SCIENCE OF INTEGRATED APPROACHES TO NATURAL RESOURCE MANAGEMENT, A STAP INFORMATION DOCUMENT

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ABOUT THE GEF

The Global Environment Facility (GEF) unites 183 countries in partnership with international institutions, civil society organizations (CSOs) and the private sector to address global environmental issues, while supporting national sustainable development initiatives. An independently operating financial organization, the GEF provides grants for projects related to biodiversity, climate change, international waters, land degradation, chemicals and waste.

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Science of Integrated Approaches to Natural Resources Management

Anna Tengberg[1], **Sandra Valencia**[1]

Abstract

To meet multiple environmental objectives, integrated programming is becoming increasingly important for the Global Environmental Facility (GEF). Integration of multiple environmental, social and economic objectives also contributes to the achievement of the Sustainable Development Goals (SDGs) in a timely and cost-effective way. However, integration is often not well defined. This report therefore focuses on identifying key aspects of integration and assessing their implementation in natural resources management projects. To that end, we draw on systems thinking literature, and carry out an analysis of a random sample of GEF integrated projects and in-depth case studies demonstrating lessons learned and good practice. We identify numerous challenges and opportunities of integrated approaches that need to be addressed in order to maximise the catalytic impact of the GEF during problem diagnosis, project design, implementation and governance. We highlight the need for projects to identify clearer system boundaries and main feedback mechanisms within those boundaries, in order to effectively address drivers of environmental change. We propose a theory of change for Integrated Natural Resources Management (INRM) projects, where short-term environmental and socio-economic benefits will first accrue at the local level. Implementation of improved INRM technologies and practices at the local level can be extended through spatial planning, strengthening of innovation systems, and financing and incentive mechanisms at the watershed and/or landscape/seascape level to sustain and enhance ecosystem services at larger scales and longer time spans. The evolving scientific understanding of factors influencing social, technical and institutional innovations and transitions towards sustainable management of natural resources should be harnessed and integrated into GEF's influencing models and theory of change, and be coupled with updated approaches for learning, adaptive management and scaling up.

According to this study, key factors that merit further attention from GEF and its partners include:

- Understanding the system – Focusing on drivers to environmental degradation requires a clear system boundary as well as long-term commitment to be effective.
- Transformative change – A stronger focus on transformative change at the local level is needed, as it is at the local level where niches of innovation, experimentation and learning occur.
- Enable learning, innovation and adaptive management –The GEF should consider adding as part of its monitoring mechanisms an explicit participatory assessment of lessons learned.
- Communication strategy – Messages should be tailored to different target groups, including local communities, practitioners, and policy and decision makers across multiple sectors to influence learning and adaptive knowledge management and governance related to integration.
- Incorporate conflict-resolution mechanisms –Avoiding conflicts in complex systems should ideally build on existing institutions and collective action initiatives at the local level and the setting of clear rules. Processes of reaching consensus can also contribute to building social capital.
- Achieve short, medium and long-term environmental benefits and impact at scale –There is a need to understand how higher-level processes along the theory of change can influence agent behaviour at lower levels through scaling out, scaling up, nesting, and institutionalization.

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- Form institutional partnerships – Partnerships should be based on technical expertise and complementarity among partners and agencies, rather than broad institutional mandates, to justify the transaction costs associated with multi-agency programmes and projects.

In conclusion, INRM approaches need to be flexible and the identified integration domains should not become a 'straight jacket' or 'check-list', but be applied when relevant and adjusted to the particular context and social-ecological system.

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1. Background

The Global Environment Facility (GEF) was created to function as a financial mechanism to support countries to meet their commitments to global environmental conventions within the context of their sustainable development goals. The need for integrated approaches in the GEF goes back to its establishment in 1991 with recognition of only four focal areas eligible for funding – biodiversity (BD), climate change (CC), international waters (IW) and protection of the ozone layer (ODS) – with desertification/land degradation (LD) considered a cross-cutting issue eligible for funding only as it related to the other focal areas. In 1996, the Scientific and Technical Advisory Panel (STAP) of the GEF proposed that priority projects addressing desertification/land degradation in arid, semi-arid and sub-humid areas should focus on integrated resource and ecosystem management for the preservation and enhancement of biodiversity, carbon sequestration and water resources (STAP 1996). In 2000, the GEF established the Operational Programme on Integrated Ecosystem Management (OP12) that was fully dedicated to integrated approaches that generated benefits in at least two of the focal areas (BD, CC, IW) and the cross-cutting issue of land degradation.

Land Degradation became a GEF focal area in 2002, but as a result of the introduction of a Resource Allocation Framework (RAF), later replaced by the System for Transparent Allocation of Resources (STAR) that now covers the BD, CC and LD focal areas, there has been a new demand for integrated approaches in country-driven projects. These new integrated projects thus combine environmental benefits across the GEF focal areas with socio-economic co-benefits. Sustainable Forest Management (SFM) that cuts across BD, LD and CC has also emerged as a new cross-cutting issue. In its 2020 Strategy (GEF 2013) and in the GEF-6 strategy (GEF Secretariat 2013), the GEF introduces a new mechanism for achieving integration across its focal areas and across scales, namely the Integrated Approach Pilots (IAPs). The IAPs are explicitly designed to address key drivers of environmental degradation at global and regional scales. Three IAPS have been developed focusing on: 1) taking deforestation out of global commodity supply chains, 2) improving food security in Africa, and 3) developing sustainable cities.

The need and demand for integrated programming that better integrates different focal area objectives towards more holistic thinking, and attempts to derive multiple benefits, has thus increased in the GEF. Furthermore, the GEF has recognised that integration of multiple environmental, social and economic objectives in development interventions would contribute to achievement of the Sustainable Development Goals (SDGs), adopted by the UN General Assembly in September 2015, in a timely and cost-effective way. With respect to natural resources management, the following SDGs are of particular importance: SDG1: End poverty in all its forms everywhere; SDG2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture; SDG6: Ensure availability and sustainable management of water and sanitation for all; SDG12: Ensure sustainable consumption and production patterns; SDG14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development; SDG15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss; SDG17: Strengthen the means of implementation and revitalize the global partnership for sustainable development. Clarification is thus urgently needed on how to design integrated projects and programmes based on scientific principles, such as systems thinking and the science of sustainability, to assist the GEF in better incorporating integration in its projects' theory of change to maximise the potential for delivering multiple benefits across its focal areas and the SDGs.

Objective

The objective of this report is therefore to provide guidance to the GEF on how to develop integrated projects and programmes drawing on systems thinking literature and analysis of the GEF multifocal area (MFA) portfolio and case studies demonstrating lessons learned and good practice. The report addresses the following questions:

- What are the principles for designing integrated natural resources management projects?
- What lessons can be drawn from the literature on systems thinking and selected GEF and non-GEF case studies for the design and implementation of integrated approaches?
- What are the main aspects that need to be considered in the theory of change of integrated natural resources management projects?

2. Integrated Approaches to Natural Resources Management – theory and concepts

It is now extensively recognized that the natural resources used by humans are embedded in complex social-ecological systems with a multitude of variables, functions and subsystems interacting across multiple levels and scales (Ostrom 2009; Cash et al. 2006; Folke 2006; Born & Sonzogni 1995). Social-ecological systems refer to "the interaction of ecosystems and humans with mutual feedback and interdependence" (STAP 2016, p.1). The complexity of environmental problems and the social-ecological systems in which they are rooted requires a different kind of problem analysis as well as project design and implementation, away from single-problem projects. Effective environmental policies and programmes need to be informed by a comprehensive understanding of the biophysical, social and economic processes of a system, their complex interactions, and how they respond to different changes (Kelly et al. 2013). In other words, "understanding a complex whole requires knowledge about specific variables and how their component parts are related" (Ostrom 2009, p.420).

The recognition of this complexity, and the uncertainty that comes with it, has led to the realization that the management of social-ecological systems demands integrated approaches. Integrated approaches aim to address multiple environmental and development challenges, considering short, medium and long-term benefits and trade-offs. These approaches are designed to take into account the elements, interactions, actors and governance arrangements of social-ecological systems. They also give special attention to experimentation and learning. As a result, approaches such as integrated environmental or ecosystem management (IEM) and integrated natural resources management (INRM) have emerged for the management of social-ecological systems (Ostrom 2009; German et al. 2012; Sayer & Campbell 2004; Born & Sonzogni 1995; Loorbach 2010).

IEM and INRM are inclusive planning and management approaches that take into consideration human and environmental challenges and interconnections to achieve a range of short and long-term goals, through coordinated management of human activities in a defined social-ecological system (Born & Sonzogni 1995). Integrated approaches to natural resource management draw on systems thinking literature. Systems thinking is used to understand the structure and behaviour of complex systems (Kelly et al. 2013). Systems thinking puts special emphasis on the relationship or links between different components of a defined and delimited system, recognising that smaller components (e.g., a farm) are embedded and constrained by larger systems (e.g., policies at the national level). Systems thinking approaches allow for the consideration of the complexity and uncertainty within systems (Bosch et al. 2007), and the recognition that interactions between system components can occur in a nonlinear fashion and can result in positive or negative feedback loops (Forrester 1968). Applying systems thinking to natural resources management comes from the rationale that designing solutions to complex environmental problems requires awareness of the

larger system into which the problems and solutions fit, and thereby a systems framework and approach (Laniak et al. 2013).

INRM is generally seen as a scientific and resource management approach uniquely suited to managing complex natural resources management challenges in landscapes (and seascapes) where people are highly dependent on local resources for their livelihoods. It is considered to bridge productivity enhancement, environmental protection, and social well-being and includes an element of learning involving multiple stakeholders and participatory processes (German et al. 2012). Sayer and Campbell (2004) define INRM as a conscious process of incorporating the multiple aspects of resource use into a system of sustainable management to meet the goals of resource users, managers and other stakeholders (e.g. production, food security, profitability, risk aversion and sustainability goals), which is also the definition used by the GEF IAP-Food Security that promotes INRM as an approach to enhancing the sustainability and resilience of food security in Sub-Saharan Africa.

INRM has led to a shift away from single disciplinary projects toward multi-disciplinary and inter-disciplinary approaches. Following the STAP Multi-Focal Area (MFA) guidelines (STAP 2016), the starting premise for GEF INRM projects is that change is driven by human intervention, and governance is the process of changing and managing institutions. Therefore, the starting point for integrated programming is to engage stakeholders and map the governance arrangements. Through stakeholder engagement the problem can be identified (scoping stage), followed by a thorough assessment of the system's fundamental characteristic and its stresses, shocks and thresholds. Furthermore, learning and knowledge management should be an iterative process throughout the project cycle (ibid). Learning should be aimed to be self-referenced leading to adaptive management. Put differently, one of the processes to be achieved during INRM projects is the capacity to learn, reflect and readapt the course of action so that management strategies and activities are constantly improved (Hagmann et al. 2002).

