IEO BRIEF

A Value for Money Analysis of GEF Interventions in Land Degradation and Biodiversity

Independent Evaluation Office
GLOBAL ENVIRONMENT FACILITY

This study determined the value for money of GEF land degradation and biodiversity projects as measured by key UNCCD and CBD indicators

KEY FINDINGS

1. Overall global positive impact. Evidence from this analysis suggests that GEF land degradation and biodiversity projects have had a global net positive impact on both forest cover and vegetation productivity—as per the normalized difference vegetation index (NDVI)—with valuations in terms of carbon sequestration and soil retention ranging from $62 to $207 per ha affected.

2. Impacts vary considerably. Considerable heterogeneity exists in the absolute impact of GEF projects:

- Land degradation projects tended to perform best in areas with poor initial states along both key indicators assessed: forest cover and vegetation productivity.
- Both biodiversity and land degradation projects tended to be more effective in areas with access to electricity.
- Biodiversity projects tended to have more immediate positive impacts (observable after 1 year, as opposed to approximately 4.5 years for land degradation), in particular in areas with lower temperatures.
- Land degradation projects tended to have longer-term impacts and performed better than biodiversity projects in areas with poor initial states.

BACKGROUND

To examine value for money, a series of quasi-observational experiments were conducted in which land degradation and biodiversity project locations were contrasted with geographic locations at which no known intervention occurred, and that are similar in terms of observable characteristics—i.e., initial environmental state, proximity to infrastructure, and environmental characteristics. These contrasted locations were used in conjunction with hybrid econometric propensity score matching

PURPOSE AND METHODS: This study integrated satellite and other spatial data on the geographic location of Global Environment Facility (GEF) land degradation and biodiversity projects, and related measurements on indicators suggested by the United Nations Convention to Combat Desertification (UNCCD) and the Convention on Biological Diversity (CBD). These data, alongside related information on the geographic context and characteristics of GEF projects, were used in a matching-based quasi-observational study design to test hypotheses on the effectiveness of GEF projects along two primary dimensions: forest cover change and vegetation productivity.

WEB PAGE: www.gefieo.org/evaluations/value-money-analysis-land-degradation-projects-gef

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and machine-learning techniques to account for both potential variation in treatment effects across different socio-political and environmental conditions, and uncertainty in underlying assumptions and data.

Recent work has illustrated that, with certain adjustments, machine-learning approaches can be used to identify how the causal effects of an intervention (e.g., international aid, a medical treatment) vary across key parameters. This is relevant in top-down or global-scope analyses, as it is unlikely that GEF projects will have the same effect across highly variable geographic contexts, and the drivers of such variation may not be known.

A wide range of environmental, socioeconomic, and project characteristic covariate information was leveraged to ensure comparisons were made between similar sets. Covariate information leveraged included distance to roads, rivers, urban areas (travel time), nighttime light intensity, slope, elevation, temperature, and precipitation (including mean, minimum, and maximum), as well as geographic factors such as latitude and longitude to promote matches that were reasonably geographically proximate. Matches were limited to be within a minimum of 50 km and a maximum of 250 km of each treated location.

After impact estimates were constructed following the causal tree approach, valuations were estimated in a two-step procedure.

- The National Aeronautics and Space Administration's (NASA's) carbon storage data set and the Intergovernmental Panel on Climate Change's (IPCC's) Tier-1 Global Biomass Carbon Zones were used to translate the impact of GEF projects on the two indicators into estimates of carbon sequestration using a linear modeling approach that accounts for regional differences in the relationship between flora and the indicators.
- A value transfer approach was used to approximate valuations for both carbon sequestration and biodiversity. In this approach, the value of nonmarket services is approximated through examination of a previous study or group of studies on similar nonmarket services. While primary data collection on valuation can provide strong, in-situ measurements of valuation, evidence suggests that the density of literature on similar services—as well as the cost-effective nature of the value transfer approach—positions value transfer as a strong second-best strategy.

A similar two-stage approach was followed to estimate the value of increased soil retention attributable to GEF projects. Because of the inherent uncertainty in valuations throughout the literature, a range of values was reported in each case.

