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Evaluation Report No. 48

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Contents

Foreword	v
Acknowledgments	vi
Main Report	1
1 Overview of Impact Evaluation Work in 2008	1
2 Case Study of the Social Impacts of Protected Areas: North and Northeast Thailand.....	3
3 Case Study on the Social Impacts of Protected Areas: Costa Rica.....	4
4 Conclusions on Impact Evaluation Work in 2008	5
Annex: Selected Social Impacts of Protected Areas in Thailand and Costa Rica	7

Foreword

This is the second annual impact report produced by the Evaluation Office of the Global Environment Facility (GEF). The Office presents its impact work in a consolidated annual report, which covers work that has produced final products during the period covered, as well as ongoing work. The Office continues to explore the range of methodologies that can be usefully applied to evaluate the impacts achieved by GEF-supported activities.

The *Annual Impact Report 2008* brings together the results of two interrelated approaches that explore the value of using quasi-experimental methods to construct accurate counterfactuals for project intervention areas. In the current cases, these approaches establish the outcomes had protected area systems not been created. While such quasi-experimental studies are interesting and provide insights into what is happening in a well-structured and rigorous way, the Office's main methodology for tackling impact questions is a theory-based approach, which aims to unwrap

and evaluate the assumptions of why project interventions are supposed to achieve impact on the global environment.

At the time of this report's publication, preparations were under way for a theory-based impact evaluation of GEF support in countries with economies in transition to reduce production and consumption of ozone-depleting substances.

Because no decisions were proposed on the basis of this report, it was presented to the GEF Council in November 2008 for information purposes only. The documents on which this annual impact report is based are available on the GEF Evaluation Office Web site (www.gefeo.org).



Rob van den Berg
Director, Evaluation Office

Acknowledgments

The Evaluation Office impact evaluation work was coordinated by task manager David Todd, Senior Evaluation Officer, who has been responsible for further developing the Office's approach to impacts, building on the material reported in the *Annual Impact Report 2007*.

For the current report, quasi-experimental work in Costa Rica was conducted by principal author Kwaw Andam, International Food Policy Research Institute, Addis Ababa, Ethiopia. The report's

coauthors were Paul Ferraro, Department of Economics, Andrew Young School of Policy Studies, Georgia State University; and Margaret Holland, Gaylord Nelson Institute for Environmental Studies, University of Wisconsin–Madison.

A separate but related quasi-experimental study in Thailand was conducted by Katharine Sims of Amherst College.

The Evaluation Office remains fully responsible for the contents of this report.

1 Overview of Impact Evaluation Work in 2008

The *GEF Annual Impact Report 2007* concluded that, in its impact evaluation work, the Evaluation Office of the Global Environment Facility (GEF) would pursue “a mixed-method approach that includes macro-level statistical analysis...as well as case studies of projects.” This approach has been pursued in 2008 through a number of inter-related activities.

Impact evaluation has become a high-profile topic in the international development arena and one subject to considerable debate. Much of the discussion has revolved around the efficacy and acceptability of different methodological approaches. The GEF Evaluation Office has been actively engaged in this international debate and is collaborating in numerous initiatives both to remain on the cutting edge of the discussion and to share its growing expertise.¹ A senior evaluation specialist in the Office serves on the Steering Committee of the Network of Networks on Impact Evaluation

¹One relevant partner with which intended collaboration has not yet been initiated is the United Nations Environment Programme’s Early Warning group, which has access to substantial data sets, notably of satellite imagery and aerial photography, on environmental change. An agreement to collaborate in developing impact evaluation uses of these data sets will be developed during 2009.

and on the Coordinating Committee of the United Nations Evaluation Group (UNEG); he is also co-chair of the UNEG Task Force on Impact Evaluation. Thus, the Evaluation Office is fully informed regarding current best practice trends in impact evaluation, and its experience and products are widely known.

Following up on the initial quasi-experimental evaluation of the impacts of protected areas on deforestation in Costa Rica—an effort conducted in collaboration with the GEF’s Scientific and Technical Advisory Panel (STAP)—which was reported on in *GEF Annual Impact Report 2007*, two new quasi-experimental impact evaluations have been performed, also in collaboration with the STAP. These were conducted by providing limited funds to specialist researchers, enabling them to analyze existing data sets to explore topics relevant to the GEF. In 2008, the following two studies were commissioned and managed by the GEF Evaluation Office; both are now completed:

- **Evaluating the Local Socioeconomic Impacts of Protected Areas: A System-Level Comparison Group Approach.** This study focused on the protected area system of Thailand, which is about to receive GEF support.
- **Measuring the Social Impacts of Protected Areas: An Impact Evaluation Approach.** This study focused on the Costa Rica protected area system (which has received GEF support)

and enabled a comparison with the Evaluation Office 2007 study of avoided deforestation of the same system.