Born & Sonzogni (1995) identified four main characteristics of integrated approaches to natural resource management: 1) Comprehensive: They consider the whole system rather than certain subcomponents; 2) Interconnective: Address linkages and feedbacks; 3) Strategic: Recognize the need to pragmatically limit the number of variables and feedbacks to be addressed while maintaining comprehensiveness; and 4) Interactive/Coordinative: Favour joint decision-making among stakeholders and exchange of resources and information among interested parties, as well as conflict resolution elements. Integrated approaches need to consider both incremental and transformational change and need to provide opportunities for testing hypotheses and learning, and integrating that learning into project implementation through adaptive management (Laniak et al. 2013; Margerum 1999; German et al. 2012; Pahl-Wostl et al. 2007; Folke et al. 2005).

Apparent risks with integrated approaches are over-complication or over-simplification. Over-complication refers to involving too many aspects within a project making implementation difficult. Over-simplification refers to involving many aspects but in a superficial way potentially limiting the impacts of the project. Another concern is that social, economic and cultural factors have not been sufficiently integrated into the INRM paradigm. Critics of integrated approaches, in particular to integrated water resources management (IWRM), argue that the integrated approaches are often loosely defined, and much is open for interpretation of what is to be integrated and how to assess success. Further criticisms include that the integration of sectors and issues may not be realistic and that it requires more centralized, bureaucratic and slower processes (Biswas 2008; Pahl-Wostl et al. 2007). To overcome these challenges, a number of models and frameworks have been developed which serve as guidance.

In the identification of the problem and during project design, the 'system' needs to be defined and clearly delimited. Furthermore, the system's structure, behaviour (including main processes and feedbacks), as well as main actors in the system need to be identified. The Drivers, Pressures, State, Impacts and Results (DPSIR) framework, used in sustainability science and systems thinking, is a tool that can be used to assess the dynamics and feedbacks of the system. The DPSIR framework has already been applied to some of the GEF strategy documents and guidance tools (e.g., GEF 2014; GEF 2013). The framework can be useful to identify and understand the key relationships of complex systems. It can also help disentangle the complexity inherent in natural resource management problems as it provides a tool to break complex issues into a limited amount of elementary components at different levels within a system (Ness et al. 2010).

During project design and implementation, the work of Elinor Ostrom can serve as reference for principles to manage common pool natural resources. In her seminal work, Ostrom (1990, p.90) identified eight design principles shared by institutions that have successfully managed common pool resources. Several of the principles apply both to common pool resources and non-common pool resources, such as the importance to clearly define boundaries; the importance of collective-choice arrangements where individuals affected by operational rules can participate in defining and modifying them; and the need to set-up monitoring and conflict-resolution mechanisms for finite resources, such as land, vegetation and water.

Agricultural Innovation Systems (AIS) has emerged as the most recent in the family of systems approaches. According to the World Bank (2012), a less predictable and variable environment resulting from climate change as well as the globalisation of markets make it imperative for the world's farmers and fishers to adapt and experiment. Operationalisation of an AIS approach could provide the framework to support these processes. Klerkx et al. (2012) provide a synthesis of the characteristics of the actors and factors that co-determine AIS, which include:

1. Co-development of innovations involving multi-actor processes and partnerships
2. A transdisciplinary, holistic systems perspective
3. Focus on value chains and institutional change
4. Shared learning and change, politics of demand, social networks of innovators
5. Responsiveness to changing contexts, patterns of interaction
6. Science and technology develop and are embedded within a historically defined social, political, economic and agro-climatic context. Institutional change is considered a 'sine-qua-non' for innovation
7. Innovators are comprised of multiple actors linked to innovation platforms
8. Farmers are partners, entrepreneurs, and innovators exerting demands
9. Scientists are partners, one of many responding to demands
10. Key changes sought are institutional change and enhanced innovation capacity
11. Intended outcomes are capacities to innovate, learn and change

As seen in the characteristics above and as noted by Smith et al. (2010), the challenge for innovations is no longer limited to economic potential, but also rests in the societal and political changes necessary for innovations to be scaled up as well as the societal and environmental consequences induced by them. To understand how innovations in natural resources management can develop and be diffused, AIS can be combined with other theories such as the multi-level perspective (MLP) from transition research. The MLP is a framework for analysing socio-technical transitions to sustainability, where socio-technical transitions refers to purposive systemic changes of, for example, agri-food systems, involving the reconfiguration of the system and its elements, such as technology, policy, markets, infrastructure, and scientific knowledge, to address persistent environmental problems (Geels 2011; Geels & Kemp 2007). Socio-technical transitions are multi-dimensional as they are essentially about the interactions between technology, policy, economics, culture and public opinion.

The MLP serves as a heuristic framework to conceptualize the multi-dimensionality and non-linearity of transitions through three analytical levels: niches, socio-technical regimes and an exogenous socio-technical landscape. The niche level is where innovations, experimentation and learning occur; the regime level is the more stable level, constituted by the norms, rules and conventions that influence the use of a particular technology or practice and that stabilize the existing system, and it includes users, policy makers, scientists and other societal groups; the landscape level is made up of broad normative and cultural values and long-term economic and social development pathways (Geels 2011; Lawhon & Murphy 2012; Geels 2002). Transitions occur from an interaction between the three levels, where the landscape level creates pressure on the regime, destabilizing in turn existing regimes and providing opportunities for new innovations at the niche level. The transition is said to have taken place when there is a shift from a regime to another (Schot & Geels 2008; Geels 2011; Geels & Kemp 2007).

However, transitions can be challenged by lock-in mechanisms in the current system, such as economies of scale, investments already made in equipment, infrastructure and competencies, lobbying, shared beliefs and practices (Geels 2011; Lawhon & Murphy 2012). These lock-in mechanisms make it difficult to change existing systems. Factors both within and outside the regime can destabilize the system and open up windows of opportunity where new innovations can develop at the niche level. Innovations are scaled up from the niche to the regime and landscape level through co-evolutionary process where a change in technology, or, as is the focus of this paper, a change in INRM technologies, practices and approaches, occurs together with changes in the knowledge of the actors, preferences of users, informal rules, regulation and infrastructure (Figure 1) (Loorbach & Rotmans 2010; Geels 2002; Geels 2011).

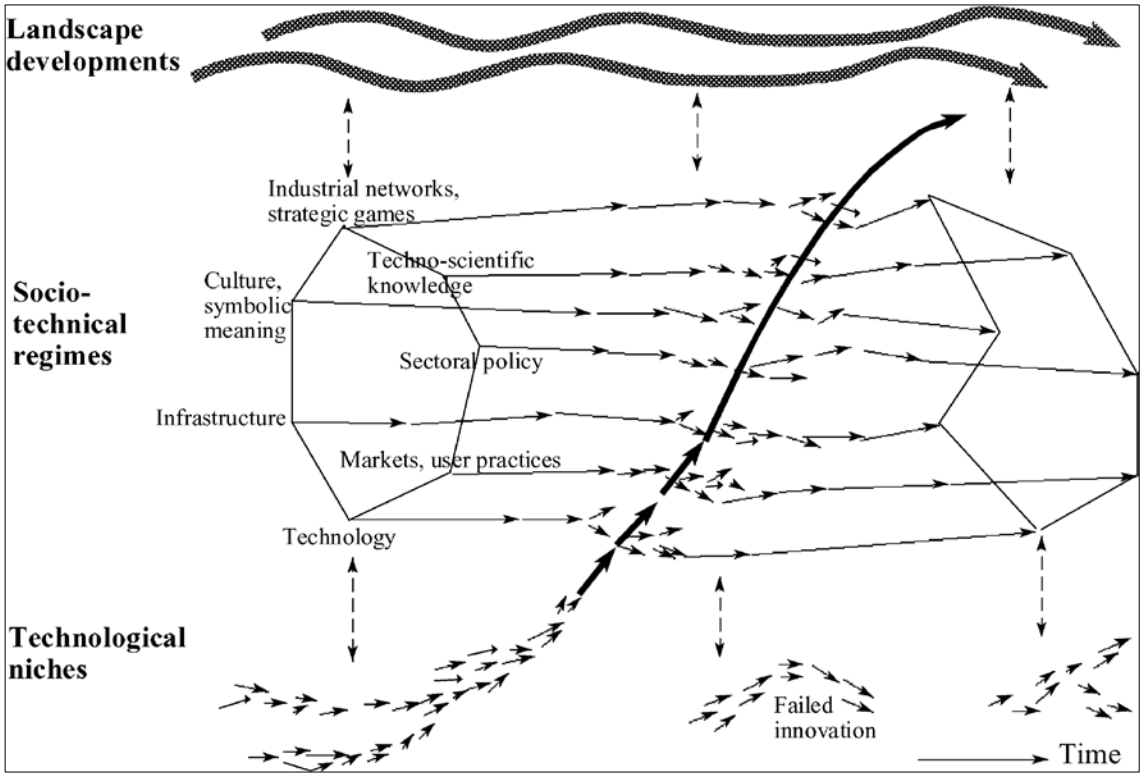

Figure 1. Multi-level perspective on transition theory (Geels 2002, p.1263)

A transition takes place through the following stages: (i) A pre-development phase where there is very little visible change at the systems level but a great deal of experimentation at the individual level; (ii) A take-off phase where the process of change starts to build up and the state of the system begins to shift because of different reinforcing innovations or surprises; (iii) An acceleration phase in which structural changes occur in a visible way through an accumulation and implementation of socio-cultural, economic, ecological and institutional changes; and (iv) A stabilisation phase where the speed of societal change decreases and a new dynamic equilibrium is reached (Loorbach & Rotmans 2010). In short, the MLP can be a useful framework for bringing attention to the actors and activities behind the challenges and opportunities of changing unsustainable practices and trajectories through innovations in managing natural resources (Geels 2011). MLP can also be linked to the concept of scaling, where "scaling-out" refers to the expansion of activities at the same level of socio-political organization, "scaling-up" refers to innovations at a new level of socio-political organization or the process of innovation itself, nesting is the final stage of institutionalization and relates to feedbacks and interactions at different temporal and spatial scales (German et al. 2012; Rounsevell et al. 2012).

In short, applying a systems thinking perspective to natural resources management allows for a holistic view of social-ecological systems and provides a basis for identifying and designing integrated solutions to complex environmental problems. AIS is one of the approaches based on systems thinking, which focuses on innovations. Adoption of innovations, not only in agricultural systems, but more generally in the management of natural resources, requires an understanding of the different actors and factors that are part of current regimes that may facilitate or hinder further adoption and scaling up of innovations. Transition research has emerged as a field to understand such processes. Frameworks such as the MLP from transition research can be useful to analyse and conceptualise the processes behind the outcomes and impact pathways in the theory of change of GEF projects.

3. Methodology

The study has applied a combination of methods as described below:

Literature review

It started with a literature review of the concept of integration in the context of natural resources management. The study also included a review and systematic analysis of selected GEF documents related to multi-focal areas, integrated approaches, GEF strategies, GEF and STAP technical reports and guidance notes relevant for this study (e.g. RAPTA guidelines, STAP report 'Mainstreaming Biodiversity in Practice', to name a few). The synthesis of the review of these documents can be found in Annex 1. The literature review was followed by a rapid screening of selected GEF MFA projects and a more in-depth analysis of case studies as explained next.

