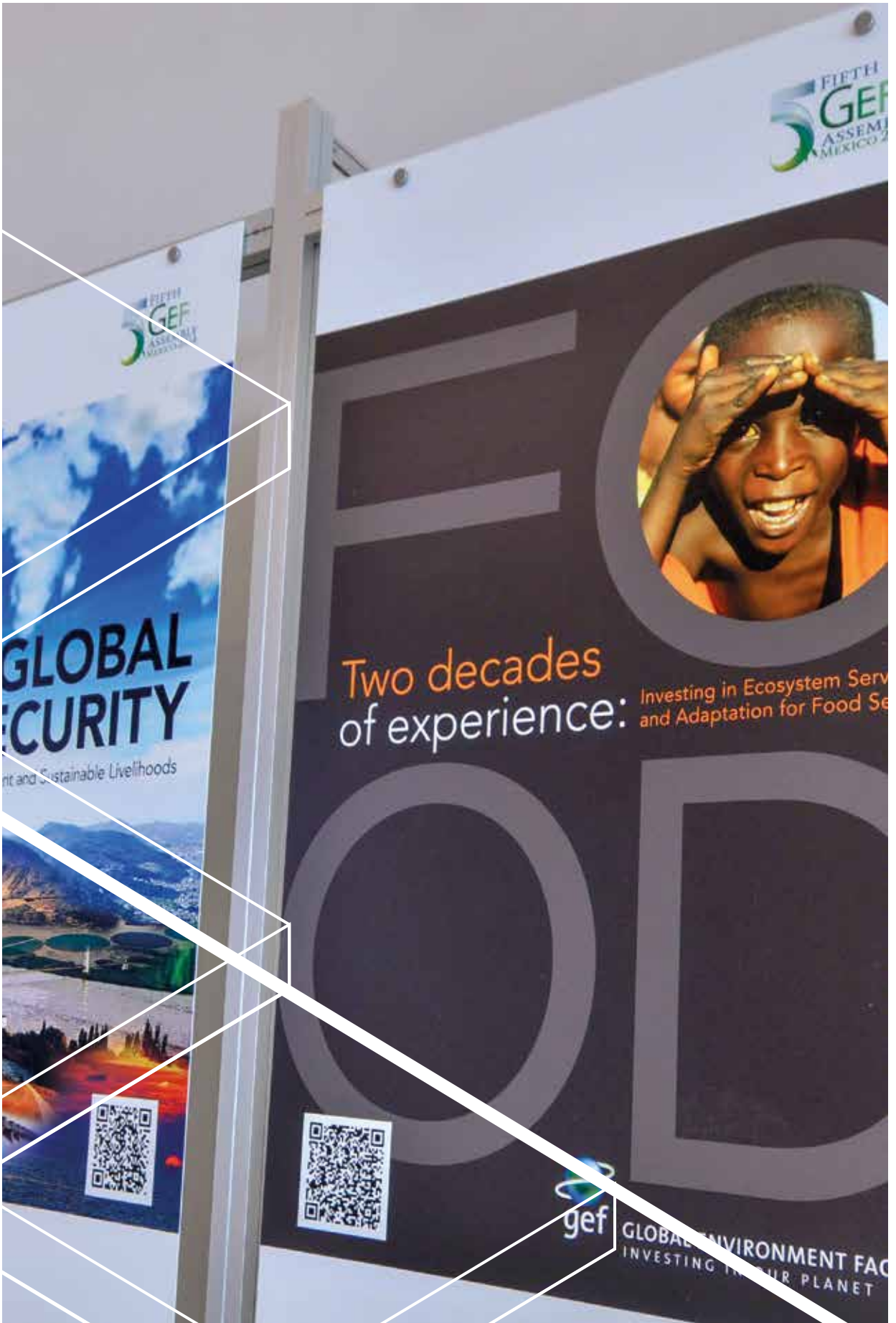