The two studies have provided important insights on the impacts of protected areas, an area of investigation first undertaken by the Office with its efforts in East Africa in 2007. One reported finding of that body of work was the negative socioeconomic impacts experienced by one subgroup (the Batwa) in the locality neighboring one protected area. This raised the broader issue of the socioeconomic impacts of protected area systems, a major component of GEF-supported activities in the biodiversity focal area. The two studies conducted in 2008 found the following:

- Districts surrounding protected areas in Costa Rica and Thailand experienced less poverty than carefully controlled counterfactual districts not adjacent to protected areas with similar geographic and physical characteristics.
- When these districts were compared with counterfactual districts in similar locations but not adjacent to protected areas, the latter were even poorer. Thus, proximity to a protected area in fact emerged as having a positive effect on income.
- Income inequality increased near protected areas in Thailand (data on this factor were not available for Costa Rica), so an aggregate income improvement may disguise pockets of worsening poverty.

Because Costa Rica and Thailand have relatively high income levels as compared with most developing countries, and since both already have well-developed tourism industries, the specific national-level findings should not be assumed to apply to protected area systems in other countries.

The Evaluation Office is conducting a third case study in addition to the two quasi-experimental

studies of protected area systems noted above. This third study looks at a completed GEF project—the Regional Integrated Silvopastoral Approaches to Ecosystem Management Project (GEF ID 947)—which was conducted by the World Bank in Colombia, Costa Rica, and Nicaragua and had an experimental design featuring participant and control groups of farmers. The case study draws on existing research, compiled by a doctoral researcher formerly associated with the GEF Evaluation Office. Limited follow-up fieldwork was conducted to evaluate the strengths and weaknesses of the project’s experimental design and impacts at the field level, including the adoption of improved silvopastoral practices, environmental benefits, socioeconomic benefits, and the sustainability of land use changes. The case study was completed in November 2008 and will be reported on in the next annual impact report.

The Office’s major impact evaluation activity in 2008 entailed the methodological development for and initial implementation of an impact evaluation of GEF activities concerning the reduction of ozone-depleting substances. This evaluation uses a theory-based approach and will include extensive statistical analysis of the impacts of GEF activities as compared with those of the Multilateral Fund of the Montreal Protocol. It entails a detailed desk review of all relevant GEF activities (focusing particularly on terminal evaluations) and the scientific literature, and an analysis of statistical data available from the Montreal Protocol. Detailed fieldwork will be conducted in Kazakhstan, Russia, Ukraine, and Uzbekistan. During the study preparation, discussions were held with STAP members and with the Evaluation Offices of GEF partners, as a result of which the evaluation is being conducted in collaboration with the United Nations Environment Programme and the United Nations Industrial Development Organization. The initial findings of this work will be incorpo-

rated into the final report of the GEF Fourth Overall Performance Study (OPS4) and included in the *GEF Annual Impact Report 2009*.

The extensive development of impact evaluation approaches has been fed into the design of the methodology for the evaluation of results in OPS4. In addition to including the findings of the protected area and ozone-depleting substances evaluations in the OPS4 results analysis, the Office's theory-based approach is being adapted so that it can enable an improved understanding and reporting of results throughout the GEF portfolio. Theories of change are being developed for all major areas of GEF activity; early testing has shown that they facilitate an improved understanding of the sustainability and catalytic effects of GEF support after formal project closure.

2 Case Study of the Social Impacts of Protected Areas: North and Northeast Thailand

This evaluation approach develops and applies a new comparison group-based method for evaluating the socioeconomic effects of protected areas on local communities across a protected area system. The approach was designed to extend and complement program evaluation methods previously developed by the GEF Evaluation Office.