Systematic review of GEF projects using random sampling

The study included a systematic review of a wide sample of selected GEF projects and programmes according to criteria adapted from the literature – as explained below (e.g., Scrase & Sheate 2002; Bosch et al. 2007) – to identify how integration has been approached in GEF programming. A stratified random sample of the total portfolio of MFA projects was selected. The sample was limited to full-size MFA projects, which were at project approval stage or further in implementation at the time of selection (August and September 2016). Selected projects included both national and regional ones. Projects with a focus on chemical waste or energy were not included in the sample as they are the focus of another study commissioned by the GEF's STAP. Once the initial criteria were met, projects were sorted by main geographical regions and a numerical random selection was done of at least 2 projects per region. If projects selected for a region had the same focal area, one of those projects was removed and another project with different focal areas included in the sample. Of

the initial 224 MFA projects, 28 projects made the final sample for the rapid screening (the name and number of screened projects can be found in Annex 2). The rapid screening consisted of a review of CEO endorsement documents (when available, alternatively the Project Information Form (PIF)) and the projects' results frameworks of selected projects. The analysis focused on the extent to which different domains of integration were incorporated into the design of the project. These domains are based on the review criteria that are explained below.

Selected case studies of GEF programmes and projects promoting integrated approaches

Major GEF integrated programmes and projects were selected as case studies to analyse them against different integration criteria. Selection of case studies was based on our Terms of Reference but also on recommendations from GEF Secretariat and staff of GEF implementing agencies. Larger programmes addressing similar or related issues across several phases of the GEF were selected to analyse contrasting approaches, how integration has evolved in GEF programming, and to draw lessons and identify remaining gaps that need future attention. Projects with a focus on Land Degradation are over represented in the analysis due to the history of the focal area as an entry point for integration, which offers a longer history of learning than for the other focal areas. Moreover, according to a recent exercise on lessons from GEF multi-focal area projects, the vast majority (91%) of MFA projects focused on Land Degradation in some capacity (GEF 2016); Biodiversity was a focus for 87% of the projects; Climate Change was the focus in over 56% of the MFA projects; while International Waters and Ozone Depletion combined represented only 11% of the projects. Additionally, single-focal are projects were also selected for analysis. Some of these projects were child projects of the selected MFA-programmes; others were selected based on suggestions from staff from GEF agencies. These latter projects were used to analyse the extent to which integration also takes place in single-focal area projects. Programme and project documents, evaluations and other relevant literature were used for the analysis. To triangulate the findings from the case studies, interviews with key informants from GEF agencies, GEF Secretariat and the GEF Independent Evaluation Office (IEO), and project partners were undertaken (see Table 1).

Table 1. Semi-structured interviews with key informants

Agency	Number of interviewees
GEF SEC	4
IEO	3
GEF Agencies (World Bank, IDB, ADB, UNDP, UNEP, IFAD, WWF)	11
TOTAL	**18**

Selected Non-GEF case studies

In order to address the challenges with regard to design, implementation and monitoring of integrated approaches identified in the analysis of GEF projects, selected non-GEF programmes were analysed to identify possible new approaches and solutions. Case studies of relevance to critical elements in the GEF theory of change (which is presented in section 4: findings and discussion) were given priority and the selection was based on recommendations from GEF Secretariat and GEF Agency staff as well as STAP.

Review criteria

The meaning of integration, or what integration entails, can be disentangled through numerous factors or domains applied at different stages of the project cycle: (i) integration domains during problem diagnosis and assessment; (ii) integration domains during project design; and (iii) integration domains during implementation and governance. The domains of integration draw on the literature review, and in particular on Scrase and Sheate (2002) who identify 14 'meanings of integration' in environmental assessments and governance. These 'meanings of integration', henceforth domains of integration, were adapted and categorized under each project stage and used as review criteria for screening of the random sample of GEF MFA projects and for the more in-depth analysis of case studies. The selected review criteria for integration include the following:

Integration domains during problem diagnosis/assessment:

- **Analysis and definition of system** – This includes defining the system's boundaries, the main processes, actors and feedbacks within the system.
- **Integrated information sources** – Incorporating knowledge from different sources and system levels, including integrating local knowledge with scientific knowledge: if different data are gathered independently from each other, a larger integrated picture may be impossible to obtain.
- **Integration of assessment tools** – This includes both integrating and linking different tools to assess social-ecological systems, including impacts, resilience, among other factors. The focus in this study is on tools that measure global environmental benefits, resilience and co-benefits of integrated approaches, such as Sustainable Land Management (SLM).
- **Integrated environmental-social-economic modelling** – This includes combining modelling from natural science (e.g. atmospheric, climate) and economics, and requires quantitative data and complex computer models that may not always be available to broader development projects and is therefore not applicable to most GEF projects.

Integration domains during project design

- **Integration across GEF focal areas** – Integration across different environmental media, such as land, water and soil, has, for the purpose of this study, been redefined as integration across GEF focal areas, as they largely correspond to these media (i.e. land is related to the LD, CC and BD focal areas; water is related to the IW focal area as well as LD; air is related to the CC focal area). Integration across different environmental media is important for avoiding environmental problems being pushed from one media to the other.
- **Integration across GEF agencies** – GEF agencies bring different comparative advantages and dimensions to integration, from investments (International Financial Institutions (IFIs) such as World Bank, ADB, IDB and IFAD), technical (e.g. FAO, IUCN, CI, WWF), development (e.g. UNDP) and policy (e.g. UNEP).
- **Integration of actors and institutions at the subnational and national level** – This includes public and private sector actors and is a precondition for inclusive governance. Including multiple stakeholders through participatory processes is key to project design and translation of decisions at the strategic level into effective actions, as well as for learning from experiences on-the-ground. Fully integrating multiple stakeholders involves going beyond consultation during project design. Different levels of participation can be considered adapted from Biggs (1989)[2]: contractual, consultative, collaborative and collegiate. The consultative level is the most

[2] Biggs categorized participation of farmers in research projects; this categorization can be extended and adapted to assess how multiple stakeholders participate in the design and implementation of natural resources management projects.

common in projects where stakeholders are consulted and 'experts' design and implement solutions. The collegiate level is the highest level of participation, where stakeholders are considered 'colleagues' in the project. Higher levels of participation (i.e., collaborative and collegiate) may require more time and resources but can contribute to the empowerment of local stakeholders and to the sustainability of projects once funding ends.

- **Spatial integration** (across and between landscapes and seascapes) – Spatial integration refers to integration within landscapes, following the concept that environmental regions or spatial units need to be managed holistically. The boundaries can be identified as catchment, bioregions, landscapes, etc. and is a departure from standard practice that is usually based on administrative units. When feasible, spatial integration can also refer to integration between landscapes and seascapes as for example proposed in the source-to-sea framework (Granit et al. 2016).
- **Integration of environmental and development concerns** – Environmental issues are often treated separately to development issues, which leads to environmental projects not fully considering development issues. Similarly, environmental issues are often considered as externalities and being underfunded in development projects, as environmental considerations are not seen as an integral part of sustainable development, despite high-level commitments to SDGs.
- **Integration across policy domains** –It is important to link the environment with other sectors to achieve sectoral integration through better coordination and synergies, and avoid conflicts with other areas of policy concern.

<u>Integration domains during project implementation and governance:</u>

- **Integration of environmental concerns into governance and investments** – This refers to integration of environmental concerns into the actual management of land, water and biological resources and associated governance arrangements and investments from both the public and private sector.
- **Vertically integrated planning and management** - It refers to integration of local, regional and national and higher decision-making levels. It also underpins scaling up processes related to institutional innovations and collective action.
- **Integration of multiple stakeholder groups into governance** – Inclusive governance is important for both the sustainability and resilience of integrated approaches, and it brings attention to issues of power and accountability, as well as the importance of integrating multiple stakeholders into the decision-making process, for instance as members of projects' steering committees. This domain is closely related to the 'Integration of actors and institutions at the subnational and national level' domain, but highlights the importance of fully involving multiple stakeholders throughout the project cycle, not only during project design consultations.
- **Integration of equity concerns into governance** (e.g. gender, indigenous people, poverty, etc.) – Sustainable development in social terms is a distributional issue and strengthening of social capital and other assets among populations, especially vulnerable groups contributes to resilience of social-ecological systems.
- **Integration of learning and adaptive knowledge management into governance** - Includes evidence-based adaptive policy and decision-making, and explicit consideration of uncertainty in decision-making, as well as consideration of the process of learning that contributes to political and institutional change.
- **Extent and sustainability of integration** – This refers to the sustainability of integration (to what extent it will continue) once funding is over, as well as to what/who was included and not included in integrated projects.

While the integration domains have been categorized in different project cycle stages to highlight where particular focus has to be given to these aspects, all domains should be considered during project design and their relevance assessed for the rest of the project cycle. Furthermore, these domains are not meant as a "check-list" but rather as guidance on what integration could entail. The domains need to be applied and adjusted according to the context and the objectives of each project.

4. Findings and Discussion

Findings from review of STAP and other relevant GEF reports

The GEF, through STAP, was early in recognising integrated natural resources and ecosystem management as an approach for the preservation and enhancement of biodiversity, carbon sequestration and water resources that would allow addressing land degradation as a cross-cutting issue. It is therefore relevant, before taking stock of integration in programmes and projects, to provide an overview of STAP's major contributions to the understanding of integrated approaches to natural resources management and the underlying science. Annex 1 provides an overview of relevant STAP reports and to what extent they have addressed systems thinking and integration. It can be seen that STAP has tackled issues from resilience, spatial management, governance and indicators, stakeholder involvement, learning and knowledge management, to equity concerns. It could be argued that integration across a variety of domains have been considered implicitly, and even promoted, in several of the reports, such as integration of environmental and developmental concerns, and integration of multiple stakeholders. At the same time, what precisely is meant by integration, and how it is to be assessed in GEF programming, has so far not been explicitly defined.

Findings based on rapid screening of GEF projects

The rapid screening of 28 MFA GEF projects served as an initial step to assess the extent to which systems thinking and a range of integration domains have been taken into account in problem identification and project design (see Annex 2). With respect to **system boundary**, in the majority of projects, the boundary of the system was usually vaguely defined (Figure 2, A). In many projects the ecosystem was defined and a large region(s) where the ecosystem is present, but the specific delimitation of project interventions was often missing or unclear. Even when defined, It would be important for projects to include what is <u>not</u> part of the boundary, what is left aside and why (i.e. what is considered external to the system and potential implications of those externalities). Regarding **system description**, the descriptions and project rationales usually address the links between environmental degradation and socio-economic issues, in other words, social and economic drivers of the degradation as emanating from the local level but often also beyond. However, the level of analysis and detail about the processes and feedbacks within and outside the system varied significantly from project to project as illustrated in the graphs below (Figure 2, B and C).