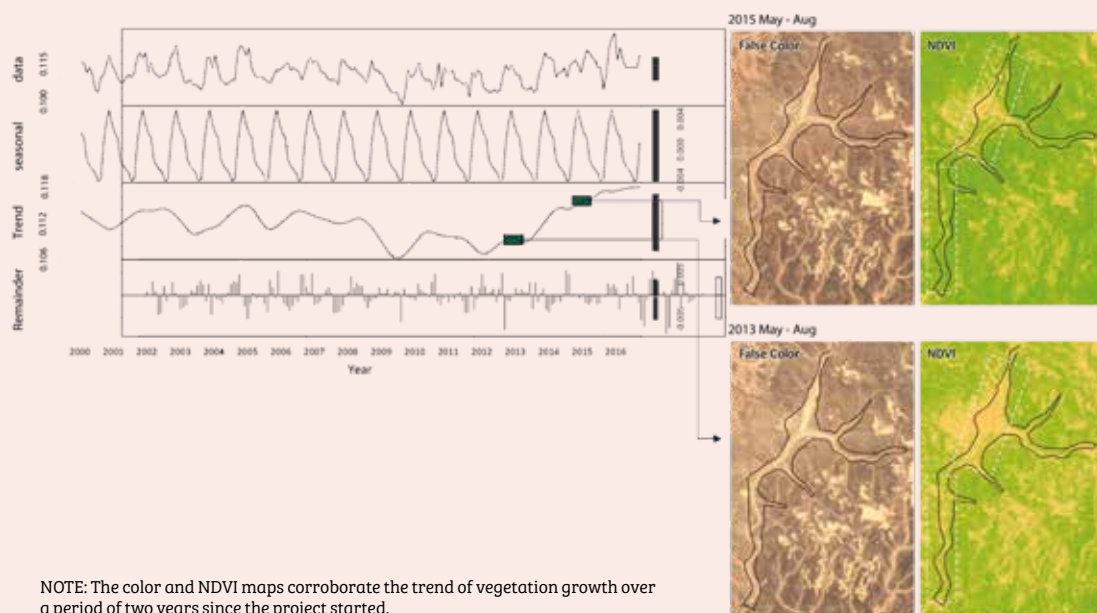


