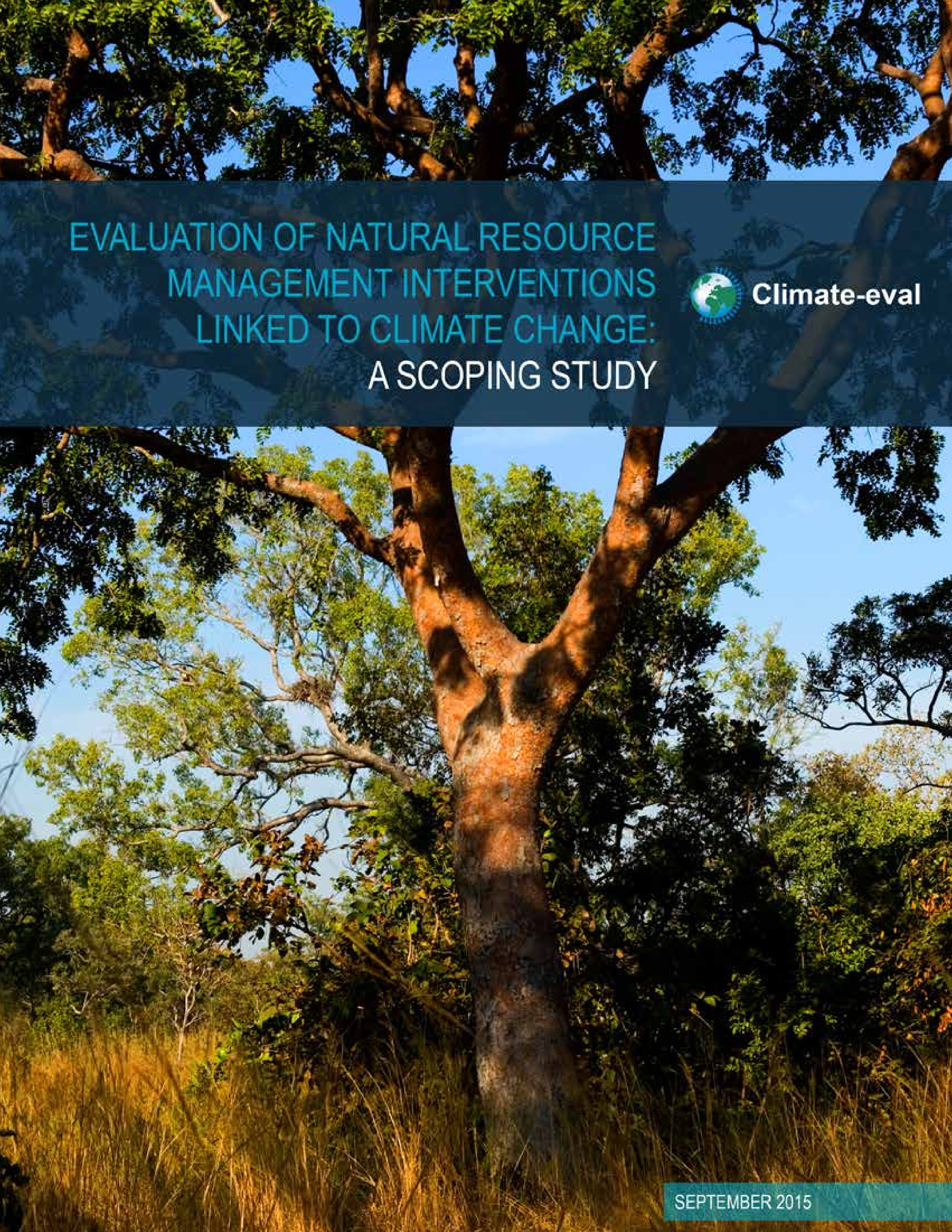
EVALUATION OF NATURAL RESOURCE MANAGEMENT INTERVENTIONS LINKED TO CLIMATE CHANGE: A SCOPING STUDY

Climate-eval



SEPTEMBER 2015

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Credits

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Contents

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Abbreviations

CGIAR	Consultative Group for International Agricultural Research
CO_2	carbon dioxide
DFID	Department for International Development
EITI	Extractive Industries Transparency Initiative
ENRM	environment and natural resource management
FAO	Food and Agriculture Organization of the United Nations
GEF	Global Environment Facility
IFAD	International Fund for Agricultural Development
M&E	monitoring and evaluation
MRV	monitoring, reporting, and verification
NICFI	Norway's International Climate Finance Initiative
NORAD	Norwegian Agency for Development Cooperation
NRM	natural resource management
OECD	Organisation for Economic Co-operation and Development
UNDP	United Nations Development Programme
USAID	U.S. Agency for International Development

All dollar amounts are U.S. dollars unless otherwise indicated.

Executive Summary

An exploratory scoping study was conducted for the Climate-Eval community of practice on evaluation of climate change and development, hosted by the Independent Evaluation Office of the Global Environment Facility, to provide an overview of how climate change aspects are being addressed in the evaluations of natural resource management (NRM) interventions. The study included a search of evaluation literature, and reviewed a sample of project and program evaluations conducted by selected donor organizations.

The study revealed significant variation in how NRM is defined—for example, in either including or excluding extractive usages such as mining. The literature on natural resource governance often includes extractive usage because this is where many of the most severe governance and equity issues are found. However, donor-financed NRM interventions were found to focus on renewable usage, with extractives treated as a separate sector or thematic area, often in combination with the energy sector. For this study, NRM was limited to nonextractive, renewable usages.

At the project level, the sampled NRM evaluations were mostly terminal studies conducted for accountability purposes. Climate change aspects were included where objectives such as carbon dioxide sequestration had been part of the project design. Carbon sequestration has been a relatively frequent feature of land-based NRM projects since the 1990s, and its inclusion has increased over time. As concepts such as payments for ecosystem services and REDD+ have become more commonly integrated in project designs,[1] they are also found in terminal evaluations, but it is still too early to find many relevant evaluations since numerous projects are still under implementation.

The approach and format of project-level evaluations emphasize accountability for use of donor resources, with implementation issues often the focus of attention. Evaluation findings on lessons learned frequently point to overly ambitious design and implementation weaknesses due to capacity limitations. This trend shows little change over time: recent projects appear as likely to reveal this issue as did NRM projects during the 1990s.

NRM project evaluations reveal frequent shortcomings in their monitoring and evaluation arrangements. These shortcomings include misidentification of project outputs as outcomes and an absence of meaningful baselines against which to evaluate project performance at closing. Even projects rated as highly satisfactory at closing were found to have problems of this kind. This finding may reflect underlying issues that cannot necessarily be remedied within a monitoring and evaluation framework, such as a mismatch of short-term activities and very long-term outcomes, and a lack of practical models to reflect how complex ecological pro-

[1] REDD+ goes beyond reducing greenhouse gas emissions from deforestation and degradation (REDD) to include the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks (http://www.un-redd.org/aboutredd).

cesses interact with socioeconomic systems within a single project's context.

Several donors have done program evaluations of their NRM project portfolios or retrospective learning–focused evaluations of NRM projects that had been completed some years previously. Some of these evaluations have provided useful lessons in several areas:

- Norway's International Climate and Forest Initiative highlighted the testing of monitoring, reporting, and verification methodologies that will be needed once a global framework for REDD+ financing is in place.

- The South China Sea impact evaluation conducted by the Global Environment Facility's Independent Evaluation Office provided a practical application of a theory of change approach in an NRM evaluation.

- A World Bank–International Food Policy Research Institute impact evaluation in Niger used quasi-experimental methods to compare NRM treatment outcomes against counterfactuals.

- A U.S. Agency for International Development's retrospective stock-taking evaluation learned from local resource users how they combined and adapted new and traditional NRM technologies to improve yields and livelihoods and increase resilience to climate change.

Issues of time horizon and spatial scale are often mentioned in NRM evaluations as presenting significant challenges, and there is little indication of progress in resolving these when comparing recent evaluations against earlier ones. Landscape approaches to NRM have become common in the past 10 years or so, and these seem likely to face significant scale-related difficulties.

Evaluations often note weaknesses in data quality and implementation of project monitoring and evaluation systems. Here too, there is little evidence of progress in recent years despite increasing donor emphasis on demonstrating the results of development investments.

The conventional project modality may be responsible for some of these persistent issues. During a panel discussion on this study's findings at the Climate-Eval conference in November 2014, participants observed that, for many years, NRM experts have warned that projects designed to be completed within four to six years are far too short to adequately address desired outcomes such as restoration of degraded ecosystem functions and carbon dioxide sequestration. The problem of short time frames for implementing project activities whose results require a long time horizon is especially problematic where climate change trends may be modifying the surrounding environment in ways that are not yet fully understood—since this means that continuous adjustment of interventions may be needed as the implementation context undergoes climate changes.

The literature reviewed for this study identifies several underlying issues that probably cannot be adequately accommodated within a short-term NRM project. These include the following:

- Better scientific understanding is needed of complex ecological functions and interactions that evolve over time and may have unnoticed feedback mechanisms—for example, under conditions such as a changing climate. Also needed is consensus on selecting appropriate monitoring indicators and protocols for these.

- Improved models are needed that capture the complex interaction of the biophysical and human systems at the heart of NRM (i.e., the management by humans of naturally occurring, living resources). The linear cause-and-effect logic of a typical NRM project logframe or results framework is poorly adapted to this context.

- Models such as theory of change and adaptive management need sufficient time for performance trends to be detected and new responses put into effect; additional time is then needed to verify that these second-generation adaptations are having the desired effect. Stand-alone NRM projects typically spend their first three or four years putting in place basic management systems and introducing the targeted interventions. By project close, they have had little time for meaningful observation of trends or consideration of adaptive changes that may be indicated.

Longer implementation commitments, an openness to "rolling" designs or program approaches, and arrangement for sustaining monitoring systems over many years may offer better prospects for overcoming the issues NRM practitioners have been struggling with for many years. Communitywide consensus on monitoring standards, indicators, and units of analysis would be helpful in permitting cross-country comparisons and in learning from NRM experiences in different operational and policy contexts.

CHAPTER 1

Introduction

1.1 STUDY PURPOSE AND OBJECTIVES

This exploratory study was undertaken for the Climate-Eval community of practice on evaluation of climate change and development, hosted by the Independent Evaluation Office of the Global Environment Facility (GEF). It was designed to help develop an agenda for future work of the evaluation community. The expected benefit of this study is to provide evaluators with an overview of the main evaluative issues on the topic, improve capacity in undertaking evaluations, and increase the utility of evaluations for policy makers, decision makers in government agencies, stakeholders, and local communities. The longer-term impact envisaged is that practitioners in the field will be better informed because of the solid evidence gathered. The target audience includes the Climate-Eval community of practice, evaluators, environmental scientists, economists, and policy makers involved in development and sustainable natural resource management (NRM). The study's objectives are to

- identify approaches to evaluating NRM interventions that have a linkage with climate change,
- determine the main challenges/issues faced by such evaluations,
- identify gaps in terms of areas of intervention that lack evaluations and issues that are not covered in evaluations,
- highlight potential solutions and innovative methods that can be applied to evaluations,
- build an evidence base of relevant literature and evaluations, and
- identify areas where further research could yield knowledge to improve the practice of these evaluations.

1.2 DEFINITIONS

Natural Resource Management

The definitions used in this report follow those provided in the approach paper for this study. *NRM* refers to sustainable land management, sustainable forest management, climate-smart agriculture, and conservation of biodiversity. *Sustainable or integrated NRM* refers to the incorporation of aspects of resource use into a system of sustainable management to meet the goals of resource users, managers, and other stakeholders (Douthwaite et al. 2005)—for example, to meet production, food security, profitability, risk aversion, and sustainability goals. A World Bank report defined NRM as

> the sustainable utilization of major natural resources, such as land, water, air, minerals, forests, fisheries, and wild flora and fauna. Together, these resources provide the ecosystem services that underpin human life (Bojö 2000: 3).

The literature review found considerable variation in how the term "natural resource management" is used, which had implications in setting parameters for conducting the scoping study. Journal articles mentioning natural resources tend to use a broader sense of NRM, sometimes referring to these natural resources as natural or biophysical systems. For donor agencies, NRM is often associated with the environment (ENRM) as a sectoral or thematic cluster in which biodiversity conservation, forests, land, and water may be treated as subcategories along with NRM; while agriculture and water are typically considered as separate sectors or thematic areas. NRM is sometimes taken to refer to renewable resources as opposed to extractives, although the World Bank's 2000 definition included minerals. Conversely, the Natural Resource Charter focuses on improved governance of extractive resources, for example, oil, minerals, and timber, of which only timber has the potential to be renewable (Natural Resource Governance Institute 2014). Moreover, some donors mainly associate the term "renewable" with energy—for example, wind, solar, and biomass, which are typically treated as a separate category from the environment or ENRM.

This report focuses on the *evaluation of cross-cutting or multisectoral NRM interventions* as opposed to those that emphasize a specific sector or discipline such as biodiversity conservation, protected area systems, forestry, agriculture, or water resource management. NRM projects and programs are often multisectoral (or, in the GEF system, multifocal), with components addressing areas such as land use, forestry and agroforestry, watersheds and catchments, rangelands, biomass fuels, and wildlife. They also frequently address resource access and use rights, such as land tenure arrangements and governance—thereby bringing social science concepts and tools into the picture as well as those of the natural sciences and economics. One example of such integration is community-based NRM, which has sometimes been implemented in conjunction with nearby biodiversity conservation projects. Such efforts were initially part of what was known as integrated conservation and development projects and later as an element of larger, landscape-level approaches to conservation planning. The study did not include energy interventions within the definition of NRM, except in cases in which local use of biomass fuel (wood, charcoal, agricultural residues) was an element of a larger intervention; such uses are often included within community-based NRM interventions.

Natural resource economists often examine the ways in which a population or policy maker might seek to maximize the economic utility value (harvest or stocking rates) of a given resource (forests, fisheries, livestock) over a given time horizon subject to assumptions including an economic discount rate for calculating benefits and costs, or to optimize that utility value subject to other restrictions (Levin et al. 2013) One example is analysis of the sustainability of resource use, to avoid exhausting a particular resource use as a result of overharvesting or other unsustainable practices. Political economy adds another dimension to economic analysis, focusing on competition for scarce natural resources and how power is used in this process. Issues such as resource access rights and land tenure are central to this type of analysis. Hardin's classic "The Tragedy of the Commons," published in 1968, identifies the risks faced by open access exploitation of "common pool" natural resources, a form of market failure in which individual incentives to maximize benefits lead to unsustainable use and eventual exhaustion or collapse of the resource. More recently, Ostrom (1990) has shown how institutions can overcome this dilemma if local resource users are allowed to take responsibility for management of natural resources.

An extensive body of literature examines the relationship between natural resources, property rights, and governance (see, e.g., USAID et al. 2002); this addresses topics including forestry and fisheries, as well as examines conflict as an element in access to natural resources. Resource scarcity is often considered a significant factor driving conflicts in natural resource use (Bannon and Collier 2003; Cuvelier, Vlassenroot, and Olin 2013; Daley 2013). Natural resources are usually considered to be important economic assets, but Collier and other economists have introduced the idea of a "resource curse" affecting countries rich in natural resources but with poor governance frameworks (a new form of "Dutch disease"[1]). In such situations, natural resources are exploited unsustainably and do not contribute to poverty reduction. In fact, natural resources might even exacerbate inequality; the Extractive Industries Transparency Initiative (EITI) is one response aimed at mitigating this tendency in the petroleum and mining industries. Participating companies pledge to avoid practices such as bribery that have often characterized resource exploitation in many countries. EITI, the Natural Resource Charter, and other sources cited in the resource governance literature usually use the term "natural resources" to mean nonrenewable or extractive use of resources. In this report, however, NRM is taken to refer to *nonextractive uses of resources that are renewable or potentially renewable*, including sustainable land management, sustainable forest management, climate-smart agriculture, and conservation of biodiversity.