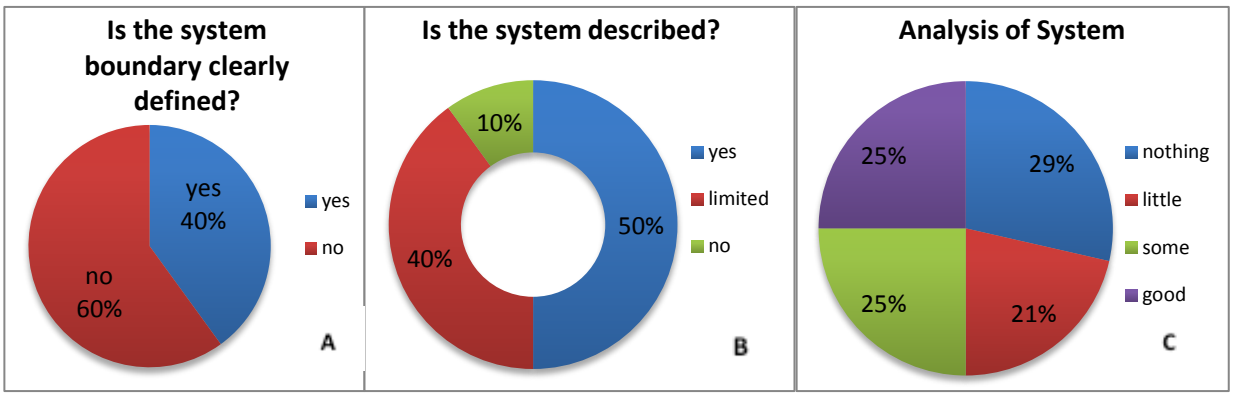

Figure 2. Description of social-ecological systems
A: Delimitation of boundary; B: Is the system described; C: Extent to which system is analysed.

With respect to the integration across various domains, Figure 3 summarizes the domains assessed and the extent of the integration into project design. It must be noted that further analysis of project completion reports or impact evaluations would be necessary to assess the extent to which these dimensions were actually taken into account during project implementation. Worth highlighting is the **integration across policy domains**. In most projects the integration has been limited to environmental and agricultural related sectors. Few projects include other sectors outside of the natural resources management area. Given the drivers of environmental degradation, projects would benefit from also considering other sectors important to local and national economies, such as mining, tourism, industries, infrastructure, to name a few. Regarding **spatial integration**, most projects integrate smaller waterbodies and terrestrial ecosystems. However, wider water bodies that take into account flows from source to sea are seldom within system boundaries. While being able to consider flows and processes from source to sea, for example, would require a very large system boundary which may not be feasible to manage in the context of a project, more explicit consideration of upstream and downstream implications of different interventions could avoid unintended consequences and trade-offs across environmental media and the GEF focal areas.

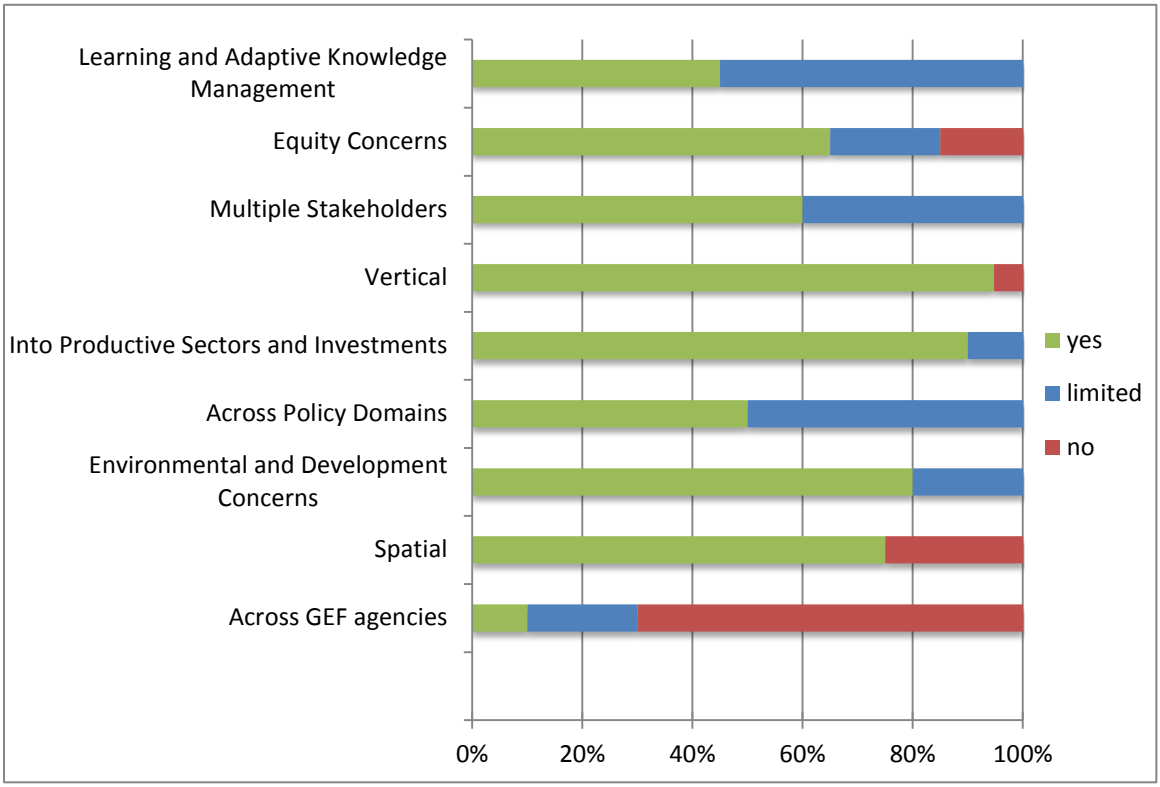

Figure 3. Extent to which integration domains are taken into account in project design

Concerning **Equity,** most projects include some consideration of gender aspects, yet in many projects the level of analysis appears superficial, suggesting that equity issues are considered only in compliance with project preparation requirements, rather than reflecting a thorough understanding of cultural gender roles, for example, and how projects can tackle them. Regarding other equity related aspects, poverty is usually mentioned in the projects, but few projects target the most vulnerable or poorest populations. Indigenous populations are commonly considered at the consultative level and as beneficiaries when relevant in the project area, but higher levels of participation (i.e., collaborative and collegial) were not evident during project review. With respect to

participation of stakeholders, all projects include consultations but few projects practice co-production of knowledge where local stakeholders are engaged from start to finish in development and implementation of projects, rather than treating stakeholders as project target groups. Some projects have advisory boards that include a wide range of stakeholders from different levels (local, regional, national), but this is limited and could be further enhanced. Advisory boards or steering committees in many projects are limited to government representatives.

With respect to **Learning and Adaptive Knowledge Management**, all projects take knowledge management into consideration, as it has become a standard requirement in GEF projects, and many are based on demonstration activities expected to be replicated and up-scaled afterwards. However, there is little indication that learning and adaptive knowledge management is taking place during project implementation. Assessment of progress and consideration of necessary adjustment during project implementation is critical. While all projects include monitoring and evaluation mechanisms where projects are reviewed during implementation, a thorough learning and adaptive knowledge management approach requires iterative participatory assessments and discussions of progress report and co-development of necessary adjustments. There is little indication that the iterative and participatory aspects of adaptive knowledge management (Pahl-Wostl 2007) are part of the monitoring and evaluation components of the projects reviewed. Additional financial resources and time may be necessary for projects to have the ability to adjust project plans based on lessons learned during implementation. Promoting reflexive and participatory monitoring processes may contribute to considering different voices and experiences. In addition, participatory monitoring and evaluation of progress can empower stakeholders and strengthen their capacity to continue project activities after project completion. Also, innovative ways to guarantee dissemination and replication of lessons learned are missing. Training and field visits of people not part of the project's target group, rather than just workshops to disseminate findings at the end, could be an important approach for learning and adaptive knowledge management.

Findings based on the case studies

A total of 10 case studies was analysed according to the criteria for integration developed above. Several of the case studies include a programme and at least one child project of the programme. The case studies include two of the recently developed Integrated Approach Pilots (IAPs). Additional case studies were selected to contrast the IAPs with programmes with similar topics and coverage funded in different phases of the GEF. The main findings of the case studies are presented in Table 2. A more detailed analysis of each case study can be found in the accompanying Extended Case Study Report (see separate document). The Non-Grant Instrument (NGI) window of the GEF was also considered as part of the analysis. The NGI was highlighted by GEF agencies as a flexible financial instrument that allowed them to innovate and integrate different private sector actors. NGI provides the opportunity to work directly with the private sector, whose involvement in GEF projects as a main beneficiary is normally limited. Three such projects, currently under preparation by the IDB, were identified. The projects are described in Annex 3.

Table 2. Summary of lessons for INRM from analysis of case studies

Programme/ Project title and number	Main lessons for INRM
2371 Biodiversity Conservation in Coffee: Transforming Productive Practices in the Coffee Sector by Increasing Market Demand for Certified Sustainable Coffee C*ountries: Brazil, Colombia, El Salvador, Guatemala*	Biodiversity conservation requires a landscape strategy beyond individual farm practices. Water, soil and agrochemical management have a greater impact if they are adopted collectively or within a specific watershed. Incorporating climate risk analysis has been identified as an important component of projects like this one. Certification of coffee triggered behaviour change of farmers and they recognized its multiple benefits despite the costs. Targeting of smallholder farmers was key to ensure beneficiaries were not only large-scale agro-industries. Group certification schemes were an innovative and important approach to include small-scale farmers. Partnership with NGOs allowed engaging with a wide range of stakeholders from producers to large coffee companies.
2757 Strategic Investment Program for Sustainable Land Management in Sub-Saharan Africa (TerrAfrica SIP)	Many child projects had too many indicators and their M&E systems were too complicated to be effective. Overall collaboration between GEF agencies was limited at the child project level. Social-centred approaches where communities were given full responsibility in project design and implementation showed positive results. All country projects included activities to promote inter-sectoral approaches and mainstreaming of SLM into policies. The inter-sectoral approach was easier to implement at local than central level. A recommendation was that projects should have focused on supporting the policy review and dialogue rather than aiming for direct policy change. There was limited attention paid to governance issues, such as land tenure and land and water access rights. While local communities were involved, the most vulnerable groups were not always included, especially not women and nomadic groups. Good examples of gender mainstreaming included for example Farmer Field Schools (FFS), as well as SLM training and income creation activities targeting women.
9070 Integrated Approach Pilot for Sustainability and Resilience of Food Security in Sub-Saharan Africa (IAP-Food Security). **Child Projects: 9139** Upper Tana-Nairobi Water Fund (Kenya); Draft regional KM and Coordination project	The IAP-FS has incorporated lessons from TerrAfrica SIP in its design. The IAP-FS will use a more standardized approach to M&E with a limited set of core indicators to monitor global environmental and socio-economic benefits. The IAP has strong involvement of local communities and stakeholders, as well international research organisations. It supports strengthening of multi-stakeholder platforms that bring together different stakeholders in the environment, agriculture, and food security sectors at multiple scales. A constraint to inter-sectoral integration is the fact that the GEF Operational Focal Point (OFP) is often hosted by the Ministry of Environment with limited collaboration with production sectors. The programme has adopted Outcome Mapping as a complementary approach to assess behavioural change over longer time spans. An innovative aspect of the programme is the introduction of an Agricultural Innovation Systems Approach (AIS) to support scaling up and out of sustainable INRM practices.