Protected areas, including those supported by the GEF, now cover a significant fraction of the global land area. However, little is known about their net effects on local incomes or poverty rates. Community-level economic development could be reduced by restrictions on land use or resource extraction activities, but could also be supplemented by a new tourism sector or increased environmental benefits. Empirical work on the actual impacts of protected areas has been limited to date by the lack of data on poverty outcomes at the appropriate spatial scale and the nonrandom

selection of protected area locations, which complicates the construction of a useful comparison group.

The approach presented here analyzes a protected area system across a national or subnational area with respect to socioeconomic and environmental impacts at the community level. It is applied in the context of Thailand's national protected area system, using data at the subdistrict level from the north and northeast regions of the country. To measure socioeconomic outcomes, data are used from new poverty mapping techniques that estimate community-level incomes and poverty rates. To assess impacts, the approach relies on evaluating differences between communities with protected land and comparison communities in the same province or district with a similar likelihood of protection and similar preprotection development potential. The comparison group was constructed on the basis of an analysis of the history of protected area designation in Thailand, in order to account for the chief factors that determined protection and might also influence outcomes.

The method applied here could productively be used to evaluate protected areas in other countries or to evaluate impacts of other large-scale environmental projects supported by the GEF. Ideally, it would complement existing studies, including case comparisons or household survey work, by providing a broader overview of impacts across a larger number of sites.

The results of this case study indicate that protected forest areas in north and northeast Thailand have prevented forest clearing that otherwise would have occurred and thus have imposed a constraint on land available for agricultural use. Subdistricts with more land in protected areas had significantly more forest cover by 2000 than did appropriate comparison subdistricts (9 to 25 percentage points more for national parks,

and 11 to 32 percentage points more for wildlife sanctuaries).

The study found that national parks and wildlife sanctuaries, even though they reduce the land available for agricultural production, did not harm average consumption levels or increase poverty rates. Looking only at correlations, subdistricts with more land in protected areas were indeed substantially poorer than the province averages. However, after controlling for geographic characteristics and preprotection development potential, the analysis indicates that this poverty is not the result of the protected areas. Subdistricts with more land in wildlife sanctuaries did not have significantly different consumption levels or poverty headcounts than counterpart comparison subdistricts. Subdistricts with more land in national parks had significantly higher consumption levels (2 to 7 percent) and lower poverty rates (4 to 12 percent) than comparison subdistricts. Inequality measures are higher on average for communities near the national parks, which indicates that a disproportionate share of these gains went to higher income households.

The results suggest that, on average, at the community level, the gains from protection have been sufficient to offset the costs of land use constraints. The most probable mechanism for the positive economic effect of national parks is increased income from tourist visits in and near the parks. The Thai government has actively promoted national parks as tourist destinations, and official statistics cite over 10 million tourist visits to national parks in 2000. Consumption levels are positively associated with the popularity of parks as measured by tourist visits; a higher flow of tourists is a likely explanation for the stronger positive effects for national parks as compared with wildlife sanctuaries, where tourism opportunities are limited. See tables A-1 through A-3 in the annex for a summary of key results.

3 Case Study on the Social Impacts of Protected Areas: Costa Rica

This case study evaluated the socioeconomic impacts of Costa Rica's protected area network, a network in which the GEF has invested for many years. The study used a quasi-experimental approach to provide estimates of the aggregate social impacts of protected areas. It looked to answer the question "What is the effect of this protected area on economic outcomes within neighboring communities?"

To answer this question, the effects of other variables on the economic outcomes in local communities affected by protected areas must be isolated. This in turn requires the establishment of a counterfactual: "What would have happened if this protected area had not been established?" Matching methods provide a way to find suitable comparisons for communities affected by protection, thus establishing the counterfactual.

The study measured the impacts of Costa Rican protected areas established before 1980 on changes in socioeconomic outcomes between 1973 and 2000. It used matching methods to identify suitable counterfactuals for protected census segments to control for the overt bias from non-random placement of protection. It matched each area affected by protection with similar unprotected areas based on relevant preprotection variables that affect the likelihood of protection as well as changes in socioeconomic outcomes. It also estimated the spatial spillover effects of protection on unprotected areas located near the protected areas and assessed the sensitivity of the results to various changes in the sample or matching specification (see tables A.4 and A.5 in the annex).

The study found no evidence that protected areas in Costa Rica have had harmful impacts on the

aggregate livelihoods of local communities. On the contrary, it found that protection has had *positive* effects on socioeconomic outcomes. For example, The establishment of protected areas is associated with a lower poverty index in local communities affected by protection. It also found that protection led to better outcomes in terms of the condition of housing and access to water supply, but found no significant differences in other (slightly higher income level) indicators such as measures of access to electricity or telephones.