[1] "The harmful consequences of large increases in a country's income" that are managed unwisely (Ebrahim-zadeh 2003).

Climate Change

The approach paper notes that there is a two-way relationship between NRM and climate change. Climate change affects natural resources in various ways (desertification and land degradation, deforestation, biodiversity loss, natural disasters, water scarcity, etc.) and is in turn affected by NRM interventions through both adaptation and mitigation activities that aim to stop or slow its processes (Corfee-Morlot, Berg, and Caspary 2003). This study looks at both aspects of climate change—adaptation and mitigation—to determine whether and how evaluations of NRM interventions are addressing climate change. To do so, it uses the GEF definitions of adaptation and mitigation:

> Adaptation is the process of reducing the adverse effects of climate change on human and natural systems. It refers to the efforts made to cope with actual change as well as of adjusting to expected change. In practice, adaptation is climate-resilient development and natural resources management. In recent years, adaptation has emerged as a top priority on the international development agenda.

> Mitigation refers to any strategic intervention and/or anthropogenic action taken to remove the greenhouse gases (GHG) released into the atmosphere, or to reduce their amount, to reduce any risk and hazards of climate change to human life and environment.

NRM and Climate Change

In the NRM sector, *mitigation* refers to measures that avoid or reduce the release of carbon into the atmosphere from land use changes and deforestation, or that improve the ability of land cover and soil to retain or sequester carbon that otherwise would be released into the atmosphere. *Adaptation* in NRM refers to measures that help resource users anticipate and adjust to changes in the climate that may have negative impacts such as drought; shortened growing seasons; reduced crop yields; and reduced access to forage, fodder, medicinal plants, wild animals, and other natural resources that are important sources of livelihoods.

CHAPTER 2

Methodology

2.1 DESK REVIEW: LITERATURE AND EVALUATION DATABASES

Rather than having a highly focused research question at the outset, scoping studies aim to identify all relevant literature related to a topic regardless of study design (Arksey and O'Malley 2005). Thus, this scoping study is based on a desk review of relevant literature as well as a search of key evaluation databases for relevant evaluations and other documents such as frameworks, toolboxes, and guidelines intended to provide guidance for the design, management, or evaluation of NRM interventions.

Although the study aimed to be as comprehensive as possible in its coverage of the available literature, some limits had to be applied to the extent of the search given time constraints. The literature review was initially limited to those evaluation journals available through the World Bank Group's online library network,[1] and was subsequently expanded to include articles cited in the initial journal search ("snowballing"). Peer-reviewed journal articles published from 2000 to 2014 were collected from these journals using the following Boolean searches:

"natural resource management"; "NRM"; "sustainable management of natural resources"; "sustainable forest management"; "protected areas"; "soil and water conservation"; "conservation"; "payments for ecosystem services"; "land rehabilitation"; "watershed management"; "sustainable land management"; "livelihoods"; "food security"; "biodiversity conservation"; "ecosystems management"

AND

"climate change mitigation"; "mitigation"; "greenhouse gases"; "GHG"; "carbon sequestration"; "carbon markets"; "soil carbon"; "landscape change"; "biomass"; "carbon sink"; "REDD+"; "emissions"; "LULUCF"; "land use change"; "land cover"

OR

"climate change adaptation"; "adaptation"; "community-based adaptation"; "resilience"; "vulnerability"

The study searched evaluation databases of key organizations involved in the evaluation of climate change and development/NRM to identify relevant evaluations that would be reviewed in the meta-evaluation component of the scoping study. These databases included the following:

- The Climate-Eval e-library of evaluations
- The GEF Independent Evaluation Office internal database of terminal evaluations
- The United Nations Development Programme (UNDP) Evaluation Resource Center

[1] *American Journal of Evaluation*, *Evaluation*, *Evaluation Exchange*, *Evaluation and Program Planning*, *Evaluation Review*, *Journal of Multidisciplinary Evaluation*, and *New Directions for Evaluation*.

- The Asian Development Bank Independent Evaluation Resources
- The U.S. Agency for International Development (USAID) Development Experience Clearinghouse
- The Organisation for Economic Co-operation and Development (OECD) Evaluation Resource Centre
- The U.K. Department for International Development (DFID) Research for Development (R4D)
- The World Bank Independent Evaluation Group

To complement the desk review, some relevant guidelines, toolboxes, and frameworks were included as possible additional sources. These were collected through a simple Google search for "natural resource management guidelines/frameworks/toolboxes" and variations on the phrase. Additional databases could not be covered due to time constraints. Furthermore, as definitions and categories of NRM vary across organizations (see chapter 1), other potentially relevant evaluations might exist that do not have the keywords "natural resource management" or "NRM" in their title but were not included in this study.

2.2 SAMPLE SELECTION

The search process identified 123 evaluations (83 project evaluations and 40 program, portfolio, or outcome evaluations), more than 400 journal articles, and 101 other documents (guides, reports or reviews, frameworks, toolkits, etc.). Of the 400-plus documents collected from the literature review, a sample of 146 articles was shortlisted by scanning for "natural resource management" or "NRM" in their title. These articles were then screened to ensure clear links to climate change and relevance to one or more categories of the NRM definition used for this study (sustainable land management, sustainable forest management, climate-smart agriculture, and conservation of biodiversity). Some articles were dropped from this set as they were reports of scientific studies of some aspect of natural resources rather than being directly related to NRM interventions; for example, a number of articles described remote-sensing methodologies for monitoring land cover change. While such tools or techniques could be useful in the context of monitoring or evaluating NRM interventions, these articles focused on the technology and did not address evaluation of an actual NRM intervention.

Of the 123 evaluations, 59 project evaluations and 32 program, portfolio, or outcome evaluations were chosen. The methodology used to shortlist these evaluations was based on a screening process that looked for keywords, clear references to climate change, evidence of specific approaches or methodologies, and verifiable data. Evaluations of projects that focused solely on one NRM sector, such as agriculture, fisheries, international waters, and protected areas, were excluded. Only those evaluations that originated in or focused on developing countries were considered; thus, a number of evaluations conducted in Europe, North America, and Australia were excluded.[2]

The shortlisting of other documents such as evaluation frameworks and toolboxes was based on whether these contained any specific references to climate change or NRM. None of the articles constituted an evaluation of an NRM intervention in the sense used in this study. Instead,

[2] The term "natural resources management" appears to be particularly prevalent in Australia, where government agencies have published numerous policy documents and technical guidelines containing this term in their title.

they reported on new approaches, technical methodologies, or scientific research findings within NRM; or discussed issues such as data quality, conceptual frameworks, attribution of causality, etc. Many of the articles provided useful insights and identified topics requiring further attention; these are described later in this report. One article specifically addressed the subject of evaluation in NRM interventions, stating that "assessments of the evaluation literature that address natural resource settings are unusual," and that

> currently there is no systematic direction for evaluation specific to natural resource settings nor are there efforts to distinguish evaluation in these settings from other settings such as education or health where much of the conceptual and applied evaluation work has been located. (Rowe 2012)

The Consultative Group for International Agricultural Research (CGIAR), which has conducted much of the peer-reviewed research on NRM, has given increasing attention to various ecological functions that interact with agriculture, including soil, forests, and water resources, as well as issues such as carbon sequestration and climate change (Waibel and Zilberman 2007). These studies were among the most technically sophisticated of the NRM studies reviewed, but are not discussed here because they focus on research findings rather than evaluations of NRM project or program interventions.

The World Bank's Climate Change Team has produced a series of guidance notes (World Bank 2010) for mainstreaming adaptation into agriculture and NRM which treats them as a single cluster, though the Bank's new environmental strategy only uses the term "NRM" in the context of the need to sustainably manage natural resources including land, oceans, and forests (World Bank 2012). USAID (2013) defines NRM as "agriculture, forestry, fishing, range management, and other fields where people manage resources in pursuit of livelihoods, ecological services, and the like." Implicitly, these definitions reflect a multisectoral or cross-cutting perspective, in contrast to projects classified as being in sectors such as agriculture, fisheries, or international waters which generally do not use the term NRM as a descriptor (although they clearly involve natural resources). This study focused on multisectoral NRM evaluations.

The final sample used for the study included 59 project evaluations (listed in annex A in table A.1); 32 program, portfolio, and outcome evaluations (table A.2); 62 academic articles and book chapters (table A.3), and 101 other documents (table A.4).

2.3 SAMPLE CHARACTERISTICS

From the initial sample of NRM project-level evaluations identified for the scoping study, 59 were selected due to the presence of a significant number of keywords indicating that they had material relevant to climate change mitigation, climate change adaptation, or both. In the course of the initial screening, it was found that some climate change keywords appeared as a "false positive"—for example, merely citing the year in which the country in question had signed the United Nations Framework Convention on Climate Change, or a passage of text referring to that country's vulnerability to climate change impacts. These cases were dropped from the sample. Also dropped were evaluations where "NRM" referred to an organizational unit or department. The cases in table 2.1 are those having more than 10 instances of the keywords "climate change adaptation," "climate change mitigation," or both.

About half of the final sample of 59 evaluations were World Bank projects that had also been independently reviewed by the Independent Evaluation Group; some (though not all) of the World Bank projects had used GEF financing. UNDP accounted for 27 percent of the total; all of these projects used GEF financing. The remaining 14 evaluations were from the Food and Agriculture Organization of the United Nations (FAO), the International Fund for Agricultural Development (IFAD), and USAID. All of the FAO and UNDP NRM projects had been financed by the GEF; the USAID projects were bilaterally funded. With the exception of the USAID projects, all of the evaluations provided outcome ratings, most of which were in the moderately satisfactory or better range (on a six-point scale of highly satisfactory, satisfactory, moderately satisfactory, moderately unsatisfactory, unsatisfactory, and highly unsatisfactory). The evaluations are not listed by country or region because of the small number of cases for individual countries, and because donors use different groupings for their regional classifications (e.g., the World Bank places Jordan in the Middle East and North Africa region, while the GEF classifies Jordan as being in Asia). Because of the small number of evaluations for FAO, IFAD, and USAID projects, generalizations about these are subject to caveats.

The World Bank evaluations mentioned climate change mitigation much more frequently than adaptation, USAID evaluations mentioned adaptation more often than mitigation, and the other donors had a somewhat more even distribution between the two categories. World Bank projects were also more likely to include climate change in the description of project outputs and outcomes, with almost three-quarters of the Bank projects sampled showing specific climate change outputs and/or outcomes in their results framework. Other donors were more likely to have mentioned climate change in the text sections of the evaluation without having specifically identified it at the level of project outputs and outcomes.

Overall, slightly more than half of the 59 NRM project evaluations showed evidence of substantive treatment of climate change, describing project outputs and outcomes specific to climate change (adaptation or mitigation). In many cases, this entailed estimates of carbon diox-

TABLE 2.1 Characteristics of Final Sample Project Evaluations

Donor	No. of evaluations	Outcome rating > moderately satisfactory		Climate change adaptation keywords >10		Climate change mitigation keywords >10		Climate change–related outputs and outcomes		Climate change funding >10%		Discussion of methodology	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
World Bank	33	26	78	7	21	20	60	22	66	13	39	25	75
UNDP	12	10	83	4	33	7	58	7	58	n.a.	n.a.	9	75
IFAD	7	5	71	0	0	0	0	1	14	n.a.	n.a.	4	57
USAID	5	n.a.	n.a.	3	60	2	40	2	40	n.a.	n.a.	3	60
FAO	2	2	100	0	0	1	50	1	50	n.a.	n.a.	1	50
Total	59	43		14		30		33		13		42	

NOTE: n.a. = not applicable; IFAD = International Fund for Agricultural Development; FAO = Food and Agriculture Organization of the United Nations.

ide (CO_2) sequestration from preventing deforestation or from tree planting. In about 45 percent of the selected evaluations, climate change had been identified as a project activity or an intended purpose or goal, but specific outputs or outcomes had not been defined in the logframe or results framework.

All of the World Bank evaluations included a list of sectors and themes for which a share of project financing had been allocated; this funding information is shown in table 2.1 even though comparable data were not available for the other NRM donors. In many of the World Bank projects, the funding data showed that climate change had been a small element of the overall project, with only 13 out of 32 cases having more than 10 percent of the budget attributed to climate change–related activities. Some projects had been reorganized after midterm review. Several of these reorganizations had resulted in a reduction or complete cancellation of the share of funds allocated to climate change; in no case had this share been increased.[3]

This finding would seem to point to implementation difficulties or perhaps to unrealistic expectations at the design stage, thus resulting in a scaling-back or cancellation of planned climate change activities. Due to time limitations, it was not possible to probe more deeply.

About two-thirds of the projects included a description of the methodology used by the evaluation related to climate change aspects, such as attribution or verification of CO_2 sequestration benefits.

A similar methodology was used to screen evaluations of donor NRM programs and portfolios (table 2.2). Evaluations with more than 10 keyword hits for climate change adaptation and/or climate change mitigation were selected from the initial population; the final sample totaled 32 evaluations in all. The Norwegian Agency for Development Cooperation (NORAD) and UNDP accounted for the largest shares, with 20 program or

[3] The sector and theme codes are not formally accountable in terms of budget commitment, but represent the World Bank's estimate of the relative share of project focus on various objectives.

TABLE 2.2 Characteristics of Final Sample Program, Portfolio, and Outcome Evaluations

Donor	No. of evaluations	Climate change adaptation keywords >10		Climate change mitigation keywords >10		Climate change–related outputs and outcomes		Discussion of methodology	
		No.	%	No.	%	No.	%	No.	%
NORAD	10	4	40	9	90	10	100	9	90
UNDP	10	8	80	7	70	8	80	8	80
World Bank	6	3	50	6	100	2	33	4	66
USAID[a]	4	2	50	2	50	1	25	3	75
FAO	1	1	100	1	100	0	0	0	0
ITTO	1	0	0	0	0	0	0	0	0
Total	32	17		25		21		24	

NOTE: ITTO = International Tropical Timber Organization; NORAD = Norwegian Agency for Development Cooperation.

a. Includes one Africa Biodiversity Collaborative Group program implemented by several partners.

portfolio evaluations between them, or nearly 60 percent of the total.

The terminal evaluations of World Bank and GEF projects were subject to an independent desk review, which sometimes led to modified project ratings if the reviewer concluded that the available evidence justified a different rating than that contained in the original evaluation. Instances of such disconnects in World Bank projects are reported by the Independent Evaluation Group to Bank management in the form of an aggregated disconnect ratio, which is understood as an undesirable reflection on team performance. (In principle, an adjustment can be either upward or downward, but is usually downward.) Independent evaluators are presumed to be less subject to pressure from project teams to give favorable ratings.

CHAPTER 3

Findings

3.1 TYPOLOGY AND DESIGN OF EVALUATIONS

In all of the project-level cases reviewed, the donors financing the NRM projects had required a summative evaluation, variously termed a project completion report, an implementation completion report, or a terminal evaluation. For many of these projects, interim or midterm evaluations had also been conducted; these formative evaluations were not reviewed for this study. No evaluation typology describing different approaches or methodologies to be applied in particular contexts was found in this review specific to the evaluation of NRM interventions, nor in assessing the climate change aspects of such interventions.