Figure 3: Vegetation growth trend around the Al Hashemiah reserve



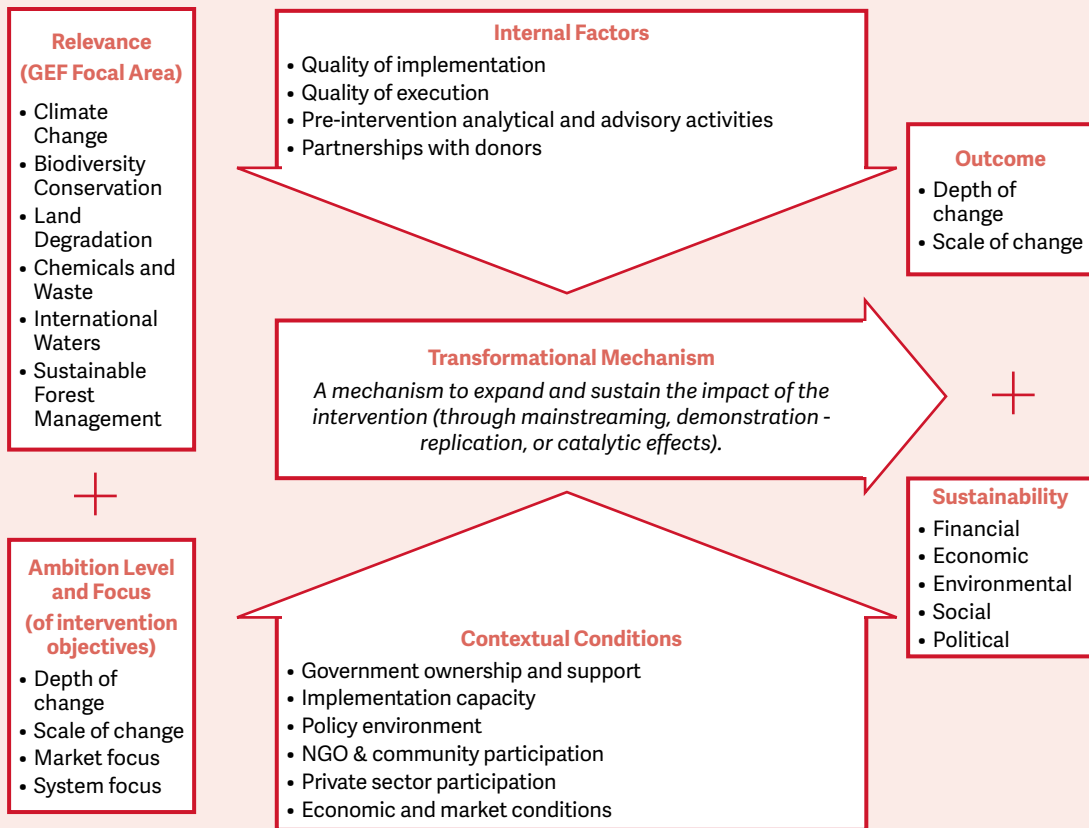
- ▶ ■ **Relevance:** the intervention addresses a global environmental challenge such as climate change, biodiversity loss, or land degradation.
- **Depth of Change:** the intervention causes or supports a fundamental change in a system or market.
- **Scale of Change:** the intervention causes or supports a full-scale impact at the local, national, or regional level.
- **Sustainability:** the impact is financially, economically, environmentally, socially and politically sustainable in the long term, after the intervention ends.

The underlying Theory of Change is that by strategically identifying and selecting projects that address environmental challenges of global concern and are purposely designed to ‘flip’ fundamental changes in key economic markets or systems, GEF interventions will be more likely to cause a large-scale and sustainable impact, subject to the quality of implementation/execution and supportive contextual conditions.

An outline of the Theory of Change, and the main causal conditions and indicators used for this study, are shown in Figure 4.

Applying the approach, the evaluation found a number of examples of transformational change generated by GEF projects:

- In 2016 Uruguay generated about 33% of its total electricity needs from wind power, up from 0% in 2008.
- Between 2005 and 2015, China’s wind power capacity increased from 1.3 GW to 129.3 GW thus producing about 3.3% of its electricity, and avoiding about 82.7 million tons/year of carbon emissions.
- Management effectiveness was improved in about 98% of Namibia’s protected areas, while estimated populations of lions, leopards, cheetahs and wild dogs doubled between 2004 and 2012.
- About 1.3 million households in remote, off-grid areas of Africa have ▶

Figure 4: Theory of Change for GEF Transformational Interventions

- ▶ purchased quality-certified solar PV lanterns at market prices through a market transformation scheme supported by the Lighting Africa program.
- About 13 “strict protection” areas totaling 13.2 million hectares, and 30 “sustainable use” protected areas totaling 10.8 million were created with the support of the Amazon Region Protected Areas Program.