Conventional statistical evaluation techniques (such as a difference in means test or ordinary least squares regression) produced biased estimates when applied to the study sample. In contrast to the results indicated above, those conventional methods erroneously implied that protection had negative impacts on the livelihoods of local communities. These findings suggest that conventional methods that fail to control for confounding factors or outcome baselines can lead to inaccurate estimates. The case study demonstrates the specific value delivered by applying an impact evaluation approach, which carefully identifies suitable counterfactuals for measuring the social impacts of protected areas.

4 Conclusions on Impact Evaluation Work in 2008

The Evaluation Office has made substantial progress in developing and implementing a variety of approaches for assessing the impacts of GEF interventions. The Office is now evaluating the impacts of the GEF program aimed at assisting in the elimination of ozone-depleting substances in countries with economies in transition; the findings from this evaluation will be incorporated into OPS4. Additionally, two quasi-experimental evaluations have been completed, both addressing an issue of great significance to GEF policy and practice—the socioeconomic impacts of protected area projects. The conclusions from these two analyses show that the most effective evaluative perspective is gained by combining methodological approaches to ensure that both macro- and local-level impacts are accurately assessed. The impact evaluation work of the Evaluation Office has contributed to and benefited from substantive engagement in key international forums that are leading the further development and implementation of approaches in the field.

Annex: Selected Social Impacts of Protected Areas in Thailand and Costa Rica

Table A.1

Consumption/Poverty Headcount Ratio and Protected Areas: Thailand

Parameter	No controls	Province fixed effects only	Slope/elevation controls	Geographic controls	Full controls
Dependent variable: log mean consumption					
National park (percent)	-0.191***	-0.170***	0.061	0.133***	0.133***
Standard error	(0.044)	(0.045)	(0.040)	(0.037)	(0.037)
Wildlife sanctuary (percent)	-0.278***	-0.217***	-0.000	0.098*	0.106*
Standard error	(0.069)	(0.075)	(0.055)	(0.055)	(0.055)
Northeast dummy	Yes	Yes	Yes	Yes	Yes
Province fixed effects	No	Yes	Yes	Yes	Yes
Slope and elevation controls	No	No	Yes	Yes	Yes
Geographic controls	No	No	No	Yes	Yes
Historical forest cover	No	No	No	No	Yes
Adjusted R2	0.143	0.417	0.466	0.570	0.574
N	4113	4113	4113	4113	4113
Dependent variable: log poverty headcount ratio					
National park (percent)	0.576***	0.458***	-0.110	-0.251***	-0.251***
Standard error	(0.125)	(0.099)	(0.067)	(0.061)	(0.062)
Wildlife sanctuary (percent)	1.006***	0.595***	0.057	-0.124	-0.142
Standard error	(0.232)	(0.168)	(0.129)	(0.129)	(0.128)
Northeast dummy	Yes	Yes	Yes	Yes	Yes
Province fixed effects	No	Yes	Yes	Yes	Yes
Slope and elevation controls	No	No	Yes	Yes	Yes
Geographic controls	No	No	No	Yes	Yes
Historical forest cover	No	No	No	No	Yes
Adjusted R2	0.265	0.616	0.655	0.709	0.711
N	4113	4113	4113	4113	4113

Note: Probability: *** p < 0.01; ** p < 0.05; * p < 0.10. **Standard errors** are robust, clustered at the district level. **Slope and elevation controls** = (log of) average slope, average elevation. **Geographic controls** = (log of) distance to major city, distance to rail line, distance to mineral deposits, distance to any roads (1962), distance to major roads (1962), max elevation, max slope, distance to national boundary, distance to navigable river; average temperature, average rainfall, ecoregion 2, ecoregion 3, near watershed. **Historical forest cover** = forest cover in 1973.