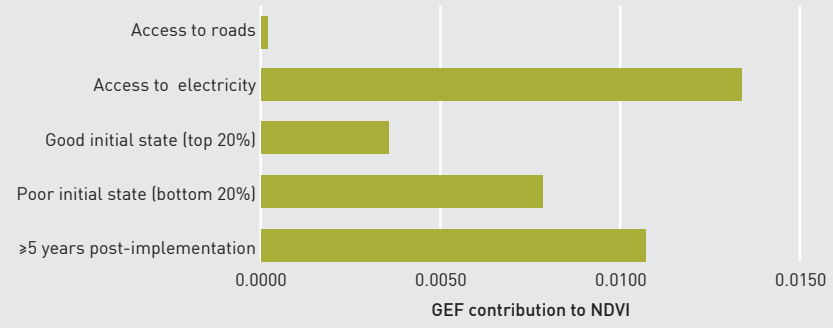
RESULTS

Land degradation. Previous research by the GEF IEO examined the impact of GEF land degradation projects on three indicators endorsed by the UNCCD's 2015 land degradation neutrality scientific framework: forest cover, vegetation productivity, and forest fragmentation. This study identified a global positive impact of GEF projects along all indicators examined, but also noted considerable heterogeneity in these impacts across different geographic contexts (figure 1). Findings include the following:

- A lag time of 4.5–5.5 years was an important inflection point at which impacts were observed to be larger in magnitude.
- Projects with access to electricity tend to have some of the largest relative positive impacts.
- 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.
- Projects in Africa and Asia had generally positive impacts on average. Projects in Latin America and the Caribbean, North and South America, and Oceania all had positive impacts on all three indicators.

The analysis identified a range of values consistent with previous analyses of the value of land degradation projects. Because considerable uncertainty exists, 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; soil retention promotes an additional value of $10–$43/ha, for a total valuation of $62–$186/ha across all land

FIGURE 1: Key factors driving positive impacts of GEF land degradation projects

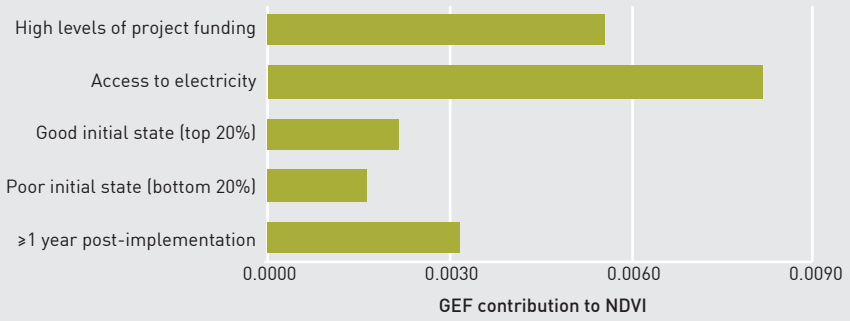


degradation projects. After costs are accounted for, it is estimated that the per dollar return on investment for land degradation projects is approximately $1.08 per dollar invested. This is likely to be an underestimate, since it only captures two ecosystem services.

Biodiversity. This analysis extended the value for money methodology applied to the land degradation case to GEF biodiversity projects, identifying a globally positive impact of biodiversity projects on vegetation productivity and forest cover. Figures 2 and 3 summarize these findings along three dimensions: the global impact on forest cover (figure 2a) and NDVI (figure 2b), and a contrast of dimensions that were associated with more positive outcomes (figure 3). Findings include the following:

- Globally, GEF biodiversity projects tend to have a positive impact on both indicators assessed.
- An improvement in performance was observed as projects increased in size, with the strongest positive outcomes observed in the top 20 percent of funded projects.

FIGURE 3: Association between positive GEF biodiversity project outcomes and relevant covariates



- Biodiversity projects had noticeable impacts after the first year of implementation.
- Biodiversity projects are sensitive to access to electricity.

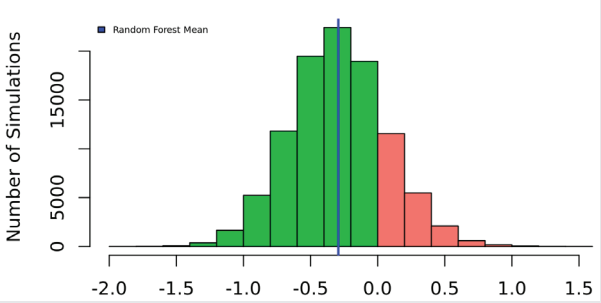
The valuation of biodiversity projects was conducted using the same approach as for land degradation activities. Following this methodology, a range of $60–$166/ha of affected area is estimated for carbon sequestration; an additional value of $10–$41 is estimated as attributable to soil retention benefits, for a total of $70–$207/ha. On average, a return of $1.04 per dollar invested was found, though considerable uncertainty remains around this value. Geographically, impacts on forest cover were relatively homogeneous; however, significant geographic heterogeneity existed in the case of vegetation productivity (figure 4).