3230 Central Asian Countries Initiative in Land Management (CACILM-1) **9094** Integrated Natural Resources Management in Drought-Prone and Salt affected Agricultural Production Landscapes in Central Asia (CACILM-2)	CACILM-1 operated through a heavy partnership framework that was very complex and involved many agencies, but the partnership was not sufficiently country driven. The information system was assessed as one of the projects most successful components, as inaccessible key data were made available to the national secretariats; however lack of data sharing limited the information that reached farmers. CACILM-1 was conceived as a bottom-up approach that included actors at all levels, however, assessments show absence of interaction between international and domestic authorities with local communities. CACILM-1 was multi-sectoral, yet integration of sectors at the ministry level remained a challenge. CACILM-2 intends to learn from the lessons of CACILM-1 to design a lighter and more function-oriented partnership with a strong focus on knowledge management. The focus has shifted from integration of investments to integration of knowledge and information on INRM/SLM. The consortium of partners, including CA countries and Turkey, CAREC, CGIARs, GIZ, etc. can be seen as an innovation in implementation in the region. The programme plans to establish a new decentralised and distributed KM system that allows a) different information management systems to be networked b) different web resources (web sites like WOCAT) to be directly and easily queried by the information management systems (for further details see Extended Case Study Annex).
3482 People's Republic of China-GEF Partnership to Combat Land Degradation in Dryland Ecosystems (phase 1) **5142** Sustainable and Climate Resilient Land Management in Western PRC (phase 2)	The steering committee of the Partnership brings together a total of 12 ministries and agencies, and similar arrangements are mirrored at provincial level. There is strong stakeholder involvement at pilot sites, and Farmer Field Schools (FFS) have been established to strengthen the engagement of farmers. While mostly government driven, some private actors have also been involved in projects. At grassroots level the widespread participation of beneficiaries in decision- making, through participatory rural appraisal (PRA) and FFS is a major achievement. Phase 1 had deficient interaction between the central coordination unit and provincial offices. Despite the resilience focus of phase 2, no specific approaches for assessing or integrating resilience were identified at design stage. The most important innovative aspect of the Partnership is the introduction of participatory integrated ecosystem management and SLM approaches in China.
3647 The Coral Triangle Initiative (CTI). **Child projects: 3589** Coral Triangle Southeast Asia (ADB);**3522** Arafura-Timor Sea Ecosystem Action Programme (UNDP); **5622** LME-EA Coral Triangle Initiative Project (COREMAPIII-CTI) (World Bank); GEF IWLearn/UNDP & ADB RETA: Regional Cooperation on Knowledge Management, Policy, and Institutional Support to the Coral Triangle Initiative	The programme uses Integrated Coastal Management (ICM) tools, Ecosystem Approach to Fisheries Management (EAFM) in fisheries projects as well as the GEF Transboundary Diagnostic Analysis/Strategic Action Programme tools in its Large Marine Ecosystem projects. Tools for bycatch management were used in two fisheries projects, and tools for reef monitoring and information systems were also promoted. There is a need for a more pronounced and articulated watershed-river basin-coastal seas systems approach and integrated landscape and seascape planning. Several projects had a focus on developing enabling conditions for the blue economy and marine-based investments. Local fishers and coastal communities were integrated into governance through co-management of fisheries refugia and coral reefs, and FFS (to engage fishers). The CTI programme is also integrating an IWLearn component that supported a regional CTI IWLearn meeting and other types of knowledge exchange at the regional and global levels.

5395 Pacific Islands Ridge-to-Reef National Priorities – Integrated Water, Land, Forest and Coastal Management to Preserve Biodiversity, Ecosystem Services, Store Carbon, Improve Climate Resilience and Sustain Livelihoods. **Child projects: 5208** Advancing sustainable resource management to improve livelihoods and protect biodiversity in Palau**;** **5405** Ridge to Reef: Testing the Integration of Water, Land, Forest & Coastal Management to Preserve Ecosystem Services, Store Carbon, Improve Climate Resilience and Sustain Livelihoods in Pacific Island Countries	In country child projects, land-use planning will be integrated from the catchment, state (sub-national) to the national level using ridge to reef approaches (R2R). In the regional project, private sector partnerships will be developed in local level demonstration projects to initiate a high level of involvement and collaboration. NGOs will be involved in promoting awareness of water, land and coastal management and use issues. The project aims to build an enabling environment at national level for linking IWRM with Integrated Coastal Management into a new R2R approach. However, this seems to neglect the role of SFM and SLM in R2R approaches. Nevertheless, innovative aspects of the project include the operationalization of R2R approaches and the establishment of a regional community of practice for these approaches. In the Palau child project the role of local communities is not given strong attention in the project design document, and support to integration of policies and of sectors outside environment and natural resources is also weak.
9072 Taking Deforestation Out of Commodity Supply Chains (IAP-PROGRAM); **Child project: 9179** Adaptive Management and Learning for the Commodities IAP (A&L Proj.)	This programme draws on the Biodiversity Conservation in Coffee project, but extends its focus to three key commodities linked to deforestation (i.e., beef, soy and palm oil) in countries that are major producers (Brazil, Indonesia and Paraguay) or emerging as a new player (i.e., Liberia). The program takes an innovative supply-chain approach by directly linking demand and production through the specific focus on commodities sourced from targeted landscapes. Voluntary sustainability standards and certification (VSS) as well as other VSS-like mechanisms were identified as tools that are being widely used by companies. Integration across agencies and ministries (at country level) has been challenging, costly and time-consuming but end product (program design) has significantly benefited from this integration by taking into account the expertise of the different actors. An anticipated challenge of the Comm-IAP is the coordination among GEF agencies and child projects during project implementation given that limited budget is allocated for that. The Program's overall goal is based on the synchronization of activities and outcomes implemented by different agencies and child projects, which requires strong technical and administrative coordination. A lesson from program design and from the coffee program is that additional mechanisms need to be put in place so that integration and flexibility remains throughout implementation.
9272 Amazon Sustainable Landscapes Program **Child project: 9339** Capacity Building and Regional Coordination for Amazon Sustainable Landscape Program **771** Amazon Region Protected Areas Program (ARPA) - phase 1 **4085** Amazon Region Protected Areas Program Phase 2	This program is building on the success of the ARPA program and is, in part, intended to expand the ARPA model of managing and setting up protected areas to neighbour countries. Regional coordination for the governance of the Amazon River basin is still a challenge, which is reflected in the child projects taking a single-country focus. Regional indigenous and community-based organisations have not explicitly been included in program design. Experience from previous projects in the Amazon demonstrates that biodiversity conservation, forest management, rural development, and poverty reduction need to be brought together to guarantee the long-term sustainability of projects. The program plans to pay particular attention to the cultural norms of communities, as well as strengthening the role of women in both indigenous and non-indigenous communities.

3889 Mainstreaming Biodiversity Conservation Through Low-Impact Ecotourism in the *Sistema Nacional de Areas Protegidas* (Sinap)	This single-focal area project aims to integrate biodiversity conservation with ecotourism to provide income generation potential for local stakeholders in selected protected areas. The project plans to develop practical tools such as public use guides, as well as payment for ecosystem services. The project includes a range of stakeholders from policy makers at national level to inhabitants of areas in and around the PAs. Engagement of local stakeholders will be done through activities such as training of local organizations and operators in providing demand driven, high quality ecotourism services. The project will also apply an innovative participatory program to monitor management effectiveness.

The findings and lessons learned with respect to integration from the case study analysis are summarized below.

Problem diagnosis/assessment :

Where there has been a long history of GEF programmatic support, several case studies indicate that the GEF has been moving away from integrated approaches with a very broad focus that support a number of cross-cutting issues, to more **spatially integrated approaches** focusing on integration within landscapes or seascapes of different land-use systems and other spatial units**.** A more limited number of cross-cutting issues are being tackled and there is also stronger focus on knowledge management (KM) and monitoring and assessment (M&A) in more recent projects and programmes. There is an increased emphasis on defining the system boundaries at programme design stage with more detailed analysis of target agro-ecosystems, as seen in the comparison between the two large SLM programs in Africa, the Strategic Investment Programme (SIP) under TerrAfrica and the more recent IAP-Food Security, as well as in the Central Asian Countries Initiative in Land Management (CACILM) phases 1 and 2, and the recent IAP-Commodities programme. Coastal and marine programmes, such as the Coral Triangle Initiative (CTI), combine the seascape and Large Marine Ecosystem (LME) approach with Ridge-to Reef (R2R) approaches. The Pacific Islands Ridge-to-Reef National Priorities combines national R2R projects with regional support to IWRM.

Another lesson is that involvement of local level stakeholders needs to be addressed not only through public participation plans, but be an integral part of problem diagnosis, project/programme design and implementation (Cardesa-Salzmann 2014), which is also stressed in the RAPTA guidelines. Involving local level stakeholders should go beyond merely consulting them during the different project stages, to collaborative or collegiate participation (Biggs 1989), whereby they become part of the decision-making process. It is therefore encouraging to see that the IAP-Food Security, CACILM-2, and the new phase of the PRC-GEF Land Degradation Partnership are paying stronger attention to involving land users in **agricultural innovation-systems (AIS) approaches**. The IAP-Food Security includes a selection of AIS elements listed in Annex 4, such as Farmer Field Schools (FFS), Participatory Technology Development (PTD), Participatory Learning and Action Approach (PLAR), Farmer-to- Farmer Approach (F2F), the Catchment Approach for Soil Conservation, and Landscape Approach and Integrated Landscape Management. The IAP also works on key regional food-crop value chains and supports multi-stakeholder platforms for knowledge sharing and innovation at the national and regional levels. The IAP thus meets some of the key characteristics of AIS as defined by Klerkx et al. (2012).

However, as discussed under the rapid screening of projects, engagement of stakeholders is still often limited to consultations during project design, selection of project participants and to dissemination of results at project completion, and thus participation is often not reaching the collaborative or collegiate levels. Local stakeholders, in particular, are not always being sufficiently included in co-production of knowledge and decision-making processes. Projects' steering committees, for example, are mostly composed of governmental actors at different levels. A few projects include private sector and civil society organizations but mostly from the national and not the local level. Furthermore, the range of beneficiaries of GEF projects could be expanded. The private sector has traditionally had a limited involvement as direct beneficiary of projects, and the project review confirmed this trend. However, there are new financial instruments and initiatives trying to address this gap. The Non-Grant Instrument (NGI) project Climate-Smart Agriculture Fund, for instance, is planning to finance select private sector agricultural companies in Latin America and the Caribbean that require concessional loans or guarantees in climate-smart agriculture to be viable.

A recent feature in the GEF portfolio is the development of ambitious programmes to address deforestation, such as the IAP-Commodities program, which aims to address the **whole supply chain**

of key commodities, namely beef, soy and palm oil. The success of the programme depends on the effective implementation of the different components, from producer side aspects at the local level to sustainable demand from suppliers and consumers of deforestation-free commodities. The coordination of these activities and stakeholders is a major undertaking but it has the potential of tackling root causes of deforestation. The IAP-Food Security is focusing on integrating sustainability and resilience aspects into regional food crop value chains in Sub-Saharan Africa through capacity building and catalytic action, which could potentially have significant impact on food systems in the region.

Previous GEF programmes, such as the TerrAfrica SIP and the first phase of the PRC-GEF Land Degradation Partnership, have encountered problems measuring and reporting on multiple global environmental benefits (GEBs). New initiatives, such as the IAP-Food Security and CACILM-2 are moving towards promotion/adoption of **standard toolboxes** for assessment of GEBs as well as of resilience and socio-economic co-benefits. This includes tools for land degradation and SLM assessment developed by the World Overview of Conservation Approaches and Technologies (WOCAT) and the Land Degradation Surveillance Framework (LDSF), the Ex-Ante Carbon-balance Tool (EX-ACT) and other carbon benefits tools, RAPTA, Multidimensional Poverty Assessment Tool (MPAT) and the Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP) for resilience assessment, and the Economics of Land Degradation (ELD) tools for economic assessment. For example, in CACILM-2 up to ten carbon benefits tools have been proposed (see Annex 4 for examples of tools identified by the IAPs).