Table A.2

Additional Socioeconomic Outcomes and Protected Areas: Thailand

Parameter	Province fixed effects only		Province fixed effects only		Province fixed effects only		Province fixed effects only	
	Full controls	Full controls	Full controls	Full controls	Full controls	Full controls	Full controls	Full controls
Dependent variable	Log poverty gap		Log squared poverty gap		Log gini coefficient		Population density	
National park (%)	0.359***	-0.245***	0.246***	-0.185***	0.007	0.060*	-170.556***	15.953
Standard error	(0.093)	(0.061)	(0.078)	(0.053)	(0.022)	(0.033)	(33.007)	(15.045)
Wildlife sanctuary (%)	0.528***	-0.112	0.390**	-0.073	-0.023	0.040	-139.317***	33.692**
Standard error	(0.167)	(0.125)	(0.150)	(0.117)	(0.046)	(0.051)	(30.673)	(15.786)
Northeast dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Slope and elevation controls	No	Yes	No	Yes	No	Yes	No	Yes
Geographic controls	No	Yes	No	Yes	No	Yes	No	Yes
Historical forest cover	No	Yes	No	Yes	No	Yes	No	Yes
Adjusted R2	0.609	0.684	0.586	0.644	0.455	0.477	0.140	0.346
N	4113	4113	4113	4113	4113	4113	4113	4113

Note: Probability: *** p < 0.01; ** p < 0.05; * p < 0.10. **Standard errors** are robust, clustered at the district level. **Slope and elevation controls** = (log of) average slope, average elevation. **Geographic controls** = (log of) distance to major city, distance to rail line, distance to mineral deposits, distance to any roads (1962), distance to major roads (1962), max elevation, max slope, distance to national boundary, distance to navigable river; average temperature, average rainfall, ecoregion 2, ecoregion 3, near watershed. **Historical forest cover** = forest cover in 1973.

Table A.3

Forest Cover and Protected Areas: Thailand

Parameter	Ordinary least squares regressions: whole sample				
	No controls	Province fixed effects only	Slope/elevation controls	Geographic controls	Full controls
Dependent variable: forest cover, 2000 (percent)					
National park (percent)	0.805***	0.667***	0.197***	0.171***	0.171***
Standard error	(0.047)	(0.043)	(0.047)	(0.048)	(0.042)
Wildlife sanctuary (percent)	0.857***	0.681***	0.262***	0.233***	0.215***
Standard error	(0.054)	(0.099)	(0.062)	(0.062)	(0.052)
Northeast dummy	yes	yes	yes	yes	yes
Province fixed effects	no	yes	yes	yes	yes
Slope and elevation controls	no	no	yes	yes	yes
Geographic controls	no	no	no	yes	yes
Historical forest cover	no	no	no	no	yes
Adjusted R2	0.452	0.636	0.835	0.845	0.866
N	4113	4113	4113	4113	4113
Parameter	Panel approach				
	Ordinary least squares (2000)	Subdistrict fixed effects	First differences	Random effects	Subdistrict fixed effects w/ common support
Dependent variable: forest cover, by year (percent)					
National park (percent)	0.101**	0.115***	0.082	0.121***	0.122***
Standard error	(0.050)	(0.039)	(0.063)	(0.038)	(0.043)
Wildlife sanctuary (percent)	0.114	0.143***	0.174**	0.130**	0.142***
Standard error	(0.094)	(0.051)	(0.066)	(0.052)	(0.052)
Province fixed effects	yes	--	--	--	--
Geographic controls	yes	no	no	yes	no
Subdistrict fixed effects	no	yes	no	yes	yes
Period fixed effects	no	yes	yes	yes	yes
Adjusted R2	0.768	0.351	0.132	--	0.316
N	1386	5473	4089	5473	3677

Note: Probability: *** p < 0.01; ** p < 0.05; * p < 0.10. **Standard errors** are robust, clustered at the district level. **Slope and elevation controls** = (log of) average slope, average elevation. **Geographic controls** = (log of) distance to major city, distance to rail line, distance to mineral deposits, distance to any roads (1962), distance to major roads (1962), max elevation, max slope, distance to national boundary, distance to navigable river; average temperature, average rainfall, ecoregion 2, ecoregion 3, near watershed. **Historical forest cover** = forest cover in 1973. **Panel approach** limits observations to those with more than 10 percent of forest cover in 1973, less than 20 percent cloud cover, and less than 20 percent land area in water. **Ordinary least squares (2000)** repeats the ordinary least squares cross-section specification in the full controls column. **Subdistrict fixed effects** includes subdistrict and period fixed effects. **First differences** regresses changes in forest cover on changes in percent protected. **Random effects** uses random effects estimation including the same additional fixed covariates as the full controls column. **Subdistrict fixed effects w/ common support** repeats the subdistrict fixed effects specification for the sample with common support (propensity score between 0.01 and 0.7).