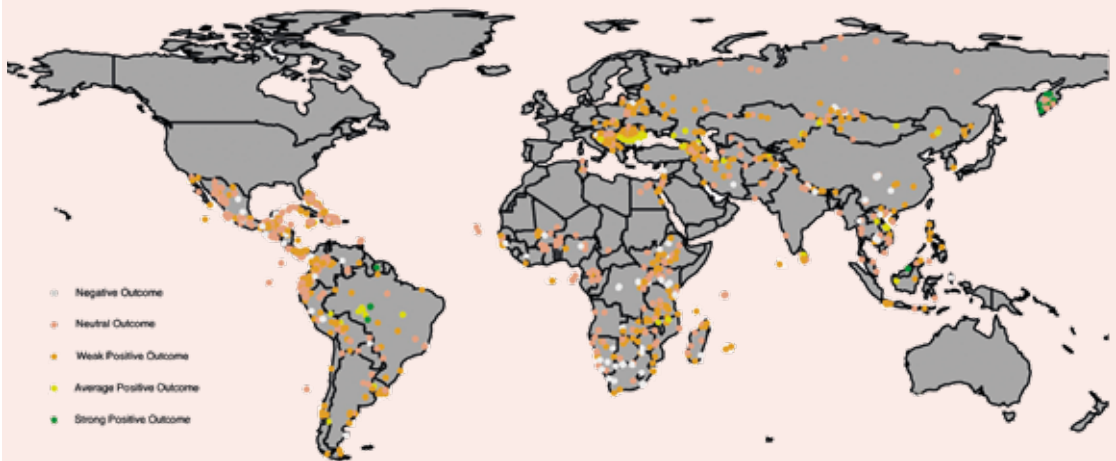
All of the above completed transformations involved a fundamental system change. They all established a demonstration-and-replication mechanism to trigger and scale up the supported activities and reforms. They were satisfactorily implemented and executed in addition to being adequately supported through good policy and a

positive economic environment. Finally, the evaluation found that ambition for transformation is important at the outset, but size is not important—medium-size projects can be just as transformational as major, multi-phase investment projects.

Does GEF Deliver Value for Money? Measuring the efficiency of GEF interventions in Land Degradation and Biodiversity

Increasingly donors are interested in understanding the efficiency of GEF investments. We developed a “value for money” analysis to examine the returns to GEF investments in land degradation and biodiversity interventions. This novel approach involved a multi-step approach of geocoding project locations and ▶▶

Figure 5: Impact of treatment in Biodiversity Projects



NOTE: Estimated impact of GEF biodiversity projects on NDVI. Strong outcomes are observed in Eastern Europe; neutral to negative outcomes tend to be clustered in Southern and Central Africa.

► combining outcome information on forest cover and forest fragmentation with other explanatory environmental variables such as temperature and proximity to infrastructure. Project locations were contrasted with geographic locations where no known intervention occurred (IEO 2016b) Propensity score matching, machine learning and causal tree approaches were used to understand the factors influencing environmental outcomes across project and control locations, impact estimates were constructed and valuations for carbon sequestration were estimated using a value transfer approach.

Land degradation analysis findings showed that the range of potential benefits from a single-focal area land degradation project is estimated at \$52–\$143/ha affected in terms of carbon sequestration alone. At the same time, soil retention promotes an additional value of \$10–\$43/ha, for a total valuation of \$62–\$186/ha across all land degradation projects. After all costs are accounted for, it is estimated that the per dollar return on investment for land degradation projects is approximately \$1.08 per dollar invested. However, this is likely to be an underestimate, as it only captures two

ecosystem services. In addition, the initial state of the environment is a key driver in GEF impacts, with GEF projects tending to have a larger impact in areas with a poor initial condition.

In the case of biodiversity, the results show that globally, GEF biodiversity projects tend to have a positive impact. A range of \$60–\$166/ha of affected area is estimated for carbon sequestration; an additional value of \$10–\$41 is estimated as attributable to soil retention benefits, for a total of \$70–\$207/ha. Geographically, impacts on forest cover were relatively homogeneous; however, significant geographic heterogeneity existed in the case of vegetation productivity (figure 5). On average, a return of \$1.04 per dollar was observed, in both land degradation and biodiversity. Impacts are observed after a time lag, and access to electricity is positively associated with outcomes.