Sustainability certifications, such as those provided by the Rainforest Alliance in the Biodiversity Conservation in Coffee project, are useful tools to promote sustainable agricultural practices, and also to encourage responsible consumption by increasing the availability of certified products in the market. Certifications can be costly and thus often not feasible for small-scale farmers. Implementing group certifications in the project showed positive results for the integration of small-scale farmers to these schemes. At the same time, analyses from the project showed that certifications are not the only mechanism to promote sustainable production, and that a range of mechanisms need to be in place for different groups and needs. Following the above, the IAP-Commodities will utilize existing **voluntary sustainability standards and certification (VSS)** tools as well as other VSS-like mechanisms (e.g., company policies with associated indicators, monitoring, and verification processes) to promote sustainable practices on the ground and across supply chains. VSS tools include those developed by the Roundtable on Sustainable Palm Oil (RSPO), Forest Stewardship Council (FSC), Round Table for Responsible Soy (RTRS), SAN/Rainforest Alliance and others, and now account for a substantial portion of some commodities. Companies are applying these tools to implement their commitments related to reducing deforestation and other supply chain risks. Information on the impacts of VSS-like mechanisms is still limited and unevenly distributed by commodities and regions.

The Amazon Region Protected Area Program (ARPA) in Brazil, which has been recognized as a highly successful program in increasing the number of conservation areas in the region, had limited monitoring and evaluation capabilities in its first phase, and the need for a remote-sensing facility that could take stock of the conservation units (UCs) was highlighted in the final evaluation. The Amazon Sustainable Landscapes Programme, a regional successor of ARPA will address this shortcoming by using the Environmental Adjustment Program ("PRA") and the Rural Environmental Registry System (SICAR) in Brazil as tools to improve transparency and provide pathways to environmental compliance. The SICAR is a georeferenced web system used in Brazil to monitor rural properties. The tool is linked to a law (law number 12.651 of 2012), which states that after five years from the date of its publication, financial institutions shall not grant agricultural credits to owners of rural properties not enrolled in the SICAR. A successful mechanism of the ARPA programmes is the "*conta vinculada*" or "conjoined account". This financial mechanism allows a direct flow of resources from the Brazilian executing agency (the non- profit FUNBIO) to protected area site managers. No

additional specific standard tools are promoted or adopted in the ARPA, Amazon Sustainable Landscapes Program or IAP- Commodities.

In the Coral Triangle Initiative (CTI), the standard IW Transboundary Diagnostic Analysis /Strategic Action Programme (TDA/SAP) approach is promoted together with Integrated Coastal Management (ICM), marine spatial planning and the Ecosystem Approach to Fisheries Management (EAFM). A stocktake of the CTI (Abraham 2015) also recommended the development of a **code for best practices** that articulates standards for replication. A certification system could be put in place that uses the ISO 9000 and ISO 14000 related to quality management and environmental management systems. However, lessons could also be learned from WOCAT that has been adopted by the UNCCD to document and identify SLM best practices for replication[3] based on a standard SLM classification system and template. Moreover, STAP could play a stronger role in ensuring that replication standards are considered and that the tools and approaches used in GEF projects and programmes are scientifically sound and up-to-date. A first step would be to review and assess the tools and approaches for INRM identified in Annex 4, identify clear criteria for their application, and to expand the toolbox as appropriate. Annex 4 includes tools proposed to measure multiple global environmental benefits across scales in the IAP-Food Security, but for a fully integrated approach from Ridge-to-Reef or Source-to-Sea, additional tools for monitoring of impacts of IWRM, ICM, marine spatial planning and EAFM would have to be added.

There is evidence that **Integrated SIDS projects** may need targeted guidance on existing tools for identification of best practices and for impact assessment of multiple global environmental benefits, as seen in the Pacific Islands Ridge-to-Reef programme. It is lacking any references to standard tools for monitoring and identification of best practices related to sustainable land and forest management and conservation of terrestrial biodiversity, although the focal areas contribute funding to the programme. This finding is corroborated by the Caribbean case study in the STAP Source-to-Sea report (Granit et al. 2016) that states that better understanding of linkages between different segments in the source-to-sea continuum could also inform the development of common and cross-cutting indicators and harmonisation of tools for monitoring of SLM and SFM in upper watersheds, and IWRM/WUE (water use efficiency) and ICM in freshwater and coastal segments.

In terms of **partnerships**, several GEF programmes seem to be reducing the number of GEF agencies in follow-up phases and in individual child projects, such as CACILM, the PRC-GEF Land Degradation Partnership and the Pacific Ridge-to-Reef Programme. This does not mean that the overall number of partners has been reduced. In the PRC-GEF Land Degradation Partnership, new provincial governments and local-level partners have joined in the new phase, while the number of GEF agencies has been reduced. In CACILM, in the new phase there are a larger number of technical agencies from the CGIAR - a global agricultural research partnership. In the Pacific Ridge-to-Reef programme there are more sectors and national agencies participating compared to an earlier regional IWRM project. This development is a result of reduced GEF funding to these programmes, but also reflects the countries' interest in working with technical partners outside the GEF, and the high transaction cost of developing GEF multi-agency programmes and projects.

It can also be observed that some programmes, such as the IAP-Commodities and the Amazon Sustainable Landscape programmes, do not explicitly include development of partnerships with existing community-based or indigenous-based organizations, such as the regional indigenous umbrella organization COICA (*Coordinadora de las Organizaciones Indígenas de la Cuenca Amazónica*) in the Amazon. The case studies and interviews indicate that there is a need for clearer

[3] http://knowledge.unccd.int/knowledge-products-and-pillars/access-capacity-policy-support-technology-tools/best-practices-slm

rules of engagement and incentives for collaboration among GEF agencies as well as among sectors and ministries at national level. Protocols for management of coordination processes may also be needed to ensure continuity of leadership and participation of key stakeholders. In contrast, GEF financial mechanisms such as the NGI are allowing GEF agencies to partner with private sector actors, such as small and medium enterprises, who are normally marginally involved in GEF projects. The NGI instrument supports design of innovative natural resources management projects that are normally not viable, or are considered higher risk with regular investment capital. The Impact Investment in Support of the Implementation of the 'Nagoya Protocol on Access and Benefit Sharing' and the 'Risk Mitigation Instrument for Land Restoration' currently in preparation by the IDB are examples of this type of projects (see Annex 3).

Implementation and governance:

Integration of environmental concerns into investments is a strong focus of all the reviewed programmes and can be linked to both loans and public funding. **Mainstreaming** into productive sectors, such as agriculture, at national and local government level can further scale up investments, as demonstrated very clearly by the PRC-GEF Land Degradation Partnership where mainstreaming of IEM/SLM priorities into successive provincial 5-year plans has led to mobilisation of significant amounts of funding for scaling up of SLM. **Innovative financial mechanisms and incentives**, such as Public Private Partnerships (PPPs), Payments for Ecosystem Services (PES), carbon finance, and voluntary market-based mechanisms were also considered as possible tools for scaling up integrated approaches in China (Tengberg et al. 2016). However, several challenges remain. PPPs for establishment of shelterbelts, afforestation and sand control were considered to have potential to scale up SLM, but the legal system is still incomplete to fully support them. Carbon benefits needs to be better integrated into SLM, and the financial benefits of carbon sequestration are still too low due to a low market price of carbon. There is also a need to ensure that compensation schemes are fair and duly benefit farmers.

The more recent programmes, such as the Food Security and Commodities IAPs, focus on strengthening **value chains** of key crops and commodities to reduce their environmental impact and make them more inclusive by involving multiple stakeholders at different stages of the value chains (including large and small-scale growers, manufacturers, retailers, governments), while improving market access and profitability. A review of the Biodiversity Conservation in Coffee project and the IAP-Commodities showed that for complex integrated and large-scale projects with value-chain approaches, the first year of implementation should be used to establish the basic implementation framework. This includes conducting baseline studies, establishing the local advisory board/steering committee and establishing and validating the monitoring system.

Mapping governance arrangements is still something that seems limited in the projects reviewed, with the exception of projects following the TDA/SAP approach of the GEF International Waters focal area (e.g. the Arafura-Timor Seas project under the CTI) that include a regional and national level governance analysis. In other types of projects, stakeholders are normally included in consultations, but a limited number of projects include local stakeholders in steering committees with representation at different levels. Stronger participation of local stakeholders would strengthen the vertical integration in projects and programmes and would empower local stakeholders as co-participants and 'colleagues' in decision-making processes. Empowering local stakeholders is important to ensure that outputs of projects are taken up and sustained at the local level beyond project implementation. It is also worth noting that the institutional anchor at national level of INRM projects is often the Ministry of Environment or equivalent and not productive sectors, such as agriculture. These ministries often lack the authority to mobilise other sectors, despite efforts at inter-sectoral coordination. However, linkages to processes at sub-regional and regional levels could help overcome this obstacle (see CACILM-2, IAP-FS and IW projects).

Furthermore, **local-level governance and institutional innovations** on issues such as land tenure, and land and water rights need more systematic attention in the GEF portfolio, as pointed out in the TerrAfrica SIP Stocktaking. This includes collective action and self-organization at the local level important for strengthening the rights of poor and vulnerable groups (following e.g., Ostrom 2009). This type of innovations can also contribute to removal of barriers to scaling up, and thus are an important element of integration. Existing guidance, such as the FAO Voluntary Guidelines on Tenure (FAO 2012) could be used more systematically by GEF projects. The GEF Small Grants Programme (SGP) also has a body of work to draw on related to scaling up of community actions, especially from the International Water focal area where it has established close partnerships with several GEF full-size projects to promote bottom-up approaches in collaboration with civil society organizations (SGP 2016). The SGP has, for example, supported Farmer Fields Schools (FFS) for fishers and strengthened spatial management arrangements of beaches and open waters in the CTI.

Avoiding conflicts in complex systems where drivers of degradation and processes that influence natural resources emanate from different levels, requires setting of clear rules (Ostrom 2009; Ostrom 1990). In International Waters projects, such as the Arafura-Timor Sea project under the CTI (Tengberg et al. 2012), mechanisms for inclusive stakeholder participation that can also support **conflict resolution**, are part of the TDA/SAP approach. Other programmes analysed, such as the IAPs, do not include specific conflict resolution mechanisms. Successful management of natural resources and addressing conflicts depends on monitoring and enforcement of agreements done at the local level by local stakeholders. Further attention to local institutions and networks and their role in collective action is thus needed across the GEF portfolio to address conflict resolution in INRM.