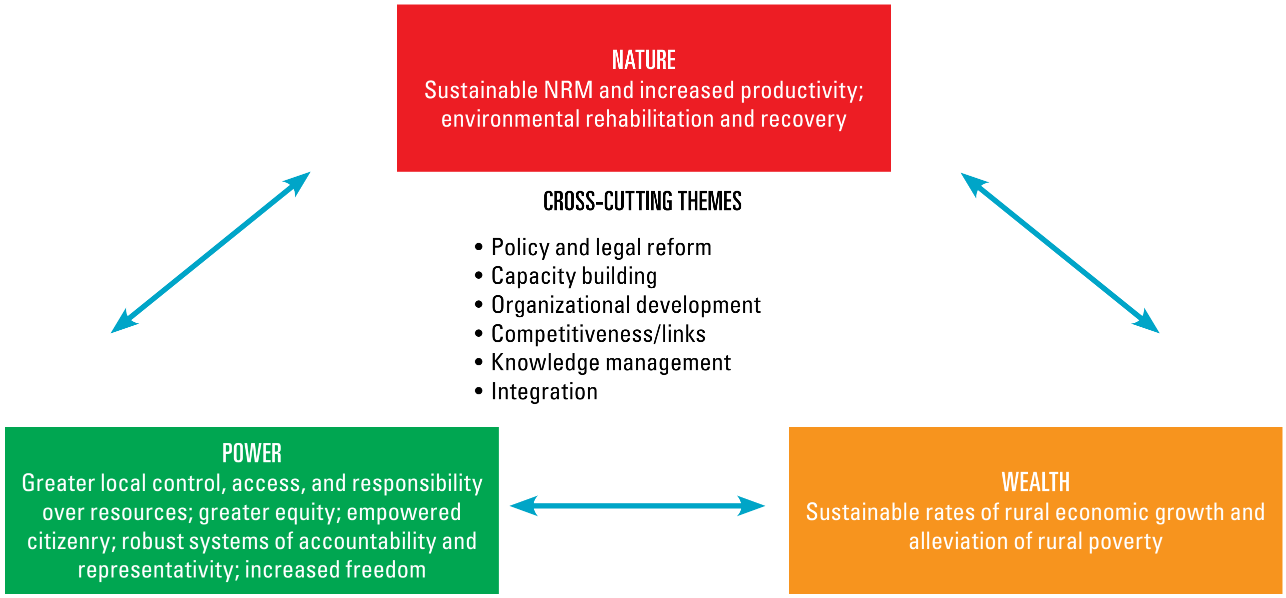
Although the specific formats of the summative evaluations varied to some degree, they were very similar in their approach, which focused on comparing the project's achievements at closing with what had been described in the project document at the time of project approval. Reasons for any disparities were discussed; and issues such as shortcomings in the original design, modifications made during implementation, project expenditures, recorded outputs, and outcomes claimed by the project were raised. Evaluation teams typically made site visits to verify project achievements and meet with stakeholders. In most cases, the evaluation reports included ratings of various aspects of project implementation and outcomes (USAID evaluations did not include ratings but included qualitative discussions of achievements and shortcomings).

Some of the more innovative evaluations reviewed for this study were portfolio-level retrospective learning reviews. These were not focused on what had been achieved by an individual project, but instead looked at a larger group of interventions that had been made over a period of several years. For example, USAID conducted a retrospective assessment of NRM interventions in Senegal using a conceptual framework developed specifically for community-based NRM (USAID et al. 2002). This nature-wealth-power model describes a "triple win" which can be accomplished through a set of coordinated actions aimed at simultaneously improving NRM (nature), raising household incomes (wealth), and improving the responsiveness and accountability of local governance (power), as shown in figure 3.1.

USAID used this framework as the basis for a suite of NRM activities implemented over a period of 10 years by the Wula Nafaa program in Senegal.[1] These activities were designed with the underlying model of causal relationships broadly represented in figure 3.1, but the project activities installed monitoring and evaluation (M&E) systems that followed then-standard USAID indicators, which did not address counterfactual or attribution issues. The retrospective assess-

[1] Wula Nafaa means "value of the forest" or "wealth of the bush" in the Mandinka language.

FIGURE 3.1 **The Nature, Wealth, and Power NRM Model**



SOURCE: USAID et al. 2002.

ment thus tried to better understand and document how well the model (or theory of change) had performed in attempting to improve household incomes, local governance, and sustainability of natural resource use in the project area as compared to villages that had not participated in the project.

The assessment used Demographic and Health Survey data available at the household level to conduct a quasi-experimental evaluation of project interventions for the wealth component. These data generally validated project claims of improved household incomes in project areas. For the other two components, significant data limitations prevented counterfactual analysis. In the case of the NRM activities, the project had followed then-standard USAID practice in measuring an aggregated proxy indicator—area of land under improved management—as a means of tracking the project's biodiversity impacts. The synthesis report team concluded that, without a more precise baseline and subsequent monitoring of site-level data capturing actual biophysical conditions over time, it was not feasible to draw strong conclusions about the relationship between NRM practices promoted by the project and any observed impacts on natural resources:

> [T]here is still a paucity of data about the direct and cumulative impacts of USAID projects and associated NRM interventions on the natural resource base, and on the scaling up of NRM practices within and outside the landscapes targeted by USAID projects. (USAID 2014: 135)

Perhaps as a result of this finding, a new USAID NRM program—Productive Landscapes (ProLand)—approved in 2014 plans to include quasi-experimental research designs as a central element of the initiative, in order to more rigorously measure the outcomes of project interventions against counterfactuals. This will provide an evidence base for subsequent scale-up efforts. Measurement challenges are discussed further in sections 3.3 and 3.4.

3.2 EVALUATIONS USING A THEORY OF CHANGE AND COUNTERFACTUALS

In recent years, attention has been given to the search for more rigorous identification of counterfactual evidence in NRM interventions. This trend has paralleled the growth of randomized control trials and quasi-experimental methods being used in other domains such as public health and the social sciences, as well as a general trend toward greater reliance on evidence-based policy making. For example, Ferraro (2009) states that, in the absence of counterfactual evidence, environmental policy makers have little basis for determining under what circumstances a given set of interventions may be appropriate. Margoluis et al. (2009) advocate building evaluation design into program design at the outset, and bridging the divide between biologist–social scientist and practitioner-researcher groups; they suggest using matched control or comparison groups as a quasi-experimental design option in conservation evaluations. A great deal of literature was found that takes positions on various aspects of this issue, but as yet there does not appear to be a consensus on the appropriate use of experimental methods in the NRM area.

One systematic literature review examined 42 published reports on community forest management to gauge the quality of the evidence basis for conclusions about hypotheses associating community forest management with improved global environmental benefits (biodiversity) and improved local livelihoods. The review found inconsistent results across the group of studies, and noted many methodological differences as well as problems of data quality. The authors called for donors to agree on a minimum standard of research design, including standardized outcome measures to be used across projects, in order to permit a synthesis of findings across multiple sites and projects instead of "just accumulating disconnected case studies of specific sites" (Bowler et al. 2010: 5). While that systematic review did not specifically address climate change, it is cited here because of the relevance of its larger point about research design. If the claimed environmental benefit had been carbon sequestration instead of biodiversity conservation, it is likely that the findings would have been much the same.

Donor-financed projects and programs typically require some form of planning framework such as a logic model, logframe, or results framework that specifically links activities and outputs to expected outcomes and objectives in a way that clearly describes the expected causal linkages relevant to the success of the intervention. In principle, such frameworks also try to identify assumptions and risks in order to support adaptive management, but in practice this aspect is often overlooked or given less emphasis. One risk of logic models is that they may reduce complex, dynamic relationships to an oversimplified model that can be more easily presented in a project or program document. (These documents are often prepared as a compliance requirement within the project approval process rather than as an instrument for informing substantive design choices or a platform for stakeholder engagement.) Feedback loops—if even mentioned—are assumed to be linear and consistent, and variations between time horizons for different types of NRM, policy, and capacity-building interventions to take root are ignored or are assumed to continue without interruption following project completion and an end to donor financing.

The World Bank commissioned a retrospective impact assessment of sustainable land management interventions in Niger, using a quasi-experimental design which tested project and program outcomes against counterfactuals many years after the original activities had closed. This evaluation is described in box 3.1. The impact evaluation included an analysis of the carbon sequestration benefits of tree plantations supported by the NRM activities, although this was not a central aspect of the evaluation.

A theory of change is the "logic" of how an intervention is expected to lead to desired impacts (Fitz-Gibbon and Morris 1996). It defines all the building blocks required to achieve a long-term goal. Box 3.2 describes the theory of change framework used by the GEF to assess and guide progress toward impact in an environmental context.

Another example of a theory of change approach to assess program contributions toward climate and development goals is that adopted by NORAD's real-time evaluation of Norway's International Climate and Forest Initiative (NICFI). This theory of change, described in box 3.3, outlines the phased approach of the program toward building measurement, reporting, and verification (MRV) systems in target countries for REDD+ readiness.[2]

[2] REDD+ goes beyond reducing greenhouse gas emissions from deforestation and degradation (REDD) to include the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks (http://www.un-redd.org/aboutredd).

BOX 3.1 Counterfactual Evaluation of NRM in Niger

The World Bank and the International Food Policy Research Institute (IFPRI) carried out an impact evaluation of sustainable land management interventions in Niger to generate counterfactual evidence on the results of more than 50 programs and projects in that country since the early 1980s. These interventions had previously been evaluated in the absence of counterfactual evidence, raising questions about the claimed results of some CFAF 200 billion (about $400 million at current exchange rates) invested by multiple donor agencies over more than 20 years. The study used a quasi-experimental design (propensity score matching) to compare program and nonprogram villages in a stratified random sample of 139 villages. The team conducted econometric analysis of data from a survey of over 1,200 households to attribute the impacts of various types and combinations of technical interventions on crop yields and household income while controlling for potential biases (internal validity).

The study concluded that sustainable land management programs had not yet reached a significant share of the rural population and that some of the programs had been located in areas with more favorable rainfall and market access, and with wealthier households. The most successful interventions were community tree plantations and protected areas, although these had highly variable results. Poverty was found to be associated with increased adoption of some NRM interventions, but acted as a disincentive for others; labor availability was a major consideration for contour bunds and *zais* (a *zai* is a traditional technique used in Burkina Faso for improving crop yields in degraded drylands: farmers dig a small pit and place dung or other organic material such as crop residues in the bottom before planting millet or sorghum seeds). Crop production showed little improvement as a result of sustainable land management, although overall incomes tended to improve due to increased access to fodder, wood, and nontimber forest products. One program was found to be associated with a decline in crop production for reasons that were not fully understood.

The study also found that adding the carbon sequestration benefits of tree plantations would boost their internal rate of return by 1 or 2 percentage points, but would not have been a major factor in determining the social profitability of those investments.

SOURCE: World Bank 2009.

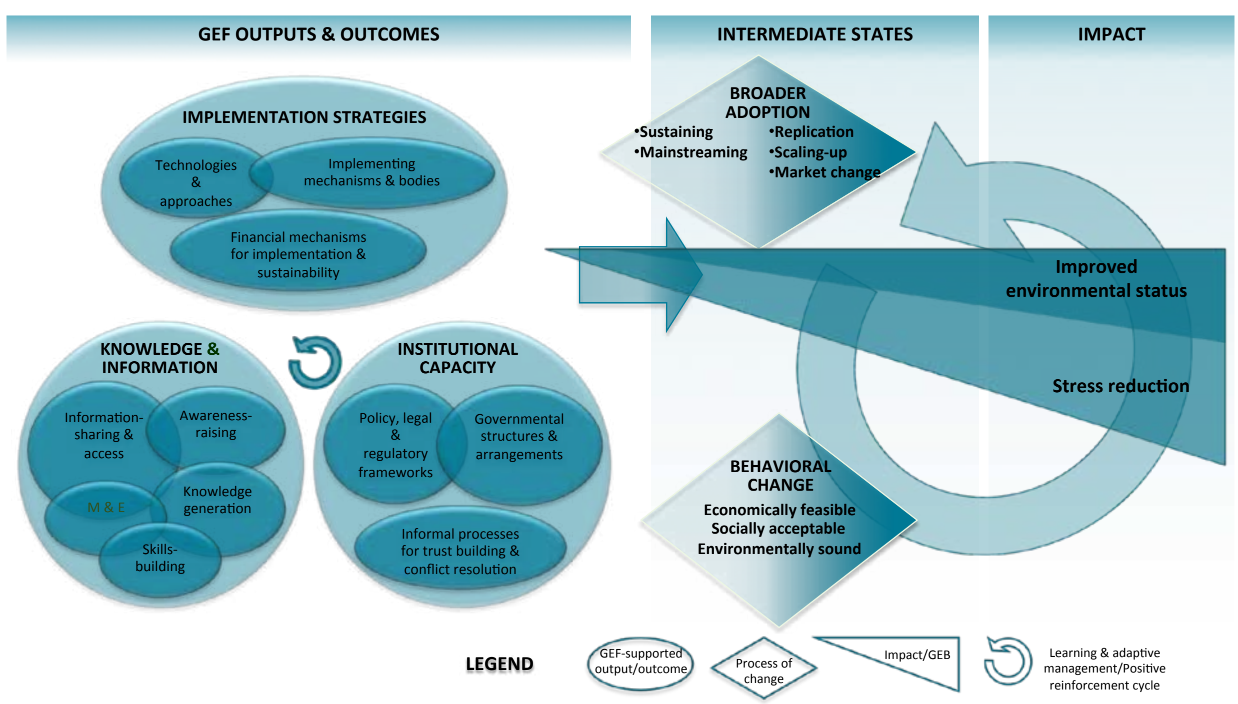
BOX 3.2 Theory of Change: GEF Impact Evaluation of the South China Sea and Adjacent Areas

The GEF theory of change framework, illustrated below, helps assess the ways and extent that GEF support interacts with contextual factors to achieve progress toward intended impacts. The framework was first applied in the Impact Evaluation of GEF Support to the South China Sea and Adjacent Areas.

Within the context of GEF support to the South China Sea, activities such as transboundary diagnostic analysis, M&E of environmental status, awareness campaigns, and information portals can be understood as **knowledge and information** activities. Activities focused on policy analysis and development of regulatory frameworks, administrative reforms, and institutional structures can be seen as supporting **institutional capacity** development. And activities such as implementation of conservation practices, wastewater treatment, and establishment of implementation mechanisms such as committees and task forces may be seen as **implementation strategies**. **Broader adoption** of demonstrated approaches and technologies, implementation of strategic action plans at wider scales, enforcement of environmental laws and regulations, and **changes in stakeholder behavior** are expected to lead to better impact.

The South China Sea marine ecosystem comprises nested scales of ecological and administrative units with spatial and temporal boundaries that often do not match. This often makes for nonlinear linkages between interventions and observed changes, complicates the prediction of outcomes, and makes attribution of changes or achievements to a specific intervention or set of interventions difficult.

Where determination of attribution was not feasible, the evaluation focused on determining the contribution of GEF support. When claiming causality for results, it underscored the importance of the theory of change, evidence of implementation and actual occurrence of chain of expected results, and adequate appreciation of the role of other actors and factors independent of the project that affected results. Where determination of a counterfactual was not feasible, counterfactual analyses were carried out using comparisons and innovative ways to eliminate rival hypotheses of observed changes where possible.