Measuring the Sustainability of GEF Interventions

According to data from terminal evaluations conducted at project closure, 80 percent of completed GEF projects ►►

BOX 3. OUTCOME SUSTAINABILITY IN BA BE PROTECTED AREA USING REMOTE SENSING

The GEF project ‘Promotion of Sustainable Forest and Land Management in the Vietnam Uplands’ (GEF ID 3627), implemented from 2010 to 2013, supported sustainable forest management in Ba Be National Park. The project focused on local communities and piloted: improved systems for animal husbandry and conservation of sloping lands; bio-energy applications; payment for ecosystem services including participatory approaches to forest protection; and ecotourism. The threats to the forest included fragmentation of habitat, conversion of forest land for infrastructure and agriculture, illegal hunting and overuse for non-timber forest products. At completion, the project was rated “moderately satisfactory” for outcomes and “moderately likely” for sustainability. Figure 6 shows that although there was reported forest loss at the national level and in the buffer areas, remote sensing showed that protected forest cover in Ba Be was stable. Information gathered through interviews indicated that a community focused project design, due attention to income generation activities, and sustained support from provincial governments contributed to positive project outcomes.

► perform satisfactorily in achieving their expected outcomes (IEO, 2018b), but only sixty-two percent of the completed GEF projects were rated in the ‘likely’ range for outcome sustainability at project completion. This finding is comparable with other multilateral development organizations. It ranges from 52 percent in the African Development Bank to 66 percent in Asian Development Bank. Ratings for IFAD, the Inter-American Development Bank, the World Bank and the GEF are at 60 percent, 62 percent, 65 percent and 62 percent respectively. A higher percentage of projects in the countries with large GEF portfolios (Brazil, China, India, Mexico and Russia), and a lower percentage of projects in Least Developed Countries and in fragile states are rated in the ‘likely’ range for

outcome sustainability. The key factors that contribute to higher sustainability include high stakeholder buy-in, political support, availability of financial support for follow up, and sustained efforts from the executing agency. Box 3 provides an example of an analysis of sustainability in Vietnam. The analysis demonstrates the importance of combining geospatial data which provides the long term trend in outcomes, with the need for qualitative field verification to understand the reasons for changes observed.

Similarly, the GEF project in Maiko National Park in DRC has sustained environmental outcomes as there has been no increase in deforestation in the protected area despite the increase in the forest loss in the buffer. ►►

Figure 6: Ba Be: Sustainable Forest Management in Vietnam

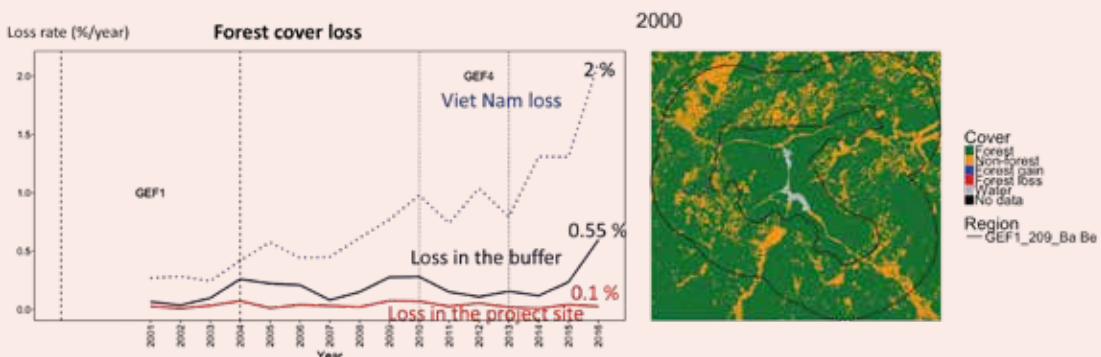
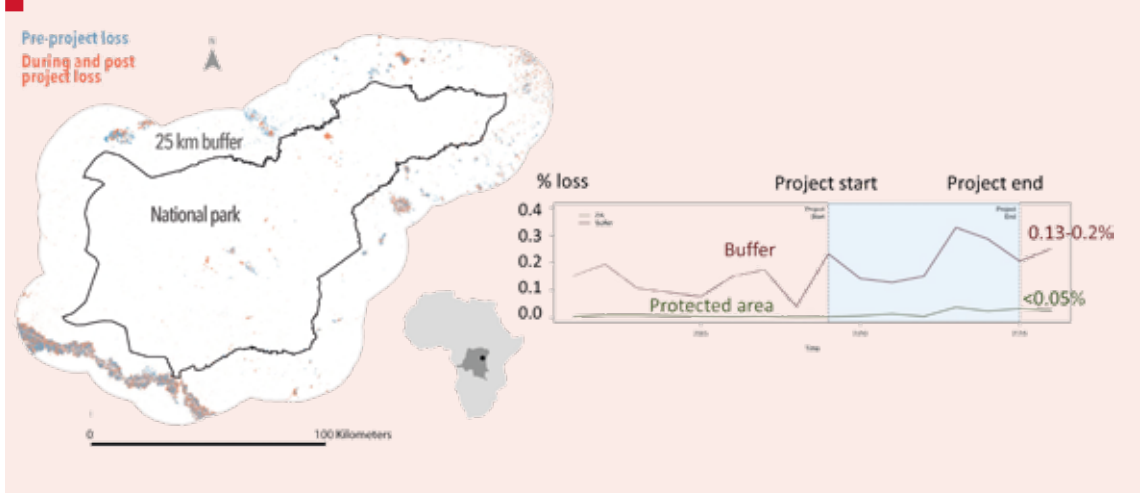