Knowledge Management (KM) systems in GEF integrated projects and programmatic approaches have often not been effective and sustainable, with the exception of IWLearn, to which the CTI and Pacific Ridge-to-Reef programmes are linked. A recommendation for the second phase of CACILM is that KM platforms should be decentralised and distributed among networked institutions, have a central orchestrator, and not build on standard reporting templates. The orchestrator is a software component that allows a) different information management systems to be networked b) different web resources (web sites such as WOCAT) to be directly and easily queried by the information management systems. The approach proposed by CACILM-2 is a multi-centre knowledge management orchestrator that builds on four features:

- Cooperation and competition between the participants: The fundamental issue is the sharing of content, however the contents remain under the physical control of different institutions and international agencies can opt for alternative options to share their data and knowledge. This will favour the institutions with more flexibility in sharing content.

- Resilience: Distributed systems are more resilient. If one institution has problems and can no longer guarantee the sustainability of a project platform, the system will not collapse and other institutions will be able to absorb the data. To the contrary, in a centralized system, a single problem could block the entire project or programme.

- Flexibility: A distributed system allows the creation of different levels of complexity, solving different problems. The system could include simple digital libraries as well as semantic content management and very complex expert systems.

- Interoperability: A distributed system does not need the use of predefined templates or structures.

To reach out to the primary beneficiaries, projects need to build in clear linkages to practitioners as well as decision makers, enabling easy access to new knowledge. In the IAPs, the child projects

focused on knowledge management and learning will be instrumental for effective coordination of the programmes as a whole, and monitoring and evaluating progress towards achieving global environmental benefits, gender balance, and socio-economic benefits. It will be imperative that lessons from monitoring and evaluation of progress is fed back in a timely fashion to relevant child projects and if necessary, adjustments to on-going and planned activities are implemented.

Communication has been a weak point in many programmes, and tools for monitoring programme impact have not reached all projects and local-level stakeholders, as for example the tool for Spatial Planning and Monitoring of Landscape Interventions developed by the TerrAfrica SIP (Willemen et al. 2014). Moreover, improvements are also needed in reaching out to policy and decision makers across multiple sectors to influence learning and adaptive knowledge management and governance related to integration. For example, the TerrAfrica SIP stocktaking pointed out that there had been a low level of involvement of media, learning and teaching organisations, and the CTI stocktaking also stressed the need to involve the education sector (Domitille Vallée & Woodfine 2015; Abraham 2015). Programmes and projects would benefit from having a communication and dissemination strategy tailored to the needs of key stakeholders. Garforth (1998) suggests considering setting a dissemination strategy from the onset of the project and identifying potential outputs (e.g. publications, video, radio) according to the target population, the time-frame and experiences of projects in similar areas or similar target groups**.** This is already happening in the IAP-Food Security that is investing in strengthening outreach under its regional knowledge management project that has also developed a programme-level communication strategy. The IAP-Commodities regional project on adaptive management and learning will develop an online Global Impacts Platform for Sustainable and Low-Deforestation Commodity Production and Sourcing Initiatives that will support company-and donor-supported actions to accelerate a transition to low-deforestation and sustainable commodity production. IWLearn provides forums for communication and outreach within the IW focal area, in which the CTI programme and Pacific SIDS have participated to share lessons and learn from similar projects in other parts of the world. Finally, programmes and projects should use modern Information and Communication Technology (ICT), including mobile technology, social media, etc. to improve dissemination and learning.

Case studies from non-GEF programmes

Based on the elements identified above as critical to integrated programming, a number of non-GEF programmes that addressed issues such as innovation systems approaches, spatial planning and landscape-based approaches, learning and adaptive knowledge management, as well as gender and behavioural change, were analysed. Some key lessons of relevance to the GEF are highlighted below and full details of the case studies are found in Annex 5.

Under its Horizon 2020 initiative, the European Commission is supporting a work programme on 'Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy' that has some similarities with the GEF priorities. The **interactive innovation approach** fosters the development of research into practical applications and the creation of new ideas through interactions between actors, the sharing of knowledge and effective intermediation. In this interactive innovation model, building blocks for innovation are expected to come from science, but also from practice and intermediaries, such as farmers, advisors, businesses, NGOs, and others. Key for interactive innovation is to include existing (sometimes tacit) knowledge into scientific work: end-users and practitioners are involved, not as a study-object, but in view of using their entrepreneurial skills and practical knowledge for developing the solution or opportunity and creating co-ownership. To foster and scale up innovations, the GEF also needs a mechanism to support innovations linked to its main objectives and large programmes. This could be based on a competitive application process, using the interactive innovation approach, among others. For example, major future GEF integrated programmes could set aside a certain percentage of funds for

'innovation grants' that could support the major components of the programme and bring in new ideas based on calls for proposals. The key themes for grant applications could be pre-defined and based on innovation needs identified under each objective.

Ecoagriculture Partners support **integrated landscape initiatives** defined as a project, programme, platform, initiative, or set of activities that: explicitly seeks to improve food production, biodiversity or ecosystem conservation, and rural livelihoods; works at a landscape scale and includes deliberate planning, policy, management, or support activities at this scale; involves inter-sectoral coordination or alignment of activities, policies, or investments at the level of ministries, local government entities, farmer and community organisations, NGOs, donors, and/or the private sector; and is highly participatory, supporting adaptive, collaborative management within a social learning framework (Denier et al. 2015). The GEF could more fully adopt the integrated landscape management approach to scale up multiple benefit outcomes that support both conservation and livelihood objectives building on existing platforms and guidelines.

The Soil Security Programme of the UK Natural Environment Research Council (NERC) sets out to deliver for the first time a truly integrated and **multi-disciplinary understanding of** the physical, chemical, and biological controls on **soil functioning**, and the relative importance of these factors for soil functioning at different spatial and temporal scales and in different contexts. A lesson for the GEF from this initiative is that addressing complex environmental challenges requires an integrated science-driven systems approach that brings together expertise from a range of disciplines and existing national and international platforms. Moreover, assessment of natural capital and development of land management incentives have proven to be key for sustainable management of soils. Phasing of impacts from programme team, to boundary partners, and finally to policy makers and practitioners could assist in mapping outcomes at different levels of the ladder of change (see explanation of outcome mapping below).

Within the framework of the joint IFAD-funded programme, "Learning Routes: a Knowledge Management and Capacity-Building Tool for Rural Development in East and Southern Africa", the Procasur Corporation supports knowledge management and capacity-building strategies aimed at scaling up best practices and innovations that contribute to reducing poverty among IFAD stakeholders in the region. The **Learning Route** is a planned journey with the learning objectives to (i) address the knowledge needs of development practitioners; and ii) map the experiences of local actors who have tackled similar problems in innovative ways, with successful results, and have accumulated knowledge that is potentially useful to others. A lesson for the GEF is that investing in knowledge management; through e.g., mapping the learning route should be considered an integral part of project design. In addition, competitive and targeted grants could support learning and innovation across projects and programmes for larger impact.

The Bill & Melinda Gates Foundation ask their grantees and partners to adopt three priorities in ensuring that programmes are **gender responsive**: i) programmes should take into account the context and circumstances of women farmers; ii) programmes must use the information collected about women farmers to inform programme design; iii) programme objectives should include women's active involvement and progress should be evaluated in terms of women's successes as well as household successes. Some of the programmes the Foundation supports account for gender differences and inequalities from the start, with an emphasis on gender equity and transforming relationships between women and men; these programmes are considered gender transformative. Most of the agricultural programmes it supports consider how women and men will participate and benefit, and they strive to benefit both and harm neither; these programmes are considered gender aware. Projects that do not account for gender differences are called gender neutral and are not supported by the foundation. The GEF could also consider classifying projects into gender

transformative, gender aware and gender neutral and link the classification to the GEF theory of change, funding priorities and eligibility criteria.

The above review shows that there is much that can be learned from programmes with a broader development focus than that of the GEF. By combining the latest insights from development research and practice with that of environment, the GEF could further improve its theory of change to identify sustainable impact pathways that better integrate innovative and multi-disciplinary approaches, with learning and adaptive management.

Towards a theory of change

Could a general theory of change be formulated for integrated approaches to generate global environmental benefits based on the analysis of the GEF INRM portfolio and the observations above? The general framework for the GEF theory of change (Uitto 2016) identifies general areas of contribution from the GEF to solve global environmental challenges as:

1. Implementation strategies;
2. Knowledge and information; and
3. Institutional capacity

They are expected to drive transformational processes that lead to broader adoption of sustainable environmental practices and behavioural change that in the longer term lead to stress reduction and improved environmental status over large areas. The findings from project screenings and case studies discussed above indicate the drivers and barriers that need to be tackled for GEF to make a contribution in finding sustainable solutions to the 'wicked' problems facing the global environment. The issues within the three general areas of GEF contribution of high importance for integrated approaches and MFA projects have been included in a simplified theory of change (Figure 4). This includes support to:

- **Spatial planning** –participatory land use planning at the landscape scale, marine spatial planning in seascapes, or integrated planning along a source-to-sea or ridge-to-reef continuum.
- **Innovation systems for INRM** –institutional innovations related to co-management, collective action and participatory governance involving co-production of knowledge, strengthening of social capital, and others using well-tested approaches such as FFS and participatory learning and action.
- **Monitoring and assessment of global environmental benefits (GEBs), resilience and co-benefits of INRM** using tested and validated tools that could be made available in a standard toolbox for monitoring of multiple GEBs and gender-balanced socio-economic benefits.
- **Sectoral integration and mainstreaming of INRM** –. involvement of a wide range of stakeholders not only as participants in consultations during project design, but as actively engaged in decision making processes from project design to implementation and governance. It also involves identifying financial mechanisms and incentives (e.g. PES, value chains) for INRM.
- **Learning and adaptive knowledge management** - this involves not only monitoring progress but reflecting on progress and adjusting actions accordingly, following the single, double and triple loop learning cycle (see below).
- **Communication and dissemination** –development of a communication strategy and use of modern ICT, such as social media, smartphone applications, and others that targets actors and stakeholders beyond the natural resources management sectors.

This is expected to generate outcomes that lead to: (i) improved INRM technologies and approaches that generate GEBs and gender balanced socio-economic benefits; (ii) institutional innovations (e.g. co-management, collective action, participatory governance) that support scaling up and out of INRM; and operational financial mechanisms and incentives (e.g. PES, value chains) for INRM. Along the proposed theory of change for INRM projects, we identify innovation systems for INRM and communication and dissemination as areas in need of more attention from the GEF to achieve its expected impact. In particular this includes enhancing the understanding of institutional innovations required to scale up INRM from the local, to sub-national and eventually national scale. Incentives for sustainable use of natural resources also need further attention.

The theory of change for integrated programmes and projects describes the impact pathway and expected behavioural change, at the individual and societal level, translating into change in policies, institutional frameworks and practices that contribute towards improved environmental status and reduced stress in social-ecological systems. Behavioural change requires learning. Learning here means not only acquiring knowledge and skills, but also implementing them into action. Learning can occur at the individual and at the societal level (Ifejika Speranza et al. 2014). It follows then that learning is demonstrated when there is behavioural change as a result of the gained knowledge or skills (Ibid). Learning is assumed to be an iterative process where experiences are reflected upon, and appropriate adjustments are done to practices, behaviour and policies.