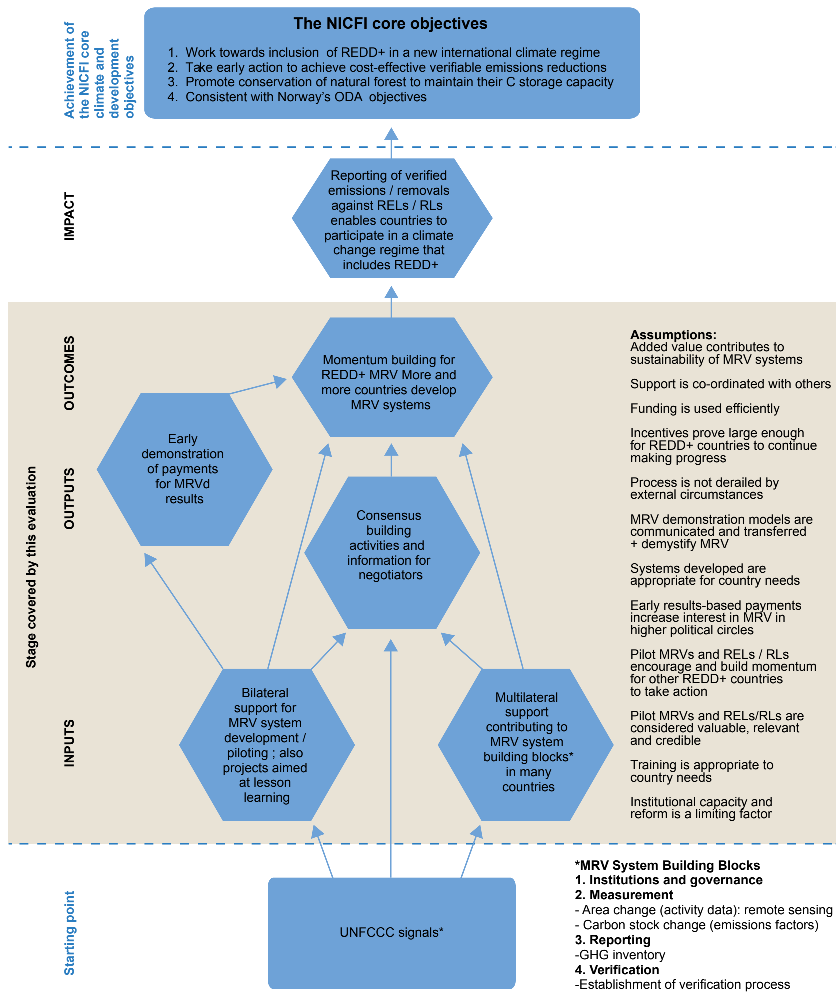
SOURCE: GEF EO 2012.

BOX 3.3 Theory of Change for Real-Time Evaluation of NICFI

The NICFI was launched in 2007 to support REDD+ efforts. Its objectives are to contribute to the inclusion of REDD+ in developing countries under the United Nations Framework Convention on Climate Change, measurable emissions reductions, and conservation of forests to maintain their carbon storage capacity.

Real-time evaluations were commissioned for the initial NICFI phase covering Brazil, the Democratic Republic of Congo, Guyana, Indonesia, and Tanzania for 2007–10. The main purpose of these evaluations was to develop a baseline for subsequent ex post evaluation and provide feedback to stakeholders and the public about preliminary achievements.

The evaluations developed the NICFI theory of change framework (see figure), which includes the following:



- **Inputs** including bi/multilateral support for MRV system development/piloting and projects aimed at lesson learning
- **Outputs** including early demonstration of payments for MRV results and consensus-building activities
- **Outcomes** including momentum building for REDD+ MRV
- **Impact** including reporting of verified emissions against reference levels

Developing MRV systems is a crucial part of a performance-based REDD+ mechanism and is fundamental to creating reference levels on country-specific emissions; these reference levels in turn are needed for climate effectiveness, cost-effectiveness, and funds distribution. The NICFI has argued for an MRV methodology that facilitates incremental improvement, uses conservative estimates where data are lacking (e.g., in forest cover area change and carbon stock change/area), and provides incentives for improvements over time. The NICFI stresses the importance of a phased approach to supporting REDD+ countries for strategy development, including institutional strengthening and stakeholder consultations.

The evaluations' synthesis report (NORAD 2014) recommends a results-based planning and reporting framework for the NICFI that builds on the theory of change. Such a framework would detail inputs, milestones, assumptions, indicators, progress toward impact, and means of verification and take into account the needs and priorities of all agencies engaged in the NICFI.

SOURCES: NORAD 2013, 2014.

Apart from the examples in boxes 3.2 and 3.3, this scoping study did not find any examples of an NRM project or program evaluation that had formally applied a theory of change model as such. In most cases, logframes or results frameworks were used, representing a simpler approach to specifying the intervention causality. As noted above, logframes and similar logic models are sometimes criticized for including overly simplified representations of what is expected to take place, as well as tending to be prepared as a compliance requirement for project approval rather than as an aid to engaging stakeholders in careful reflection on how to proceed (Vogel 2012). From this viewpoint, it is perhaps less important which specific tool is adopted for planning an NRM intervention than how well the chosen tool is implemented. In describing the advantages of rigorously specified impact evaluation, Goldstein (n.d.) notes that, until recently, World Bank evaluations penalized projects that had made midcourse changes in project design. In contrast, the impact evaluation approach tries to make change a central part of project design. On the other hand, the tendency to mechanically follow an approved project design is not necessarily an inherent flaw of logframes or results frameworks, nor should it be assumed that impact evaluations using counterfactuals would consistently improve the quality of project implementation. Indeed, a review of impact evaluations conducted for DFID found few examples of good practice on which future designs could be built:

> One common error is breaking down interconnected interventions into component parts so as to make them evaluable by particular methods and then generalising about the entire programme. Criteria for when to treat programmes as whole systems and when to decompose them into subparts are needed. (Stern et al. 2012: 81)

3.3 TIME HORIZON AND SPATIAL SCALE

Many journal articles reviewed for this study discuss various relevant methodological challenges. One article focusing on ecosystem services, carbon sequestration, and livelihoods in drylands lists 10 important data gaps, including insufficient data on soil carbon flux and dryland soil microbes, spatial distribution of above-ground biomass, natural and human drivers of biomass fluxes; and insufficient understanding of how resource management changes affect biomass and ecosystem services, and of poverty-environment relationships and how these may affect carbon mitigation strategies. An improved scientific evidence base is therefore considered a necessary condition for designing NRM interventions that can deliver carbon storage and ecosystem benefits while meeting poverty alleviation objectives (Stringer et al. 2012).

There is a significant body of literature that discusses the complex ways in which natural resource systems interact with human systems. Examples include coupled human and natural systems (Liu et al. 2007), the two-system evaluand approach (Rowe 2012), land change or land system architecture (Turner, Lambin, and Reenberg 2007), ecohealth (Bunch et al. 2011), and panarchy (Gunderson and Holling 2001). What these approaches have in common is a growing recognition of the limitations in applying methodologies developed in the context of a single research discipline to the dynamics of nested or interacting systems that function at different scales of time and space (Levin et al. 2013).

All models require simplification in order to capture the most essential elements, but the challenge in modeling highly complex systems is to know which elements can safely be omitted without making the analysis misleading or even useless. Complexity science can be useful in framing the multiple interactions within and between systems that are an unavoidable aspect of NRM (Cilliers et al. 2013). One feature of complex systems is that they have "emergent" properties that cannot be understood by analyzing individual components in isolation: the emergent properties are aspects of the complex system as a whole and are not visible at the level of subsystems (Stirzaker et al. 2010). In recent years, theory of change models have gained support as being better able to accommodate longer-term processes and offering greater clarity about the pathways by which desired changes are to be achieved (Vogel 2013; Woolcock 2009).

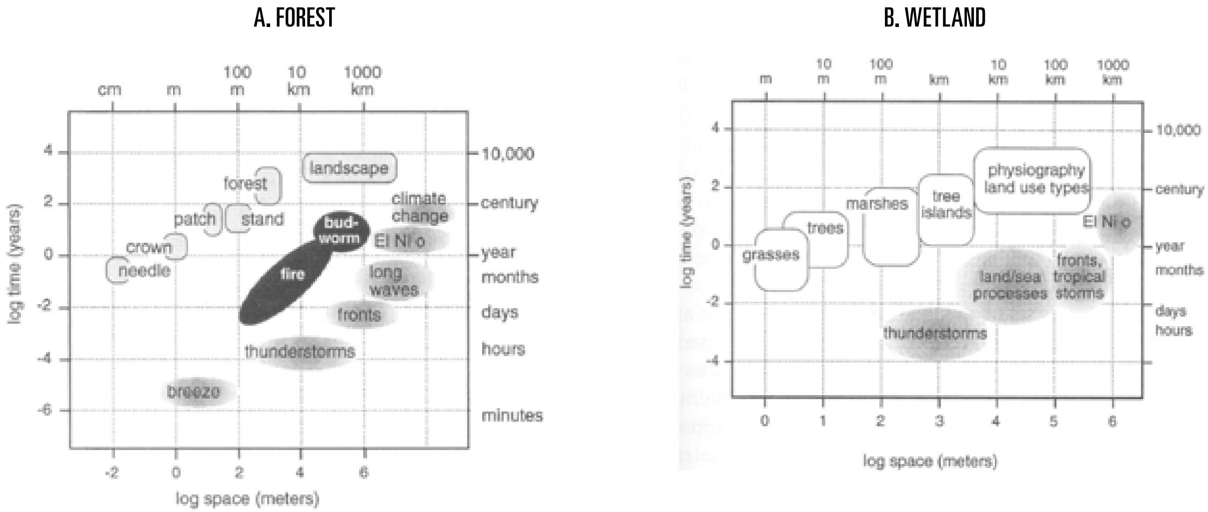
Many of the NRM project evaluations reviewed for this scoping study revealed methodological shortcomings such as inadequate baseline data or M&E systems that had not been fully implemented as designed. Thus far, no example has been found that identifies a lack of underlying scientific understanding as an area of weakness. This is probably because of the constrained scope of such accountability assessments, which were commissioned to evaluate what had been delivered as compared to the original project design; while a short "lessons learned" section is commonplace in project documents and evaluation reports, these seldom raise underlying or systemic issues of the kind found in the peer-reviewed literature.

Among the NRM evaluations reviewed for this scoping study, none had provided for postcompletion follow-up over time, which would have enabled observation of the progress of project outcomes and claimed impacts. This lack is explained by constraints in the financing model for these projects, which impose a clear cutoff date for expenditures as one of the conditions of the loan or grant. On the other hand, a significant number of environmental monitoring initiatives can be found in many developing countries, often at the subregional level. These initiatives include remote sensing facilities to assess land cover change, deforestation, etc., and potentially provide a technical platform for long-term monitoring of closed projects—provided that arrangements can be made for the costs.

Financing and logistical concerns are not the only constraints in this regard. The literature includes numerous articles exploring the theoretical and practical challenges of addressing complex or interacting systems that operate across very different spatial and temporal scales. Figure 3.2 illustrates the range of temporal and spatial scales that exist within two ecosystems: a boreal forest and a wetland. In both cases, meso-scale processes such as insect outbreaks and fires mediate between faster atmospheric processes and slower land cover and vegetative processes (Holling 2001). The development and implementation of policies and technical capacities for new resource management approaches, or for learning and applying lessons from research or evaluation to the design of new NRM interventions, are also examples of meso-scale processes. Slower still are factors such as cultural change and evolution in attitudes and belief systems. These latter are known to be important factors influencing resource users and policy makers, but are seen as beyond the scope of influence of most projects or programs.

At the level of an individual NRM intervention, it may be impractical to attempt to capture all the elements and interactions that could theoretically be relevant to long-term outcomes. A typical donor-funded NRM project may be planned to last four to five years (although in practice often extended to six or seven years because of implementation delays). For the purposes of comparison with an ecological process, figure 3.2a would place a typical NRM project at approximately the intersection

FIGURE 3.2 Time and Spatial Scale of Ecological Processes in a Forest and a Wetland



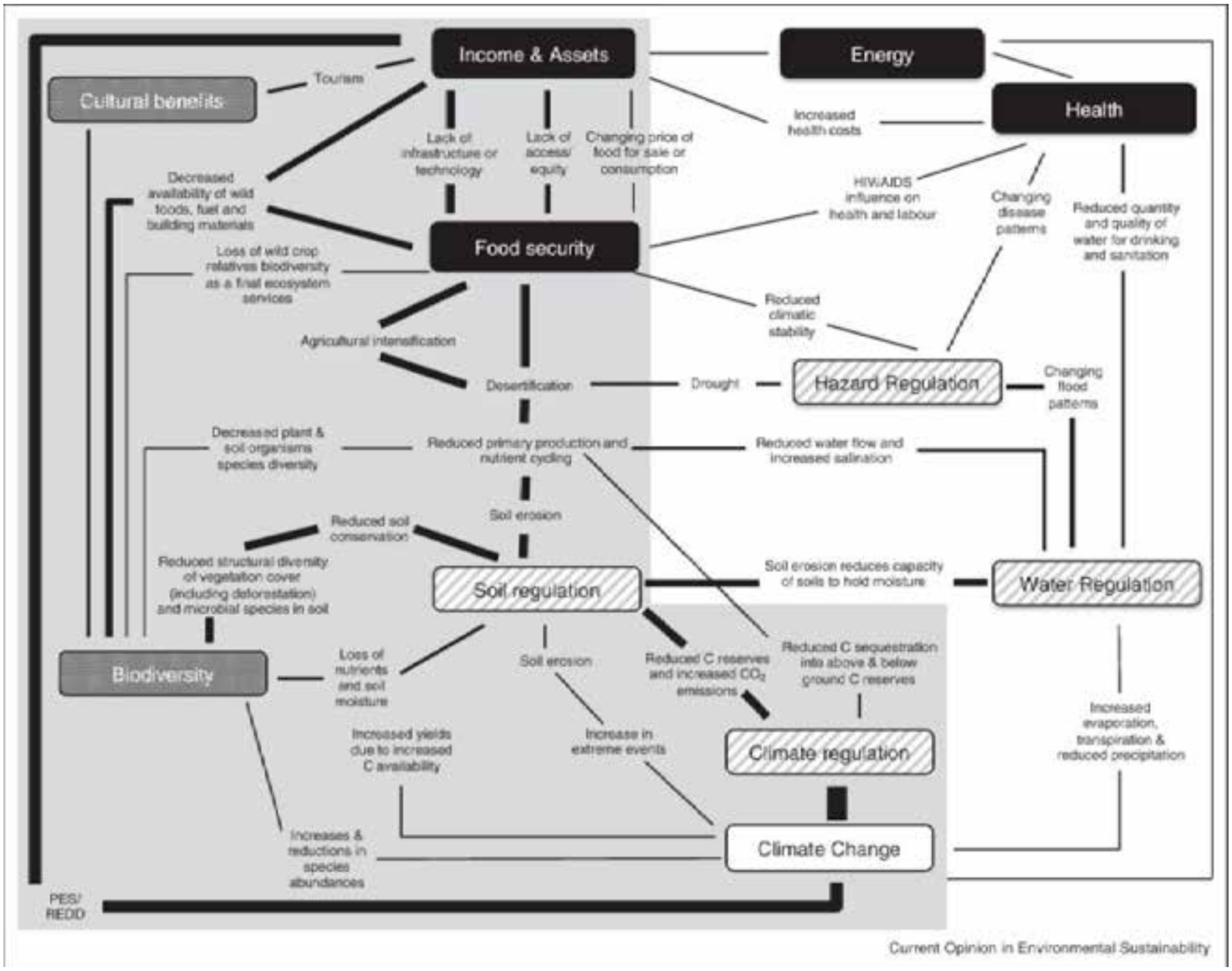
SOURCE: Holling 2001.

of an insect infestation event and a fire event. Most M&E designs do not take into account the existence of both slow and rapid ecological processes. Instead, project designs are organized around the implementation process, and monitoring is done for things measurable during the project's lifetime, at intervals that can be expected to capture meaningful changes attributable to project interventions.

Landscape-level approaches to ecosystem management and payments for ecosystem services have become alternatives to conventional NRM projects.[3] While they can overcome some of the limitations outlined above, they also raise their own issues related to complexity—not only because of time or spatial scale, but because different economic, social, and political processes may come into play at various stages, and most projects do not have direct access to convene and oversee changes in all of the relevant sectors. Convening power is a key element in approaches that try to improve natural resource governance: who has the standing or authority to "convene" all of the stakeholders and oversee a process of negotiation that can lead to an agreement that is workable and enforceable. Donors often speak of the need for "landscape"-level approaches but may lack the legal or political tools to "convene" such a process in most cases. Figure 3.3 illustrates one way of modeling the many pathways linking climate change, ecosystem services, and poverty alleviation (Howe et al. 2013). Note that this model does not include spatial or temporal dimensions, which would also need to be accounted for in the design of an actual NRM intervention. In practice, such models can become so complex as to be almost unusable for project designers and managers. The Howe model maps a large number of potential pathways for change, but does not try to include time as a variable (though projects are almost always

[3] Wikipedia defines payments for ecosystem services (PES)—also known as payments for environmental services (or benefits)—as incentives offered to farmers or landowners in exchange for managing their land to provide some sort of ecological service.