Table A.4

Effects of Protected Areas on Socioeconomic Outcomes: Costa Rica

Outcome	Poverty index	Percentage of houses		Percentage of households		
		In bad condition	In slums	Without telephone	Without electricity	Without water supply
Matching estimates (effect of protection on change in outcome 1973–2000)						
Covariate matching – Mahalanobis	-3.251***	-6.429***	-2.142**	-1.032	-1.731	-5.856***
Standard error	(0.973)	(2.189)	(1.064)	(2.051)	(3.697)	(1.652)
Covariate matching – Mahalanobis w/ calipers	-1.941***	-4.714**	-1.976**	-1.782	2.155	-4.201***
Standard error	(0.543)	(1.489)	(0.795)	(1.709)	(2.772)	(1.212)
N outside calipers	[65]	[72]	[63]	[57]	[60]	[63]
Replicating conventional methods (effect of protection on change in outcome 1973–2000)						
Ordinary least squares	2.068***	2.364***	0.621*	11.243***	7.354***	-2.622**
Standard error	(0.403)	(0.818)	(0.347)	(1.462)	(2.347)	(1.022)
Replicating conventional methods (effect of protection on post-protection outcome measured in 2000)						
Difference in means	9.170***	6.114***	0.695**	29.085***	19.270***	4.352***
N treated	399	399	399	399	399	399
N available controls	(15988)	(15988)	(15988)	(15988)	(15988)	(15988)

Note: Significance: *** at 1 percent; ** at 5 percent; * at 10 percent. **Calipers** restrict matches to units within 1 standard deviation of each covariate. **Ordinary least squares** model regresses the outcome on protection while controlling for key covariates. **Difference in means:** A t-test is applied to evaluate the difference in means of post-protection outcomes between treated and control segments.

Table A.5

Estimates of the Spillover Effect of Protected Areas on Socioeconomic Outcomes in Neighboring Unprotected Areas: Costa Rica

Outcome	Poverty index	Percentage of houses		Percentage of households		
		In bad condition	In slums	Without telephone	Without electricity	Without water supply
Matching estimates (effect of protection on change in outcome 1973–2000)						
Covariate matching – Mahalanobis	0.134	-1.241*	-0.282	-0.621	10.071***	-0.725*
Standard error	(0.258)	(0.673)	(0.257)	(1.165)	(1.903)	(0.416)
Covariate matching – Mahalanobis w/ calipers	0.147	-1.373**	-0.223	-0.654	10.101***	-0.589
Standard error	(0.252)	(0.665)	(0.252)	(1.161)	(1.894)	(0.390)
N outside calipers	[5]	[8]	[7]	[10]	[5]	[5]
N treated	786	786	786	786	786	786
N available controls	(11782)	(11782)	(11782)	(11782)	(11782)	(11782)

Note: Data are matching estimates for the effect of protection on changes in outcome over the period 1973–2000. **Significance:** *** at 1 percent; ** at 5 percent; * at 10 percent. **Calipers** restrict matches to units within 1 standard deviation of each covariate.

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Number	Title	Year
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44	GEF Annual Country Portfolio Evaluation Report 2008	2008
43	GEF Country Portfolio Evaluation: South Africa (1994–2007)	2008
42	GEF Country Portfolio Evaluation: Madagascar (1994–2007)	2008
41	GEF Country Portfolio Evaluation: Benin (1991–2007)	2008
40	GEF Annual Performance Report 2007	2008
39	Joint Evaluation of the GEF Small Grants Programme	2008
38	GEF Annual Performance Report 2006	2008
37	GEF Country Portfolio Evaluation: Samoa (1992–2007)	2008
36	GEF Country Portfolio Evaluation: The Philippines (1992–2007)	2008
35	Evaluation of the Experience of Executing Agencies under Expanded Opportunities in the GEF	2007
34	Evaluation of Incremental Cost Assessment	2007
33	Joint Evaluation of the GEF Activity Cycle and Modalities	2007
32	GEF Country Portfolio Evaluation: Costa Rica (1992–2005)	2007
31	GEF Annual Performance Report 2005	2006
30	The Role of Local Benefits in Global Environmental Programs	2006
29	GEF Annual Performance Report 2004	2005
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