Figure 7: Maiko National Park: Sustainable Forest and Nature Conservation: DR Congo



► In contrast, there is no evidence of sustainable outcomes in the case of GEF interventions in the Cardamom mountains in Cambodia or the San Rafael National Park in Paraguay.

In each of these cases, remote sensing provided additional information that we would not have acquired using traditional evaluation methods, thereby strengthening the evidence base for the evaluation.

Conclusions

The methods and results presented in this article demonstrate recent efforts

by the IEO to adapt and address issues at the forefront of donor agencies during replenishment discussions. In particular, how is the GEF driving transformational change? Did the interventions provide value for money? Are the interventions sustainable in the long term? Addressing these questions has required a rethink of frameworks and tools applied in evaluation, as well as exploring the vast data sets now available to measure outcomes. The results reinforced the importance of using a combination of quantitative and qualitative approaches to evaluate environmental outcomes.



Figure 8: Cardamom Mountains: Integrated Protected Area System, Cambodia

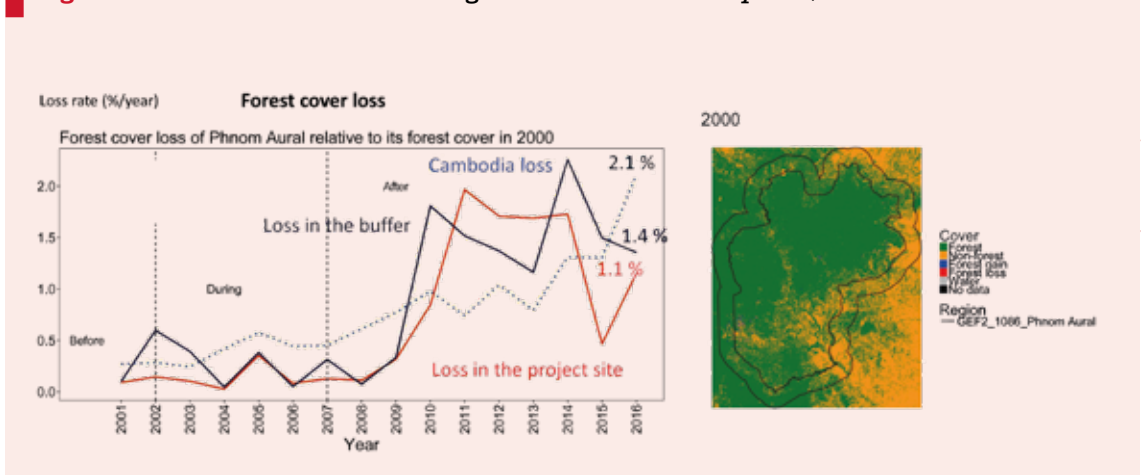
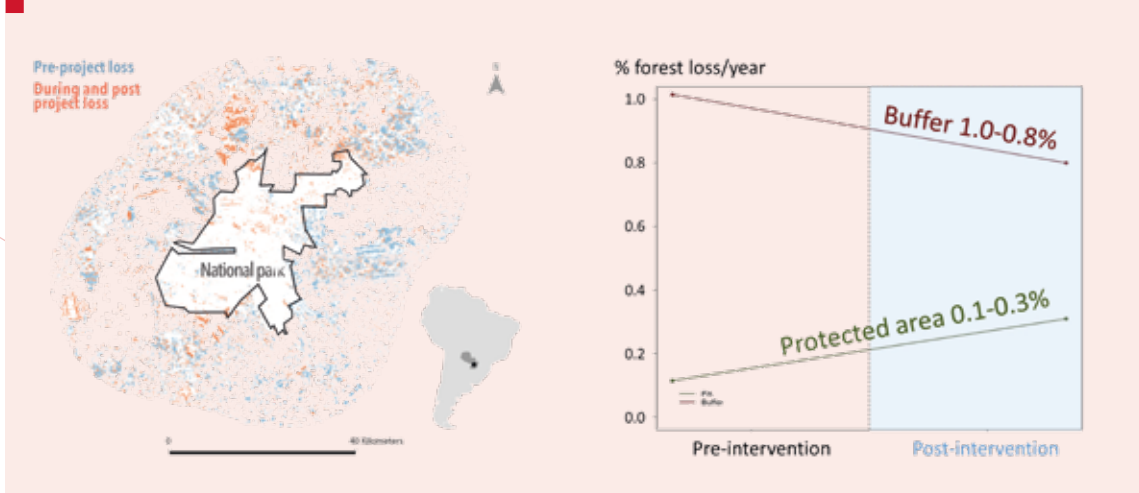


Figure 9: Conservation of Biodiversity, San Rafael National Park East Paraguay

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Authors' profile