FIGURE 3.3 Conceptual Model: Ecosystem Services, Climate Change, and Poverty Alleviation



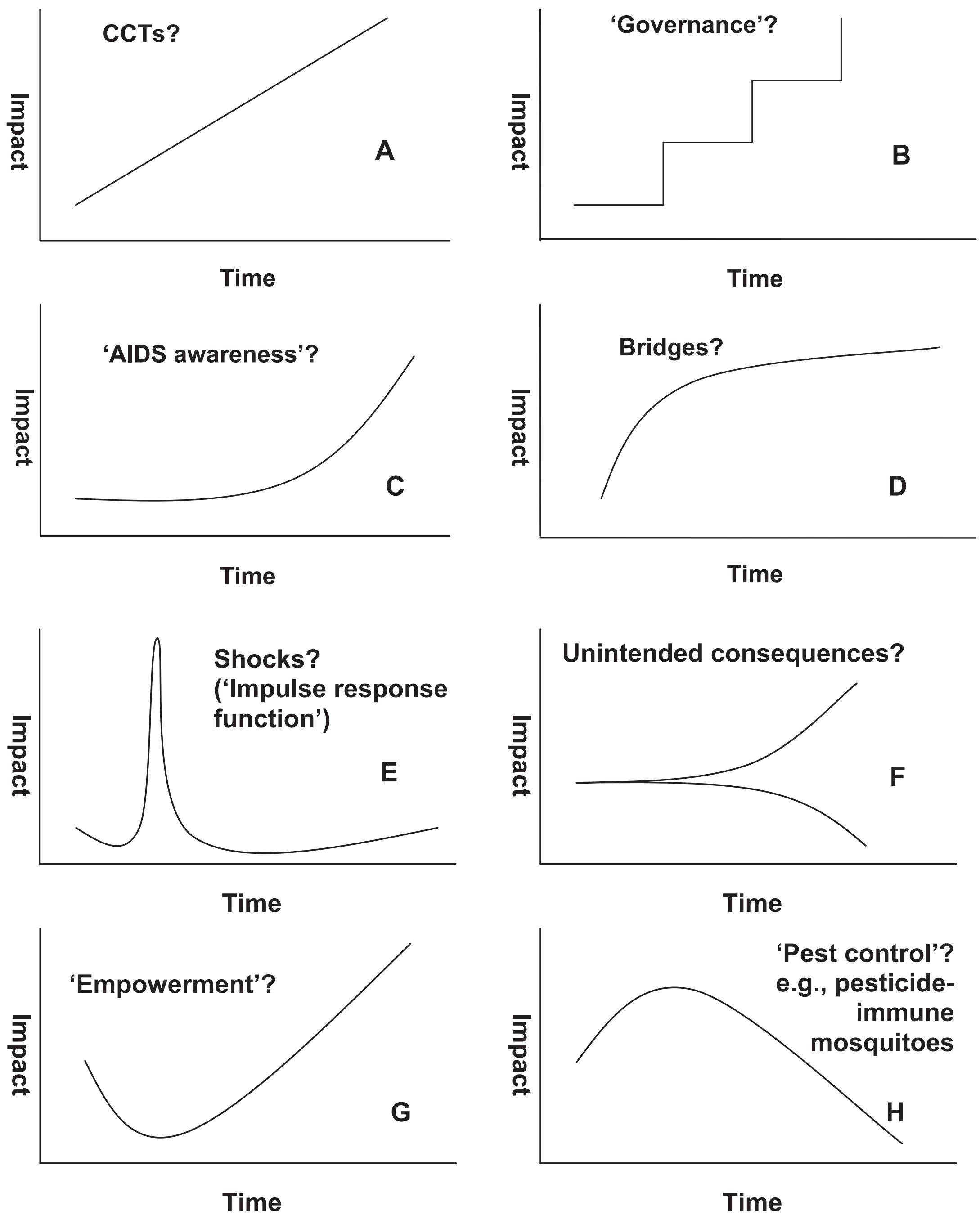
SOURCE: Howe et al. 2013.

specifically time-bound), or to address whether and how physical scale can also affect the process.

The issue of complexity is especially important where multiple interacting systems are involved, especially if there may be nonlinear feedback mechanisms or slowly evolving processes that may not be immediately apparent (including climate change effects). Some analysts refer to these as "adaptive systems," which may be resilient for periods of time yet are susceptible to sudden shifts—"regime shifts"—and may even collapse (Liu et al. 2007). Since processes unfold at different rates, modeling and predicting these interactions can be very challenging.

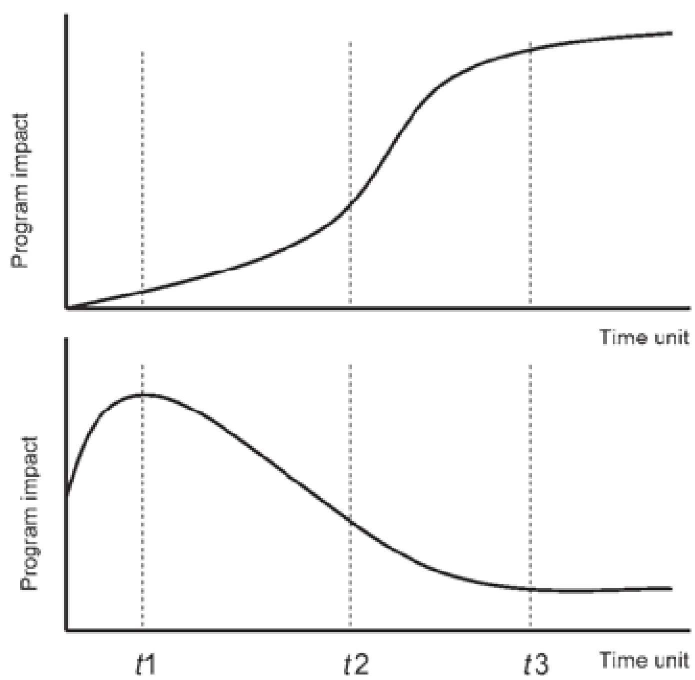
Where poverty reduction or development is part of the NRM intervention, it is clearly very important to understand the relationships and causal linkages between human and natural systems, yet often these are poorly understood and documented (Howe et al. 2013). Woolcock (2009) has described the need to take into account possible differences in the shape or trajectory of outcomes or responses to interventions—J curves, S curves, U curves, step functions, etc. These types of response curves are well known to economists and medical researchers, for example, but are not typically considered within NRM interventions. For example, an environmental variant on the Kuznets curve has been proposed that suggests that pollution increases with industrial development, and then begins to decline as the economy reaches higher levels of per capita income. Figure 3.4 shows several possible response curves for differ-

FIGURE 3.4 **Examples of Possible Response Curves in Development Projects**



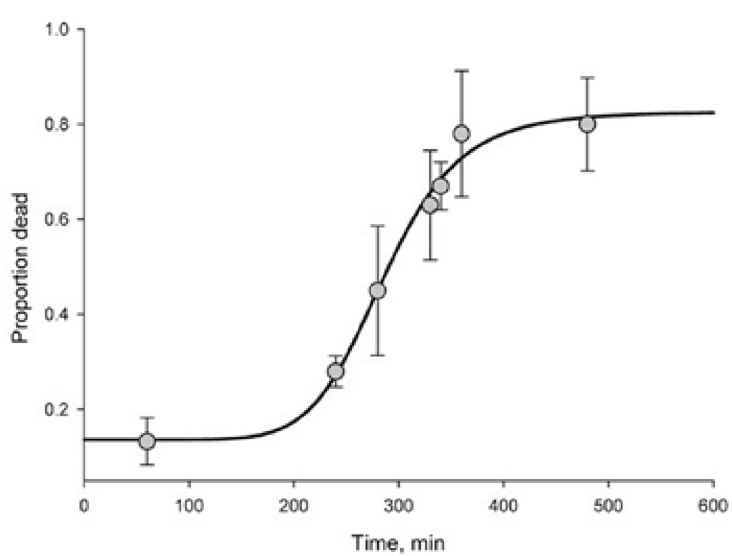
SOURCE: Woolcock 2009.

FIGURE 3.5 **Timing of Evaluations and Its Effect on Impact Estimates**



SOURCE: King and Behrman 2008.

FIGURE 3.6 **Treatment Response Curve: Insect Mortality against Time from Exposure to an Insecticide**



SOURCE: Edi et al. 2012.

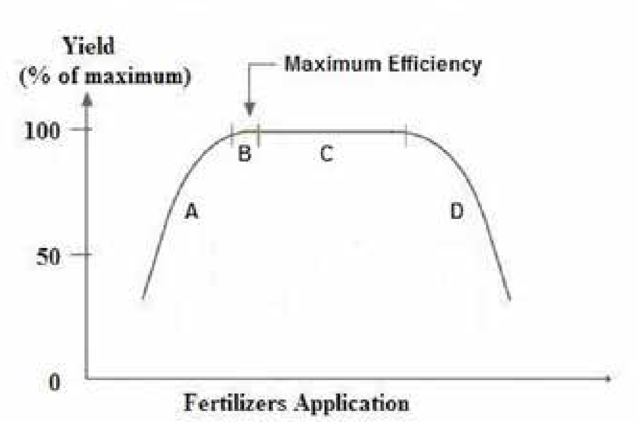
ent types of development interventions across various sectors.

The significance of this point is that it is not sufficient to take into account the different time horizons over which relevant factors take place—one must also be aware that they may follow different trajectory shapes over time, with the risk of prematurely deriving conclusions about effectiveness as well as the possible reversibility of outcomes (King and Behrman 2008; Woolcock 2009, 2013). Figure 3.5 demonstrates the difference that can result from selecting the time at which to conduct measurement for an evaluation. Evaluation at Time 1 in the upper example would provide a misleadingly low indication of intervention performance compared with measurement at Times 2 and 3. The opposite would be true in the lower case, with early measurement providing a mistaken impression of great success, which would be revealed at Times 2 and 3 to be declining in impact.

Two examples illustrate important differences in the observed shape of treatment responses. Figure 3.6 shows an example of insect mortality over time following exposure to an insecticide, in the shape of an S curve. Initially the treatment shows little or no effect, then there is a rapid increase in effectiveness, followed by a flattening of the curve, whether by declining concentration of the chemical, or the presence of insects that are resistant to the treatment. The S curve is a classic example of a response beginning slowly, increasing rapidly for a time, and finally flattening to a plateau that does not increase much with additional time. In this case, extrapolating from a single point, or even two, can be highly misleading. In the case of insect mortality, taking measurements at intervals of minutes does not present a major difficulty. Conversely, measuring changes in the accumulation of biomass in an ecosystem may require a long-term research protocol well beyond the scope of a four- to six-year NRM project.

Figure 3.7 shows how crop yields vary in response to increasing applications of fertilizer. In this case, the inverted U curve illustrates how yields can vary significantly as a result of how much fertilizer is being applied. This means that monitoring must not only compare with and without fertilizer cases, but must also be able to distinguish treatments that closely adhered to the specified level of application (neither under- nor overdosing) from cases in which incorrect treatment applications were applied. If these distinctions are not made, there is a risk that yield differences ascribed to the project may be invalid.

FIGURE 3.7 Treatment Response Curve: Crop Response to Fertilizer Application



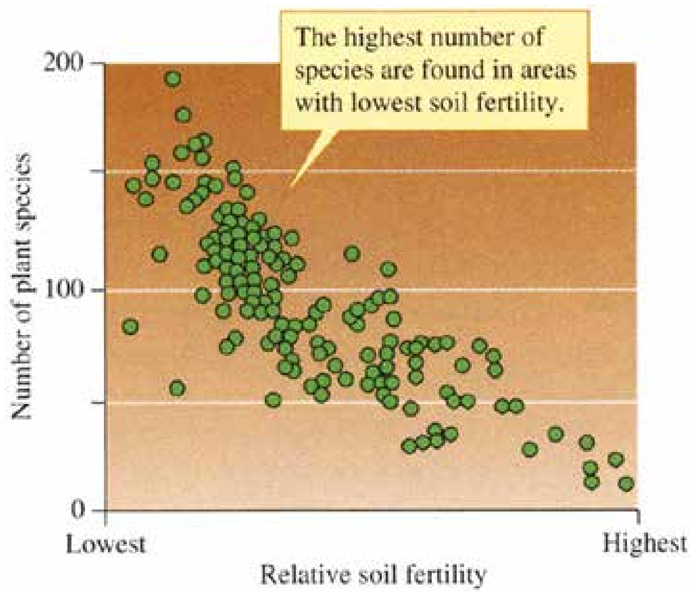
SOURCE: SMART! Fertilizer Management, http://www.smart-fertilizer.com/fertilizer-application-rates.

Problems of time horizon and physical scale have long been acknowledged in NRM. Adaptive management is one approach often recommended as a means of addressing patterns that may only become evident over time. Project or program activities and strategies are adjusted or substituted based on evidence from ongoing or previous interventions—i.e., identifying those interventions that were successful (or not). Making such adjustments requires an understanding of how specific circumstances affected the outcomes instead of continuing implementation along a predefined course of action regardless of outcomes. The approach places a premium on having well-functioning monitoring systems in place, as well as sufficient analytic capacity for managers to assess real-time information and make necessary adjustments with minimal bureaucratic interference. It also requires that the management system be in place long enough to make necessary adjustments as events progress over time, rather than ending once access to donor financing has been terminated. The term "adaptive management" is found in many of the NRM project documents and evaluations reviewed for this study, but in reality few, if any, projects are able to ensure the continuity of these management functions after closing.[4]

Appropriate understanding of what is to be measured can also present difficulties. NRM projects sometimes make overly simplified assumptions about what constitutes a healthy ecosystem; for example, by assuming that areas with greater soil fertility (and higher levels of CO_2 in the soil) will also have greater diversity of plant species. In this case, people may believe that both soil fertility and species diversity are essential aspects of ecological health. Yet in tropical forests, there is often an inverse relationship between plant diversity and soil fertility (Huston 1994). Figure 3.8 shows results from 0.1 hectare forest sites in

[4] Ruitenbeek and Cartier (2001) describe adaptive comanagement of complex systems as an emergent and agent-based strategy which could operate somewhat similarly to Adam Smith's famous "invisible hand," whereby common interest can lead to the emergence of NRM regimes favoring sustainability. This approach has not been mentioned in the evaluations reviewed for this study.

FIGURE 3.8 Defining a Healthy Ecosystem



SOURCE: Hall and Swaine 1976.

Ghana illustrating an inverse relationship between soil fertility and species richness (Hall and Swaine 1976). Projects aiming to restore degraded ecosystems need to avoid simplistic assumptions that are not supported by good science.

3.4 QUALITY OF M&E SYSTEMS

The scoping study found that shortcomings in project-level M&E systems were widespread. Shortcomings often cited in evaluation reports include implementation delays due to capacity limitations or overly ambitious design assumptions, and weaknesses in the M&E arrangements or shortcomings in implementing the M&E system described in the project design. The latter includes the absence of baseline data needed to assess outcomes or concerns about the reliability of such data. Such issues are not unique to NRM projects, but it is likely that some of the factors discussed in this report—time horizon, physical scale, multiple systems that are difficult to reflect within a single system of indicators—are particularly difficult challenges in NRM interventions.

To investigate this further, two subgroups of the 59 NRM project evaluations were examined: those that had been rated highly satisfactory overall, and those that had been rated moderately unsatisfactory or unsatisfactory. The objective was to see whether the highly satisfactory projects had better designed and implemented M&E systems, and conversely, whether more poorly performing projects had demonstrated similar weaknesses in their M&E arrangements.