CONCLUSIONS

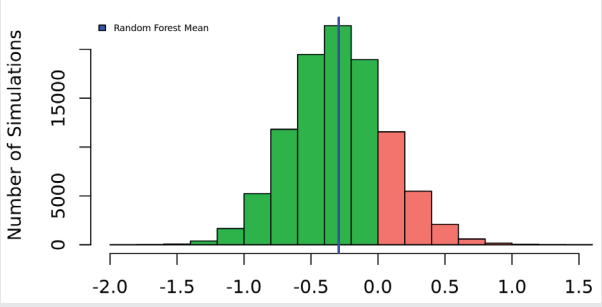
The geospatial impact evaluation presented here sought to estimate the value for money resulting from GEF projects implemented in the land degradation and biodiversity focal areas. Findings suggest that the GEF has,

FIGURE 2: Model uncertainty

a: Estimated mean impact 2013 forest cover (km²)

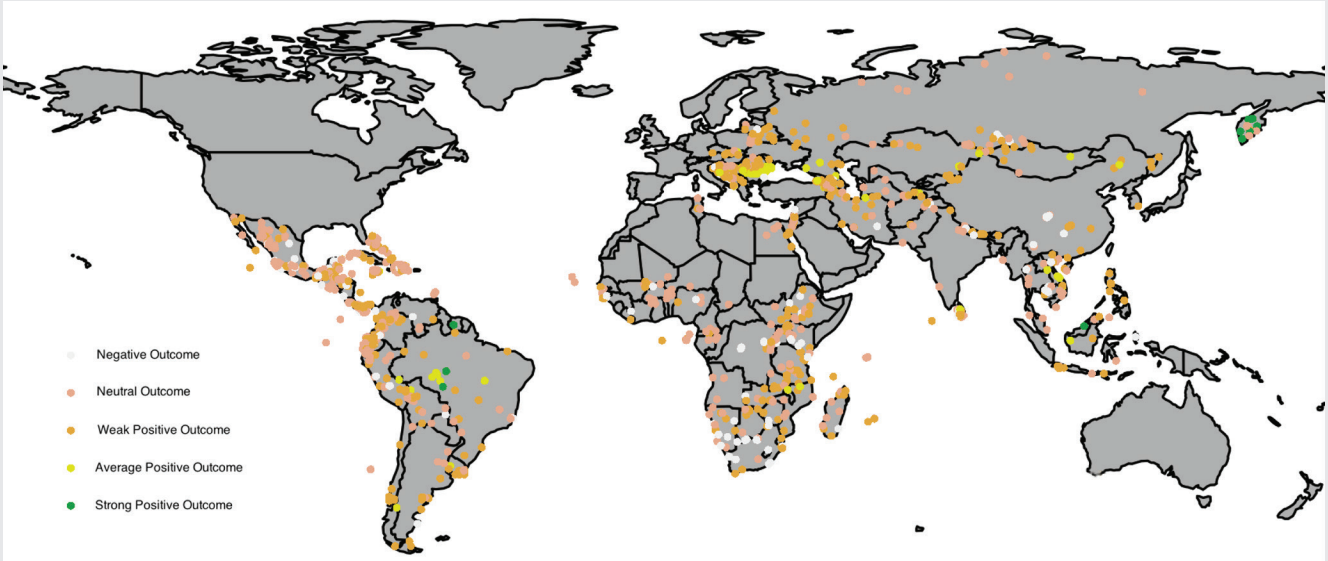


b: Estimated mean impact NDVI pre-/post-implementation difference



NOTE: The global impact of biodiversity projects on forest cover (figure 2a) and NDVI (figure 2b). The blue line indicates the average across all model runs. The height of each bar indicates the number of models that identified a given result. Positive NDVI values indicate an increase in vegetation productivity; negative forest cover values indicate an increase in avoided forest cover loss. The higher green bars reflect greater certainty in the prediction of environmental benefits being measured.

FIGURE 4: Impact of treatment



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.

globally, been effective in improving environmental conditions both through an increase in vegetation productivity as well as a reduction in the rate of forest cover loss. Critically, this study suggests that the local context in which programs are implemented can be assessed for suitability of interventions. By examining where projects have historically worked—or failed—better decisions as to how to site and fund projects in the future can be made. This study represents a first step along this path, and provides general guidance to implementers regarding the contexts in which GEF projects have been most successful.

The evidence presented in this analysis further highlights that assessing the geospatial contexts in which projects might be placed before their implementation can result in stronger positive outcomes. By targeting funds at locations that have both the poorest initial conditions and geographic characteristics for which GEF project implementations are known to provide strong outcomes, better outcomes can be achieved.

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