Dr. Geeta Batra is Chief Evaluation Officer and Deputy Director of the IEO of the GEF, since June 2015. Prior to this position, Geeta was Manager of Country and Corporate Evaluations in the Independent Evaluation Group of the World Bank from 2010-2015. Prior to that, she set up and managed the Results Measurement System for Advisory Services in the International Financial Corporation (IFC), the private sector arm of the World Bank from 2004-2010. She was in the private sector development department of the World Bank from 1998-2004, responsible for investment lending and advisory operations. She has conducted and managed project, program and country level evaluations in a leadership role over the past 16 years. Geeta has a Ph.D. in Economics.



Dr. Juha I. Uitto is Director of the IEO of the GEF. He came to the position after being the Deputy Director of the IEO of UNDP from 2009 to 2014. Prior to that, he worked as an Evaluation Adviser at the United Nations Development Program (UNDP) and as Senior Monitoring and Evaluation Coordinator/Specialist with the GEF since 1999. He has conducted and managed programmatic and thematic evaluations of international cooperation at the global, regional and country levels, in particular related to environmental management and poverty-environment linkages. He served as the Executive Coordinator of the United Nations Evaluation Group (UNEG) from 2009 to 2012 and again in 2014. Dr. Uitto spent the 1990s with the United Nations University (UNU) coordinating the university's environment and sustainable development research and training programs. He was educated at the Universities of Helsinki and Lund, and holds a PhD in Social and Economic Geography. He has authored/edited several books and published more than 40 peer reviewed articles and book chapters on topics related to the environment, natural resources management, environmental hazards, and evaluation.