The results of this analysis showed that the M&E arrangements of highly satisfactory projects tended to be rated somewhat lower than other aspects—usually in the moderately satisfactory range, though still above the ratings of the poorly performing projects. The M&E systems of poorly performing projects were also poorly rated, either in terms of quality of design, quality of implementation, or—in most cases—both. Shortcomings included the failure to collect baseline data; poor selection of monitoring indicators; and institutional weaknesses that undermined M&E functions, such as staff turnover or capacity shortcomings that were not resolved during the project's lifetime. In other cases, while some aspects of the project had been revised during the midterm review, the monitoring framework had not been adjusted accordingly; this made it difficult for evaluators to assess claimed accomplishments after project completion. Finally, one evaluation commented that the project had M&E constraints typical of that donor's operations as a whole: focused on outputs and activities rather than outcomes, excessively complex (the project had some 280 indicators in all), data quality issues, and low institutional capacity to implement the M&E system.

3.5 DATA QUALITY AND CREDIBILITY

As already noted, a shortcoming found in many of the NRM evaluations was weaknesses in the availability of baseline data, without which it is difficult to make any claims about project achievements. The GEF has required baseline data to be present at the time of project approval since the early 2000s, but in practice such data are often partial, or other shortcomings are later revealed. Often, these shortcomings stem less from the design of the M&E system or the collection of baseline data than from problems resulting from staff turnover or other institutional factors leading to incomplete implementation of the monitoring system called for in the project document. These problems are by no means unique to NRM, but the cross-cutting and interdisciplinary nature of many NRM interventions exacerbates the issues. Consequently, project components sometimes address elements as diverse as policy reform and improved local governance, diversification of household incomes, promotion of tree planting, control of livestock grazing, measures to reduce illegal wildlife hunting, introduction of techniques for improving soil fertility and erosion control, introduction of drought-resistant seed varieties, and many others. Evaluators may find themselves trying to retrospectively establish baseline data and account for variables that had not been specified in the project design. The USAID Senegal retrospective study cited previously (USAID 2014) was able to use econometric techniques to validate a number of project achievements at the level of household incomes, even though the study was not able to confirm project outcomes at the biophysical level (biodiversity, soil carbon, etc.) due to the project's use of an overly aggregated proxy indicator (hectares under improved management).

The systematic review of community forest management studies cited earlier (Bowler et al. 2010) pointed to a larger data problem. By using different methodologies, definitions, and approaches to measurement, the NRM community faces serious problems in trying to draw larger lessons from individual interventions. The difficulty arises in trying to aggregate results from individual projects, which may use different ways of defining and measuring results, thereby making it very challenging to provide meaningful conclusions about large-scale trends. Largely as a response to the Millennium Development Goals agenda, the development community has made progress in agreeing on standard indicators for some sectors (health, education), which facilitates comparison across countries and learning from experience in different contexts. By establishing an agreed-upon set of indicators—the core sector indicators—a common definition is now being used by the development community as a whole instead of each entity using its own approach (World Bank 2013). Examples from the core sector indicators relevant to NRM include the following:[5]

- Land area where sustainable land management practices have been adopted as a result of the project (hectares)
- New areas outside protected areas managed as biodiversity friendly (hectares)
- People in targeted forest and adjacent communities with increased monetary and nonmonetary benefits from forests (number)

[5] Note that NRM is not one of the sectors covered by the core standards; the examples listed here are drawn from sectors that often feature in NRM projects: agriculture, biodiversity, forestry, land management, participation, and civic engagement.

- Subprojects or investments for which arrangements for community engagement in postproject sustainability and/or operations and maintenance are established (percentage)

Assuming that M&E design and implementation are handled effectively, there is a remaining challenge facing data quality and credibility. This challenge pertains to whether the data being collected are appropriate in supporting conclusions about the attribution of project outcomes and impacts. Moreover, experimental methods may have limits in terms of external validity—how do we know if the tested intervention might work at other locations and at larger scales?

> For example, an intervention run by an NGO [nongovernmental organization] might be totally different when applied at scale by government officials facing different incentives. Understanding the institutional-implementation factors that make the same program successful in one place but not another is an important but under-researched issue. (Ravallion 2009: 4)

The DFID review of impact evaluation cited earlier notes that there is an inverse relationship between the scope of a given intervention and the strength of causal claims that can be made about the intervention:

> The reality is that many contemporary programmes are not narrowly specified: they are ambitious, broad in scope and made up of many sub-programmes. Policy makers may therefore have to accept a trade-off between strong causal inference and relevance. (Stern et al. 2012: 80)

The cost and availability of technical expertise required for evidence-based NRM evaluation also needs to be recognized. One article reviewing the use of impact evaluation by foundations concluded that, while there is growing demand for experimental methods to test causation, few donors understand the cost of such techniques and few recipient nonprofit organizations are adequately staffed to implement them (Snibbe 2006). According to this assessment, donors seldom base their future funding decisions on results from evaluative evidence, but require summative evaluations as a measure of accountability for the use of their funding.

An example of how data quality issues affect the evaluation of NRM projects can be found in a sustainable land management project in West Africa, which was designed as a GEF-financed component of a larger project supporting agricultural research and development. The GEF component had the objective of helping reduce land degradation and improve ecosystem functions and services, and the M&E system was integrated within the larger agriculture project. One of the three indicators for this component was to increase soil carbon (organic matter) from 0.20 percent to 0.23 percent in an area that was experiencing serious ecological degradation.[6] The project document acknowledged that the three-year project implementation period would pose challenges because some of the monitoring indicators could be affected by outside factors and might take longer than three years to show improvement.

Though the project was launched in 2009, the baseline for soil carbon content was based on 1990 data, which were acknowledged to be outdated at the time of project approval. Soil samples were collected at the beginning of the project to provide

[6] The other two outcome indicators listed in the project logframe were actually outputs: number of hectares on which improved practices were introduced, and number of project beneficiaries. The evaluation did not comment on this point.

updated baseline data; but due to budgetary difficulties, the samples were not analyzed until the end of the project in 2012. The evaluation provided few details on the soil carbon analysis except to note that the original baseline data were outdated averages for the region as a whole, and had been replaced by new data at the time of the biophysical study conducted at the conclusion of the project (table 3.1). The original project design had expected to increase soil fertility by about 15 percent, but the 1990 published values proved to be nearly 10 times lower than actual soil fertility levels measured during the project. The project evaluation calculated a soil fertility increase of 47 percent attributable to project interventions, but no data were presented on the range of values found across the various project sites, nor on seasonal variations due to factors such as rainfall. The evaluation also did not discuss whether soil carbon measurements represent an adequate indicator of ecosystem functions and services—although it noted that some sites were not effectively monitored during project implementation, and concluded that standard formats should have been developed and used for technical monitoring of and reporting from field sites.

Although this project is recorded as having achieved its objectives and was rated as satisfactory at completion, serious data quality issues exist which raise questions about the technical analysis underlying the project design, as well as the claim of having restored ecosystem functions and services in a degraded landscape after just three years of implementation.

3.6 VALUATION OF NATURAL RESOURCES

Economic valuation of natural resources takes various forms in the NRM evaluations reviewed. Many NRM projects include components based on agriculture, forestry, livestock, or fisheries, for which economic valuation is done using conventional yield and market data, as well as household income (as in the USAID Senegal project). It is relatively simple to measure the market value of fodder, fuelwood, and charcoal—or of nontimber forest products such as medicinal herbs and gum arabic—since all of these are economic commodities for which market data can be monitored over time (attributing changes to a project intervention is another matter, as discussed above). Whether project outcomes are sustained over time is a long-standing issue, which is certainly not unique to NRM. Using data from the Demographic and Health Survey, the USAID retrospective assessment in Senegal demonstrated that household incomes appear to have had sustained benefits several years after project completion. However, this analysis focused on economic benefits to households, and did not attempt to estimate the economic value of other interventions such as reform of the charcoal commodity chain in Senegal or the CO_2 benefits of tree planting (USAID 2014).

CGIAR has tried to estimate the economic value of some of its NRM research. For example, the International Institute for Tropical Agriculture's introduction of biological control of cassava mealybug in Sub-Saharan Africa was estimated to have generated net present value of some $9 billion, with similar economic benefits attributed to other biological controls introduced for cassava green mite, mango

TABLE 3.1 Increased Percentage of Organic Matter in Soil in Target Areas

	Baseline value	End project target	Increase
Project document	0.20	0.23	15
Final evaluation	1.82	2.29	47
Adjustment to original value	910	996	

SOURCE: World Bank 2009.

mealybug, and water hyacinth (Renkow 2010). These estimates are derived from market valuation based on production losses averted by the new technology; to date, there has been less progress in using nonmarket valuation techniques relevant to ecosystem services affected by the results of NRM research.

Payment for ecosystem services interventions take a different approach, by creating nonconventional markets that aim to address environmental externalities ignored by existing market forces. One example is compensating farmers in hilly areas for improved soil management practices that mitigate damage downstream—for example, reduced river flow or siltation that hinders the operation of hydroelectric systems or water supplies for urban areas. Another example is REDD+, which attributes a price for carbon that has been captured and sequestered in tree planting or avoided deforestation, based on global markets currently operating on a voluntary basis. Annual reports on these markets are now available that provide an indicator of price trends and adoption of methodologies and progress in the development of verification systems (Ecosystem Marketplace 2013). In many cases, payment for ecosystem services projects have tended to focus on one domain for simplicity (forest carbon, water quality), but conceptual models have also been proposed that point to a more comprehensive approach to valuation of ecosystem services (e.g., as shown in figure 3.3). Implementing a model of this type would present significant challenges, but has the benefit of trying to specify more clearly the expected linkages between some of the various elements in an NRM project. Results-based management and impact evaluation require very precise identification of what has changed in response to project interventions. In many cases, project designs do not (or are not able to for practical reasons) specify all of the intervening factors and variables that can influence the ultimate outcome—as found in the USAID retrospective assessment in Senegal (USAID 2014).

Another factor that has handicapped efforts to provide greater economic incentives for protecting ecological services has been the failure thus far to agree on a global regulatory framework. According to data collected by Forest Trends (Ecosystem Marketplace 2013), voluntary carbon markets accounted for 95 percent of total carbon markets in 2012, although declining from \$10.30 per tonne of CO_2 in 2011 to \$7.60 per tonne in 2012. Clean Development Mechanism and Joint Implementation prices fell even more sharply, from \$3.90 per tonne in 2011 to \$1.10 in 2012, though prices in compliance-based markets rose from \$7.20 to \$10.50 during the same period. These price signals reflect a complex and unsettled governance and regulatory framework, which has significant implications for economic valuation of benefits in NRM interventions.

3.7 UTILIZATION OF NRM EVALUATIONS

In a recently published review of knowledge and learning at the World Bank, the Bank's Independent Evaluation Group concluded that the existing instrument used to evaluate completed projects—the implementation completion review—has limited utility for institutional learning, as "people look at the ratings, not the lessons." Moreover, "ICRs for the second or third project in a series rarely convey any sense of cumulative learning" (IEG 2014). Shortcomings cited by Bank staff interviewed by the Independent Evaluation Group included that evaluation lessons were so general as to have little operational relevance, that it was difficult to apply lessons from one country to another, and that lessons learned from evaluations were too often inserted into project documents as a pro forma exercise without any evidence that project design had been modified in light of the evaluation findings (IEG 2014).

Other donors have similarly struggled with finding more effective ways to ensure that the lessons learned from evaluation are integrated into the selection and design of new operations. The African Development Bank, the Asian Development Bank, the GEF, and USAID are among the organizations that have made a commitment to strengthen knowledge management functions. And in fact, the World Bank's ambitious recent reorganization is intended in part to ensure that newly created global practices can become more effective hubs for knowledge functions.

In the case of NRM evaluations, an additional challenge is generated by NRM paradigm shifts. Mace (2014) describes how attitudes toward nature conservation have evolved since the 1960s, and illustrates how this evolution has influenced the focus of scientific research in the field of conservation. During the 1960s and 1970s, the organizing idea was the need to protect species; this was underpinned by research into species, habitats, and wildlife ecology. During the 1980s and 1990s, the focus shifted toward habitat loss and overexploitation, and scientific research began to emphasize population biology and NRM. By the early to mid-2000s, attention was focusing on ecosystem services, reflected in more research into ecosystem functions and payment for ecosystem services. Mace suggests that there is now another shift under way, toward a focus on resilience and adaptation, with more attention being given to research that combines theories and instruments from the social and ecological sciences. Compared with other scientific paradigm shifts, Mace concludes that, in the case of conservation, all of these framings remain in simultaneous use—creating the risk of sending contradictory messages and ambiguous signals to policy makers. On the other hand, the increased interest in resilience and adaptation provides a much clearer entry point for integrating climate change into NRM interventions and evaluations. Indeed, awareness of these topics may well be due to greater awareness of climate change.

CHAPTER 4

Conclusions

Although there is limited evidence so far, some authors and practitioners have shown how methodological challenges can be tackled and where more efforts can be directed. For example, Miteva, Pattanayak, and Ferraro (2012) explore common issues in evaluation of conservation interventions and argue for a new emphasis based on better theory, methods, and data. Better theory involves enhancing internal and external validity, improving counterfactuals, and accounting for the two-way relationship between humans and ecosystems. Better methods include removing bias, analyzing spillover effects, and measuring variables over a longer time period. Better data includes gathering more and better socioeconomic and institutional data from relevant locations when setting baselines, and improving collaboration between environmental scientists and economists during analyses of ecological data. FAO has produced a sourcebook for climate-smart agriculture which summarizes a range of challenges for assessment, monitoring, and evaluation that apply to NRM in general:

> the difficulty of setting the goals and an agreed definition for CSA [climate-smart agriculture]; the multi-sectoral nature of CSA and the involvement of various stakeholders; the issues of scale, leakage, permanency, externality and ancillary impact; the difficulty of obtaining quality data and information; the uncertainties with data, information, and methods; difficulty of attribution; inadequate capacity and resources; and the practicality of methods and tools (FAO 2013: 534)

Several recent trends should be recognized when thinking about how to strengthen evaluation methodologies as applied to NRM:

- In parallel with calls for evidence-based policy making, there has been a growing demand for the *use of experimental or quasi-experimental methods* to more sharply define the conditions or circumstances in which a particular NRM intervention can be said to be effective. In this regard, Ferraro has been a proponent of greater use of "counterfactual thinking" in the environmental policy community (Ferraro 2009). And USAID's recently approved Productive Landscapes program will use quasi-experimental methods to test a range of interventions intended to increase agricultural production while improving ecosystem functions.

- Some economists and social scientists are pushing back against this trend, as they believe that experimental methods are most appropriate to narrowly defined situations such as medical trials and are being misused in complex policy contexts in which it is impossible or impractical to control for some important external factors that may influence outcomes (Donaldson, Christie, and Mark 2009; Ravallion 2009; Rodrik 2008).

- Increasing interest in landscape-level approaches and ecosystem services is also resulting in an awareness of methodological issues related to adequately taking into account wide variations in temporal and spatial scales. Some articles explore the dynamics of complex interactions between coupled systems which present obstacles in terms of data gaps, conceptual frameworks, and research instruments (Donaldson, Christie, and Mark 2009; Liu et al. 2007; Rowe 2012).

- Theory of change approaches address the time horizon problem by taking an iterative and long-term perspective which adjusts over time as new information and experience are accrued. However, this perspective is very challenging to apply in the limited time frames within which most donors finance NRM (and other) interventions. NORAD is developing and testing a suite of methods for monitoring REDD+ interventions using a theory of change approach.

- Mixed methods and carefully selected case studies provide a means to resolve some of these methodological issues (Woolcock 2013). Further, there is increasing interest in finding practical ways to triangulate using different tools instead of relying on a single "best practice" or "gold standard" methodology. The USAID assessment in Senegal is one example of using multiple methods and types of evidence in order to develop a deeper understanding of how NRM practices have been adapted by farmers. In some cases, new or modified cultivation and grazing practices had not been anticipated at the time of project design, and the retrospective assessment was able to significantly expand knowledge about factors influencing farmer decisions in degraded drylands.

- NRM is a domain in which taking longer-term approaches seems especially relevant. Projects designed to operate over five years or so are required to make many assumptions about processes that unfold slowly, and typically lack effective opportunities for adaptive management once donor funding has ended. Longer-term models seem to be an inevitable alternative, although these may be difficult for donors to accommodate within current budgeting systems. Programs that provide longer-term funding in sequential phases are one practical alternative, since approval of a given phase is conditional on successful implementation of the previous one. One example is the USAID Central African Program for the Environment (CARPE), launched in 1995, which is currently in its third phase of providing support to conservation activities in the Congo Basin of Africa.

- Retrospective and stock-taking assessments offer another way of untangling complex cause-and-effect situations after NRM interventions have concluded, and may be able to identify adaptations made by stakeholders that had not been foreseen in project design nor captured by M&E systems.

ANNEX A

Evaluations Used and Other Documents Reviewed

TABLE A.1 NRM PROJECT EVALUATIONS

No.	Title	Organization	Country
1	Albania Natural Resources Development Project ICR	World Bank, GEF	Albania
2	Bhutan Sustainable Land Management Project ICR	World Bank, GEF	Bhutan
3	Brazil Ecosystem Restoration of Riparian Forests in Sao Paulo Project PAR	World Bank, GEF	Brazil
4	Sustainable Agro-Pastoral and Land Management Promotion under the National Community Development Program Support Program ICR	World Bank, GEF	Cameroon
5	Costa Rica GEF Ecomarkets Project ICR	World Bank, GEF	Costa Rica
6	Ghana Natural Resources and Environmental Governance Development Policy Operation (I–III)	World Bank	Ghana
7	Integrated Ecosystem Management in the Jordan Rift Valley GEF Project ICR	World Bank, GEF	Jordan
8	Kazakhstan GEF Drylands Management Project ICR	World Bank, GEF	Kazakhstan
9	Kenya Arid Lands Resource Management Project—Phase II ICR	World Bank	Kenya
10	Western Kenya Integrated Ecosystem Management Project ICR	World Bank, GEF	Kenya
11	Kenya NRM Project ICR	World Bank	Kenya
12	Integrated Silvo-Pastoral Approaches to Ecosystem Management Project in Columbia, Costa Rica, and Nicaragua ICR	World Bank, GEF	Columbia, Costa Rica, Nicaragua
13	Mali Household Energy and Universal Access Project ISR	World Bank, GEF	Mali
14	Mauritania Community-Based Watershed Development Project ICR	World Bank, GEF	Mauritania
15	Mexico Framework for Adaptation to Climate Change in the Water Sector—Development Policy Loan ICR	World Bank, GEF	Mexico
16	Mexico Environmental Services Project ICR	World Bank, GEF	Mexico
17	Medex Low-Carbon Development Policy Loan ICR	World Bank, GEF	Mexico
18	Nigeria 2nd National Fadama Development Critical Ecosystem Management Project ICR	World Bank	Nigeria
19	Integrated Management of Critical Ecosystems Project—Rwanda ISR	World Bank, GEF	Rwanda
20	Senegal SLM Project ICR	World Bank, GEF	Senegal

No.	Title	Organization	Country
21	Uganda Second Environmental Management and Capacity Building Project ICR	World Bank	Uganda
22	Uruguay Integrated Natural Resources and Biodiversity Management Project ICR	World Bank, GEF	Uruguay
23	Performance Evaluation of 3 Biodiversity and Ecotourism Activities in Mozambique	USAID	Mozambique
24	Improving Livelihoods and Governance through Natural Resources Management (ILGNRM) Project Performance Evaluation Final Report	USAID	Afghanistan
25	Evaluation of USAID/Ecuador's Sustainable Forest and Coast Project Evaluation Report	USAID	Ecuador
26	Final Evaluation 1997–2006: USAID and USDA/US Forest Service InterAgency Agreement—Forest Resources Management Project	USAID	Global
27	Biodiversity and NRM Project—Turkey ICR	World Bank, GEF	Turkey
28	Integrated Ecosystem Management in Three Priority Ecoregions (internal)	UNDP, GEF	Mexico
29	Integrated Ecosystem Management in Indigenous Communities ICR	World Bank, GEF	Central America
30	Natural Resources Management and Poverty Reduction Project ICR	World Bank, GEF	Armenia
31	Rio de Janeiro Sustainable Integrated Ecosystem Management in Production Landscapes of the North-Northwestern Fluminese ICR	World Bank, GEF	Brazil
32	Integrated Ecosystem Management in Northern Bohemia Final Evaluation	UNDP, GEF	Czech Republic
33	Mali NRM in a Changing Climate Project ISR	World Bank, GEF	Mali
34	Sudan Sustainable Natural Resources Management Project SSNRMP ISR	World Bank, GEF	Sudan
35	Namibia—Integrated Community-Based Ecosystem Management Project ICR	World Bank, GEF	Namibia
36	Conservation and Sustainable Use of Wetlands in Nepal Terminal Evaluation Report	UNDP, GEF	Nepal
37	SLM to Combat Desertification in Pakistan Terminal Evaluation	UNDP, GEF	Pakistan
38	Building Capacity and Mainstreaming SLM in Cambodia Terminal Evaluation	UNDP, GEF	Cambodia
39	Country Pilot Partnership Programme for Integrated SLM	UNDP, GEF	Namibia
40	Protection de l'environment Final Evaluation	UNDP, GEF	Cameroon
41	Zimbabwe Adaptation Project: Coping with Drought and Climate Change Terminal Evaluation	UNDP, GEF	Zimbabwe
42	Pangani River Basin Management Project Terminal Evaluation Report	UNDP, GEF	Tanzania
43	Sustainable Land Management Project Final Evaluation	UNDP, GEF	Liberia
44	Malawi Biodiversity Projects Evaluation	USAID	Malawi
45	Evaluation of Upper Mandrare Basin Development Project	IFAD	Madagascar
46	Northern Mindanao Community Initiatives and Resource Management Project	IFAD	Philippines

No.	Title	Organization	Country
47	Yarmouk Agricultural Resources Development Project	IFAD	Syria
48	Land Degradation Assessment in Drylands Terminal Evaluation Report	FAO	Global
49	Democratic People's Republic of Korea Uplands Food Security Project Interim Evaluation	IFAD	Korea, Dem. People's Rep.
50	Qinling Mountain Area Poverty Alleviation Project Interim Evaluation	IFAD	China
51	Hashemite Kingdom of Jordan National Programme for Rangeland Rehabilitation and Development Project Performance Assessment	IFAD	Jordan
52	Andhra Pradesh Farmer Managed Groundwater Systems Evaluation Report	FAO	India
53	Republic of Zambia Forest Resource Management Project Performance Assessment	IFAD	Zambia
54	Energy and Water Sector Reform and Development Project ICR	World Bank, GEF	Cape Verde
55	Community Based Rangeland Rehabilitation for Carbon Sequestration and Biodiversity Terminal Evaluation	UNDP, GEF	Sudan
56	Sustainable and Participatory Energy Management ICR	World Bank, GEF	Senegal
57	Renewable Energy for Agriculture ICR	World Bank, GEF	Mexico
58	Renewable Energy and Forest Conservation: Sustainable Harvest and Processing of Coffee and Allspice Terminal Evaluation	World Bank, GEF	Nicaragua
59	Oaxaca Sustainable Hillside Management Project Terminal Evaluation	UNDP, GEF	Mexico

NOTE: ICR = implementation completion and results report; ISR = implementation status and results report; PAR = performance assessment report; SLM = sustainable land management.

TABLE A.2 NRM PROGRAM, PORTFOLIO, AND OUTCOME EVALUATIONS

No.	Title	Organization	Country
1	Adapting to Climate Change: Assessing the World Bank Group Experience Phase III	World Bank	Global
2	Environmental Sustainability: An Evaluation of World Bank Group Support	World Bank	Global
3	The Forest Carbon Partnership Facility: Global Program Review	World Bank	Global
4	Managing Forest Resources for Sustainable Development: An Evaluation of the World Bank Group's Experience	World Bank	Global
5	Protected Area Effectiveness in Reducing Tropical Deforestation: A Global Analysis of the Impact of Protection Status	World Bank	Global
6	A Review of Climate Change Adaptation Initiatives within the Africa Biodiversity Collaborative Group Members	Africa Biodiversity Collaborative Group	Regional
7	Energy Environment and Livelihoods Outcome Evaluation	UNDP	India
8	Outcome Evaluation of the Practice Area of NRM as Part of UNDP's Country Programme for 2010–2015 (Kazakhstan)	UNDP	Kazakhstan

No.	Title	Organization	Country
9	Kenya Forest and Coastal Management Programs: Mid-Term Evaluation	USAID	Kenya
10	Outcome Evaluation: Energy & Environment Portfolio	UNDP	Philippines
11	Joint Programme on Environmental Mainstreaming and Adaptation to Climate Change in Mozambique—Final Evaluation	UNDP	Mozambique
12	Outcome Evaluation: Capacities to Conserve Biodiversity and Respond to Climate Change	UNDP	Cambodia
13	Joint Programme on Environment with a Focus on Climate Change, Land Degradation/Desertification and NRM	UNDP	Tanzania
14	Water and Development: An Evaluation of World Bank Support 1997–2007	World Bank	Global
15	Asia-Pacific Regional Climate Change Adaptation Assessment	USAID	Regional
16	Meta-Evaluation of Previously Evaluated ITTO Projects	ITTO	Global
17	Real-Time Evaluation of Norway's International Climate and Forest Initiative—Contributions to a Global REDD+ Regime 2007–2010	NORAD	Global
18	Real-Time Evaluation of Norway's International Climate and Forest Initiative—Contribution to Measurement, Reporting and Verification	NORAD	Global
19	Strategic Evaluation of FAO's Role and Work in Forestry	FAO	Global
20	Review of EEA and Norway Grants—Biodiversity Support	NORAD	Global
21	Mid-Term Evaluation of MDG Fund Environment Programme/Enabling Pastoral Communities to Adapt to Climate Change and Restoring Rangeland Environment	UNDP	Ethiopia
22	Enhanced Conservation of the Natural Resources Base Outcome	UNDP	Malawi
23	Evaluation of Norway's Bilateral Agricultural Support to Food Security	NORAD	Global
24	Real-Time Evaluation of Norway's International Climate and Forest Initiative—Lessons Learned from Support to Civil Society Organizations—Democratic Republic of Congo	NORAD	Congo, Dem. Rep.
25	Real-Time Evaluation of Norway's International Climate and Forest Initiative—Democratic Republic of Congo	NORAD	Congo, Dem. Rep.
26	Real-Time Evaluation of Norway's International Climate and Forest Initiative—Tanzania	NORAD	Tanzania
27	Real-Time Evaluation of Norway's International Climate and Forest Initiative—Indonesia	NORAD	Indonesia
28	Real-Time Evaluation of Norway's International Climate and Forest Initiative—Brazil	NORAD	Brazil
29	Real-Time Evaluation of Norway's International Climate and Forest Initiative—Guyana	NORAD	Guyana
30	Outcome Evaluation: Integrated Land, Coastal Zone, Water and Energy Management Practices Improved—Jamaica	UNDP	Jamaica
31	Mid-Term Program Evaluation Consultancy Report of Module 3, Profitable and Environmentally Sound Farming Systems Replace Slash-and-Burn Agricultural Practices at the Landscape Scale—Madagascar	USAID	Madagascar
32	Final Evaluation of the UN-REDD Tanzania National Programme Final Report	UNDP	Tanzania

TABLE A.3 ARTICLES AND BOOKS REVIEWED

No.	Title	Author(s)	Type	Year
1	A Conceptual Fusion of the Logical Framework Approach and Outcome Mapping	Ambrose and Roduner	Academic article	2009
2	Scoping Studies: Towards a Methodological Framework	Arksey and O'Malley	Academic article	2005
3	Natural Resources and Violent Conflict: Options and Actions	Bannon and Collier	Academic article	2003
4	Natural Resources Management	Bojö	Book	2000
5	Money as an Indicator: To Make Use of Economic Evaluation for Biodiversity Conservation	Brauer	Academic article	2003
6	Development as a Conservation Tool: Evaluating Ecological, Economic, Attitudinal and Behavioral Outcomes	Brooks et al.	Academic article	2006
7	Environmental Evaluation Practices and the Issue of Scale	Bruyninckx	Book chapter	2009
8	Promoting Health and Well-Being by Managing for Social-Ecological Resilience: The Potential of Integrating Ecohealth and Water Resources Management Approaches	Bunch et al.	Academic article	2011
9	Complexity, Modeling, and Natural Resource Management	Cilliers et al.	Academic article	2013
10	Evaluating the Influence of Global Environmental Assessments	Clark, Mitchell, and Cash	Book chapter	2006
11	Exploring Linkages between Natural Resource Management and Climate Adaptation Strategies	Corfee-Morlot, Berg, and Caspary	Academic article	2003
12	Resources, Conflict and Governance: A Critical Review of the Evidence	Cuvelier, Vlassenroot, and Olin	Academic article	2013
13	What Counts as Credible Evidence in Applied Research and Evaluation Practice?	Donaldson, Christie, and Mark	Book	2009
14	The Concept of Integrated Natural Resource Management (INRM) and Its Implications for Developing Evaluation Methods	Douthwaite et al.	Book chapter	2005
15	Back to Basics	Ebrahim-zadeh	Academic article	2003
16	Multiple-Insecticide Resistance in Anopheles gambiae Mosquitoes, Southern Côte d'Ivoire	Edi et al.	Academic article	2012
17	Counterfactual Thinking and Impact Evaluation in Environmental Policy	Ferraro	Academic article	2009
18	Understanding the Relationships between Ecosystem Services and Poverty Alleviation: A Conceptual Framework	Fisher et al.	Academic article	2014
19	Theory-Based Evaluation	Fitz-Gibbon and Morris	Academic article	1996
20	Panarchy: Understanding Transformations in Human and Natural Systems	Gunderson and Holling	Book	2001

No.	Title	Author(s)	Type	Year
21	Classification and Ecology of Closed-Canopy Forest in Ghana	Hall and Swaine	Academic article	1976
22	The Tragedy of the Commons	Hardin	Academic article	1968
23	Desk Review: Evaluation of Adaptation to Climate Change from a Development Perspective	Hedger et al.	Academic article	2008
24	Land, Environment and Climate: Contributing to the Global Public Good	Hertel	Working paper	2013
25	Time Horizons in Evaluating Environmental Policies	Hilden	Book chapter	2009
26	Understanding the Complexity of Economic, Ecological, and Social Systems	Holling	Academic article	2001
27	Elucidating the Pathways between Climate Change, Ecosystem Services and Poverty Alleviation	Howe et al.	Academic article	2013
28	Biological Diversity: The Coexistence of Species	Huston	Book	1994
29	Timing and Duration of Exposure in Evaluations of Social Programs	King and Behrman	Working paper	2008
30	The Consultative Group on International Agricultural Research Approach to Impact Evaluation of Environment and Natural Resource Management	La Rovere	Book chapter	2014
31	Social-Ecological Systems as Complex Adaptive Systems: Modeling and Policy Implications	Levin et al.	Academic article	2013
32	A Checklist for Ecological Management of Landscapes for Conservation	Lindenmayer et al.	Academic article	2008
33	Complexity of Coupled Human and Natural Systems	Liu et al.	Academic article	2007
34	The Influence of US Development Assistance on Local Adaptive Capacity to Climate Change: Insights from Senegal	Lo and Tumusiime	Research backgrounder	2013
35	Under What Circumstances and Conditions Does Adoption of Technology Result in Increased Agricultural Productivity?	Loevinsohn et al.	Systematic review	2013
36	Whose Conservation? Changes in the Perception and Goals of Nature Conservation Require a Solid Scientific Basis	Mace	Academic article	2014
37	Biodiversity and Ecosystem Services: A Multilayered Relationship	Mace, Norris, and Fitter	Academic article	2012
38	Synthesis in Land Change Science: Methodological Patterns, Challenges and Guidelines	Magliocca et al.	Academic article	2014
39	Design Alternatives for Evaluating the Impact of Conservation Projects	Margoluis et al.	Academic article	2009
40	Impact Evaluation of Natural Resource Management Research Programs: A Broader View	Mayne and Stern		2013

No.	Title	Author(s)	Type	Year
41	Key Insights for the Design of Environmental Evaluations	Mickwitz and Birnbaum	Book chapter	2009
42	Evaluation of Biodiversity Policy Instruments: What Works and What Doesn't?	Miteva, Pattanayak, and Ferraro	Academic article	2012
43	Governing the Commons: The Evolution of Institutions for Collective Action	Ostrom	Book	1990
44	Data Credibility: A Perspective from Systematic Reviews in Environmental Management	Pullin and Knight	Book chapter	2009
45	Should the Randomistas Rule?	Ravallion	Academic article	2009
46	Sustainable Agricultural Intensification: The Promise of Innovative Farming Practices	Ringler et al.	Book chapter	2013
47	The New Development Economics: We Shall Experiment, but How Shall We Learn?	Rodrik	Research working paper	2008
48	Matching Impact Evaluation Design to the Nature of the Intervention and the Purpose of the Evaluation	Rogers	Academic article	2009
49	Using Programme Theory to Evaluate	Rogers		n.d.
50	Evaluation of Natural Resource Interventions	Rowe	Academic article	2012
51	The Invisible Wand: Adaptive Co-Management as an Emergent Strategy in Complex Bio-Economic Systems	Ruitenbeek and Cartier	Working paper	2001
52	Drowning in Data	Snibbe	Academic article	2006
53	Requisite Simplicities to Help Negotiate Complex Problems	Stirzaker et al.	Academic article	2010
54	Challenges and Opportunities in Linking Carbon Sequestration, Livelihoods and Ecosystem Service Provision in Drylands	Stringer et al.	Academic article	2012
55	Land System Architecture—Using Land Systems to Adapt and Mitigate Global Environmental Change	Turner	Academic article	2013
56	The Emergence of Land Change Science for Global Environmental Change and Sustainability	Turner, Lambin, and Reenberg	Academic article	2007
57	Evaluating Environment and Development: Lessons from International Cooperation	Uitto	Academic article	2014
58	Evaluating Climate Change and Development	van den Berg and Feinstein	Book	2011
59	A Methodology for Adaptable and Robust Ecosystem Services Assessment	Villa et al.	Academic article	2014
60	Review of the Use of 'Theory of Change' in International Development	Vogel	Academic article	2012
61	Toward a Plurality of Methods in Project Evaluation: A Contextualised Approach to Understanding Impact Trajectories and Efficacy	Woolcock	Academic article	2009
62	Using Case Studies to Explore the External Validity of "Complex" Development Interventions	Woolcock	Academic article	2013

TABLE A.4 OTHER DOCUMENTS REVIEWED

No.	Title	Organization	Type	Year
1	Performance of ADB Assistance to Agriculture and Natural Resources—Evidence from Post-Completion Evaluations	ADB	Synthesis Report	2010
2	Guidelines to Climate Mitigation Evaluations	Climate-Eval	Guidelines	2013
3	The 2009 Annual Report on Results and Impact of IFAD Operations: Environment and Natural Resources Management	IFAD	Issues paper	2009
4	FESLM: An International Framework for Evaluating Sustainable Land Management	FAO	Discussion paper	1993
5	Effects of Climate Change on Natural Resources and Communities: A Compendium of Briefing Papers	U.S. Department of Agriculture	Compendium	2011
6	Mainstreaming Adaptation to Climate Change in Agriculture and Natural Resources Management Projects	World Bank	Guidance Note	2010
7	Lessons Learned from Appraising the Impact of IFAD Projects in Nepal on the GHG Balance and Stocks of Natural Resources	FAO	Study	2013
8	Building Climate Change Adaptation on Community Experiences	International Institute for Environment and Development	Study	2012
9	The Evidence Base for Community Forest Management as a Mechanism for Supplying GEBS and Improving Local Welfare	GEF Scientific and Technical Advisory Panel	Advisory document	2010
10	Integrating Community and Ecosystem-Based Approaches in CC Adaptation Responses	Ecosystem and Livelihoods Adaptation Network	Paper	2012
11	Synergies of Nature, Wealth, and Power: Lessons from USAID Natural Resource Management Investments in Senegal	USAID	Retrospective study	2014
12	A Guide to Taking Stock of Natural Resource Management: Impacts and Lessons	USAID	Guide	2013
13	Nature, Wealth and Power: Emerging Best Practice for Revitalizing Rural Africa	USAID	Guide	2002
14	ESPA Guide to Working with Theory of Change for Research Projects	Ecosystem Services for Poverty Alleviation	Guide	2013
15	An Introduction to Impact Evaluation	World Bank	Presentation	2006
16	Do Households Gain from Community-based Natural Resource Management? An Evaluation of Community Conservancies in Namibia	World Bank	Working paper	2004
17	Evaluating Community-Based Programmes in Australia—The Natural Heritage Trust and the National Action Plan for Salinity and Water Quality	OECD	Conference report	2005

No.	Title	Organization	Type	Year
18	The Role of Community-Based NRM in Climate Change Adaptation in Ethiopia: Assessing Participatory Initiatives with Pastoral Communities	International Institute for Sustainable Development	Working paper	2013
19	Climate Resilience and Food Security: A Framework for Planning and Monitoring	International Institute for Sustainable Development	Report	2013
20	Climate-Related Disasters in Asia and the Pacific	Asian Development Bank	Working paper	2013
21	A Framework for Documentation and Evaluation of Soil and Water Conservation—Technologies	World Overview of Conservation Approaches and Technologies	Survey	2005
22	Monitoring and Evaluation of Integrated Water Resource Management	SOPAC—Pacific Islands Applied Geoscience Commission	Toolkit	n.d.
23	Monitoring, Evaluation & Reporting for SLM in LDC & SIDS Countries	GEF and UNDP	Toolkit	2006
24	Agricultural Monitoring and Evaluation Systems: What Can We Learn for the MRV of Agricultural NAMAs?	World Agroforestry Centre	Working paper	2011
25	The Economics of Desertification, Land Degradation, and Drought: Toward an Integrated Global Assessment	International Food Policy Research Institute	Discussion paper	2011
26	Toolkit for M&E of Agricultural Water Management Projects	World Bank	Toolkit	2008
27	Sustainable Land Management in Practice—Guidelines and Best Practices for Sub-Saharan Africa	TerrAfrica and FAO	Guidelines	2011
28	Climate Change, Water and Food Security	Overseas Development Institute	Background note	2009
29	Growing Africa: Unlocking the Potential of Agribusiness	World Bank	Report	2013
30	Climate-Smart Agriculture Sourcebook	FAO	Sourcebook	2013
31	Covering New Ground: State of the Forest Carbon Markets 2013	Ecosystem Marketplace	Report	2013
32	Republic of Niger: Impacts of Sustainable Land Management Programs on Land Management and Poverty in Niger	World Bank	Report	2009
33	Climate Change and Variability in the Sahel Region: Impacts and Adaptation Strategies in the Agricultural Sector	United Nations Environment Programme and World Agroforestry Centre	Report	2006
34	Building Natural Capital: How REDD+ Can Support a Green Economy	United Nations Environment Programme	Report	2014
35	Global Landscapes Forum	Centre for International Forest Research	Final report	2013
36	A Farming Systems Framework for Targeting Investment in Africa	World Agroforestry Centre	Policy brief	2013
37	Tree Based Systems In African Drylands	World Agroforestry Centre	Draft report	2014

No.	Title	Organization	Type	Year
38	CGIAR System-Level Outcomes (SLOS), Their Impact Pathways and Inter-Linkages	CGIAR	White paper	2013
39	Assessing the Environmental Impacts of CGIAR Research: Toward an Analytical Framework	CGIAR	Working paper	2010
40	Interactive MAP: Where Is the Evidence	CGIAR	Map	n.d.
41	Broadening the Range of Designs and Methods for Impact Evaluations	DFID	Working paper	2012
42	NRM Monitoring, Evaluation, Reporting and Improvement Framework—Australia	Australian government	Framework	2009
43	Participatory M&E Guidelines for Learning and Adaptive Management in LLS (Livelihoods and Landscapes Strategy) Geographic Components and Landscapes	IUCN	Guidelines	2008
44	Global Ecological Zones for FAO Forest Reporting: 2010 Update	FAO	Working paper	2010
45	Guidelines on SFM in Drylands of Sub-Saharan Africa	FAO	Working paper	2010
46	Sustainability Assessment of Food and Agriculture Systems	FAO	Guidelines	2012
47	Water and the Rural Poor: Interventions for Improving Livelihoods in Sub-Saharan Africa	IFAD and FAO	Report	2009
48	Conservation Agriculture with Trees in the West African Sahel—A Review	World Agroforestry Centre	Occasional paper	2011
49	The Drivers Shaping Change in African Farming Systems	World Agroforestry Centre	Policy brief	2013
50	Food Security in a World of Natural Resource Scarcity: The Role of Agricultural Technologies	International Food Policy Research Institute	Policy note	2014
51	Potential Impact of Investments in Drought Tolerant Maize in Africa	International Maize and Wheat Improvement Center	Paper	2010
52	An Econometric Investigation of Impacts of Sustainable Land Management Practices on Soil Carbon and Yield Risk: A Potential for Climate Change Mitigation	International Food Policy Research Institute	Discussion paper	2010
53	Timing and Duration of Exposure in Evaluations of Social Programs	World Bank	Working paper	2008
54	Climate Risk Management through Sustainable Land Management in Sub-Saharan Africa	International Food Policy Research Institute	Discussion paper	2011
55	Putting Gender on the Map: Methods for Mapping Gendered Farm Management Systems in Sub-Saharan Africa	International Food Policy Research Institute	Discussion paper	2012
56	Planting the Seeds of a Green Revolution in Africa	Alliance for a Green Revolution in Africa	Report	2014

No.	Title	Organization	Type	Year
57	Guidance Note 3: Theory of Change Approach to Climate Change Adaptation Programming	SEA Change and UKCIP	Guidance note	2014
58	Guidance Note 1: Twelve Reasons Why Climate Change Adaptation M&E Is Challenging	SEA Change and UKCIP	Guidance note	2014
59	A Climate Trend Analysis of Kenya	U.S. Geological Survey and USAID	Brief	2010
60	A Climate Trend Analysis of Niger	U.S. Geological Survey and USAID	Brief	2012
61	A Climate Trend Analysis of Mali	U.S. Geological Survey and USAID	Brief	2012
62	A Climate Trend Analysis of Senegal	U.S. Geological Survey and USAID	Brief	2012
63	A Climate Trend Analysis of Burkina Faso	U.S. Geological Survey and USAID	Brief	2012
64	A Climate Trend Analysis of Chad	U.S. Geological Survey and USAID	Brief	2012
65	A Climate Trend Analysis of Sudan	U.S. Geological Survey and USAID	Brief	2011
66	A Climate Trend Analysis of Ethiopia	U.S. Geological Survey and USAID	Brief	2012
67	A Climate Trend Analysis of Uganda	U.S. Geological Survey and USAID	Brief	2012
68	Smallholders, Food Security, and the Environment	IFAD	Report	2013
69	Regional Livestock Study in the Greater Horn of Africa	International Committee of the Red Cross	Report	2004
70	Improving Land and Water Management	World Resources Institute	Working paper	2013
71	Land Degradation: Land Under Pressure—2011 Global Food Policy Report	International Food Policy Research Institute	Report	2011
72	International Food Security Assessment, 2013–2023	U.S. Department of Agriculture	Report	2013
73	Combating Land Degradation in Production Landscapes—Learning from GEF Projects Applying Integrated Approaches	GEF	Report	2014
74	Reducing Risk: Landscape Approaches to Sustainable Sourcing	Landscapes for People, Food and Nature	Synthesis report	2013
75	Farming Systems and Poverty: Improving Farmers' Livelihoods in a Changing World	FAO	Summary	2001
76	Indigenous Rangelands Monitoring: Harnessing Pastoralist Knowledge in the Horn of Africa	IUCN, World Initiative for Sustainable Pastoralism, and FAO	Briefing note	2011
77	Understanding African Farming Systems—Science and Policy Implications	Australian International Food Security Centre	Report	2012
78	An African Agricultural Carbon Facility—Feasibility Assessment and Design Recommendations	Climate Focus	Report	2010
79	Restoring Woodlands, Sequestering Carbon and Benefitting Livelihoods in Shinyanga, Tanzania	IUCN	Report	2011

No.	Title	Organization	Type	Year
80	The Invisible Wand: Adaptive Co-Management as an Emergent Strategy in Complex Bio-Economic Systems	Center for International Forestry Research	Occasional paper	2001
81	2012 Climate and Development Research Review	The Climate and Development Knowledge Network	Synthesis report	2012
82	Is the Use of Natural Resources in the Developing World More or Less Sustainable, Pro-Poor and Profitable Under Controlled Access Compared to Open Access?	University of East Anglia	Review report	2010
83	Learning for the DRC in Best Practices in Climate, Environment and Energy Investment in Fragile States	DEW Point and DFID	Report	2011
84	Co Benefits of Adaptation, Mitigation and Development: ICF Background Paper Prepared for DFID	International Climate Fund and DFID	Background paper	2011
85	Payments for Environmental Services: A Market Mechanism Protecting Latin American Forests	Evidence and Lessons from Latin America	Policy brief	n.d.
86	Impact Evaluations and Development: NONIE Guidance on Impact Evaluation	Network of Networks on Impact Evaluation	Guidance	2009
87	Resource Scarcity and Environment: Review of Evidence and Research Gap Analysis	DFID	Literature review	2013
88	Addressing Research at the "Agriculture-Environment Nexus"—Insights from the CGIAR Science Forum 2011	CGIAR	Brief	2012
89	PLOW Learning Resource: Natural Resource Governance	Professional Development for Livelihoods Advisers Website and DFID	Learning resource	2005
90	Stakeholder Effectiveness in Natural Resource Management	GSDRC	Research report	2013
91	Environmental Sustainability: An Evaluation of World Bank Group Support	World Bank Independent Evalu-ation Group	Report	2008
92	Swidden, Rubber and Carbon—Can REDD+ Work for People and the Environment in Montane Mainland Southeast Asia?	Climate Change Agriculture and Food Security	Working paper	2011
93	Evaluation Framework for CMA [Catchment Management Authority] Natural Resource Management	Department of Environment and Climate Change, New South Wales, Australia	Report	2009
94	Farmer Managed Natural Regeneration	World Vision International	Report	2012
95	Adapting to Climate Change: Natural Resource Management and Vulnerability Reduction	IUCN, Worldwatch Institute, International Institute for Sus-tainable Development, and Stockholm Environment Insti-tute–Boston Center	Background paper	2002

No.	Title	Organization	Type	Year
96	Monitoring and Evaluation Guidelines for World Bank–GEF International Waters Projects	World Bank and GEF	Guidelines	1996
97	Transboundary Agro-Ecosystem Management Project for the Kagera River Basin	FAO	Brochure	2010
98	Toward Viable Landscape Governance Systems: What Works?	Landscapes for People, Food and Nature Initiative	Report	2014
99	Climate Change Implications for Food Security and Natural Resources Management in Africa	FAO	Paper	2010
100	OPCS: Introduction to the Bank's Sector and Theme Codes	World Bank	Guidelines	2013
101	A Guide to Taking Stock of Natural Resources Management: Impacts and Lessons	USAID	Guide	2013

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