There are different levels of learning, from zero learning to single, double and triple loop learning, which reflect the extent of the learning process as well as different times scales (from short to medium term). Single-loop learning is the first stage and it involves short-term processes of correcting basic errors and adjusting practices but within existing norms and values, that is, without questioning underlying assumptions. Double-loop learning is a more radical change process where basic assumptions and previous frameworks of reference are questioned. Double-loop learning involves unlearning old habits and changing practices, policies and beliefs based on critical reflection of previous experiences. Triple-loop learning is the most radical change and involves a transformation in the whole regime and frame of reference, and development of new governance mechanisms and protocols based on several iterative learning cycles, and thus results from a long-term process (Johannessen & Hahn 2013; Pahl-Wostl et al. 2007; Ifejika Speranza et al. 2014). The different learning loops emphasise the level (‘depth’) of reflection, rather than duration of the process. However, it is recognised that deeper levels of reflection and learning normally come from several reflection and learning iterations, and thus take time.

Based on the above, the theory of change for integrated natural resources management includes intermediary steps between outcome and transformational processes to reflect the iterative and time-scaled learning process required to move from actions and changes in practices towards broader adoption of more sustainable practices and policies. As noted by Pahl-Wostl et al. (2007) long-term changes in governance structures and underlying norms around natural resources management cannot take place in isolation from the wider societal and political context, an assumption which highlights the importance of integrated approaches and of having a comprehensive understanding of the multiple processes on different times scales involved in learning.

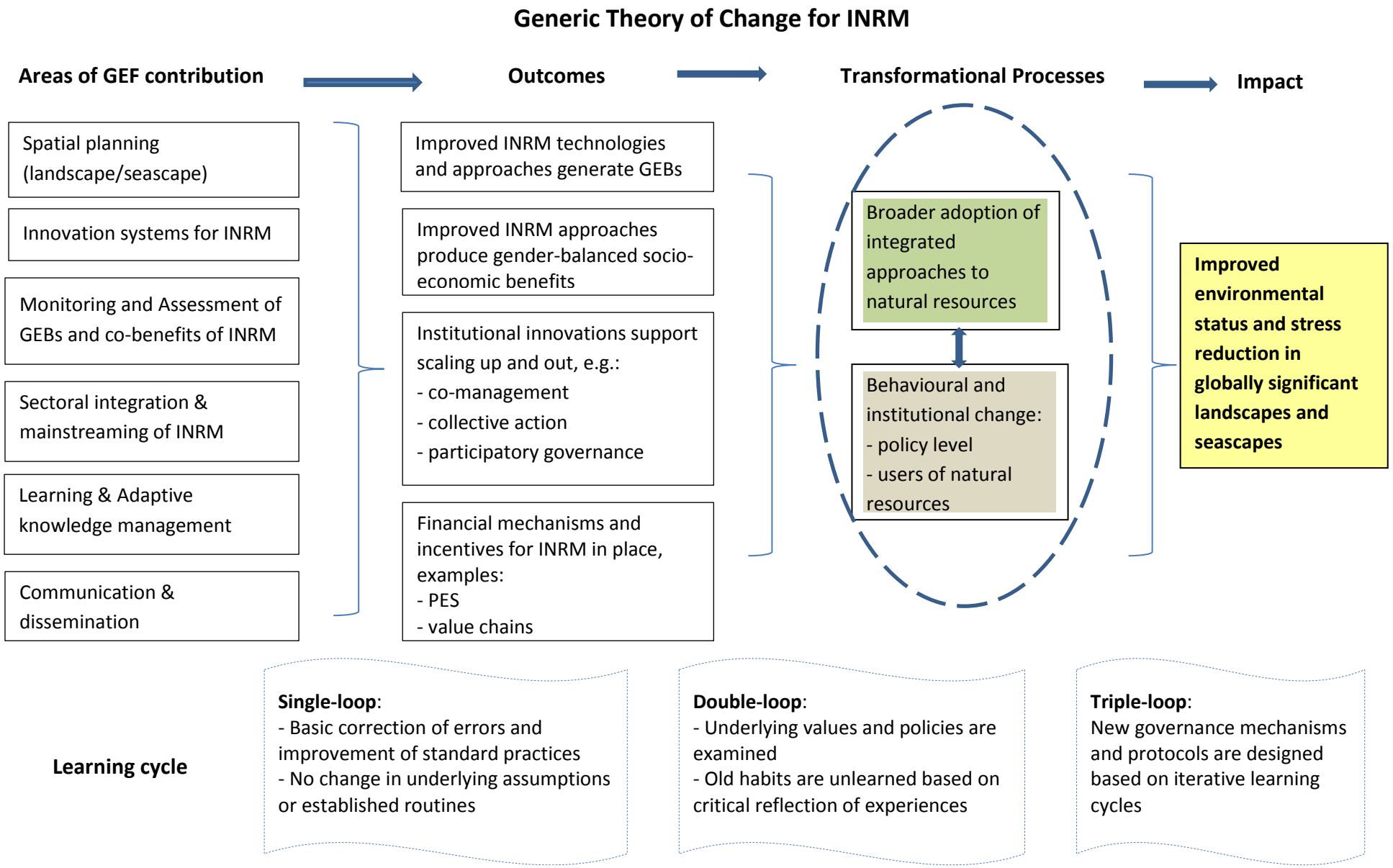

Figure 4. Theory of Change for Integrated Natural Resources Management

In Figure 5, different elements of implementation strategies follow the S-curve of increasing impact with time. The S-shape is based on the theory of innovation diffusion from transition management and stresses the process of system transformation, or regime-shift, over time following the transition phases mentioned in section 2, namely: pre-development, take-off, acceleration and stabilisation (Nastar 2014; Loorbach & Rotmans 2010). This representation of the theory of change can facilitate the identification of transition pathways for scaling up of innovative INRM technologies using the multi-level perspective on transition theory that conceptualises transitions from niche adoption, regime shift, to landscape development. We argue that an agricultural innovations systems approach can accelerate the scaling up of sustainable INRM technologies and practices from the niche to the landscape level through a focus on markets and value chains, institutional change and inter-sectoral collaboration, shared learning through multi-stakeholder knowledge platforms, and strategic partnerships. The theory of change can be understood as following the four stages of a socio-technical transition, from pre-development, take off, acceleration and, stabilisation.

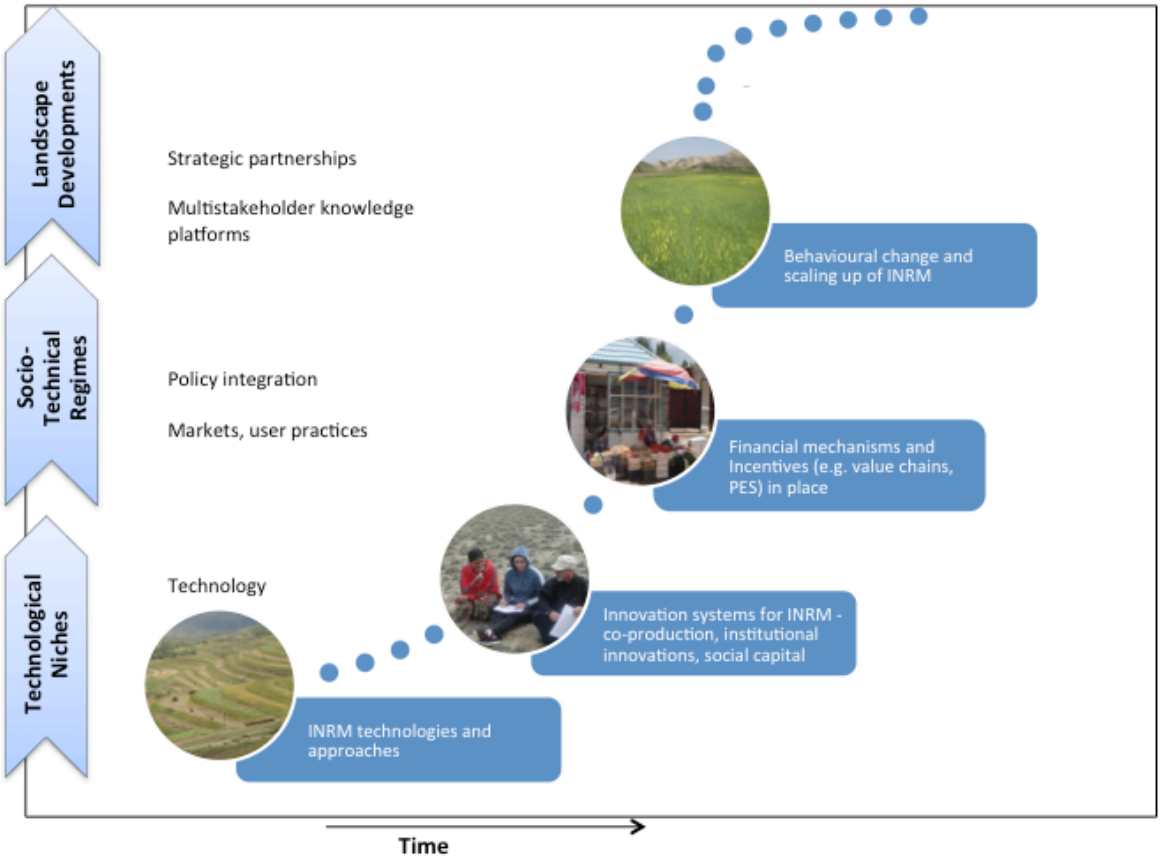

Figure 5. INRM Theory of change and the transition from niche adoption to regime shift and landscape development (figure draws inspiration from Geels 2002)

Developing and implementing integrated approaches to natural resources management is a process that requires time and commitment. The case studies have shown that programmatic approaches to address land, water and ecosystem degradation in Africa, China, Central Asia, and the Pacific to a large extent address the same barriers over multiple phases, including policy, institutional, finance, market and knowledge barriers. A recommendation from the review of the TerrAfrica SIP was that projects should have focused on supporting the policy review and dialogue rather than aiming for direct policy change. To overcome the problem of assessing influence on policy processes, the IAP-Food Security has adopted **Outcome Mapping (OM)** as a complementary approach to assess behavioural change over longer time spans. OM can be used as a tool to assess the different levels of learning (i.e., single, double and triple-loop learning), as it unpacks the theory of change and provides

a framework for collecting data on immediate changes in the enabling environment and behavioural change along the impact pathway that will lead in the longer term, to more transformative change. It constitutes a plausible assessment of the initiative's contribution to outcomes. OM focuses on the program's external influence, both deliberate and unplanned, during its progression and relates these to project activity rather than focussing internally on the progress of the project. Rather than assigning credit for achieving a particular impact, the emphasis of OM is on monitoring and reporting changes in the actions of the actors involved. This has some similarities with the order of outcome framework proposed by the Source-to Sea approach that is also emphasising the importance of long-term goals and behavioural change (Granit et al. 2016).

OM has been used by organisations, such as the Department for International Development (DFID) and the CGIAR, to map contribution towards achieving long-term policy goals and behavioural change in the area of natural resources management (Smutylo 2005; Earl et al. 2001). It involves using three levels of progress markers (ladder of change):

1. Developing a vision and mission statement
2. Identifying boundary partners - individuals, groups or organisations with whom the programme interacts directly and with whom it can anticipate opportunities for influence
3. Defining progress markers - expect-to-see, like-to-see and love-to-see (ladder of change)

The IAP-Food Security undertook a rapid outcome mapping in its design stage based on existing documentation, but the key stakeholders would need to meet again to both review the theory of change of the programme and to fine tune the outcome mapping. The initial OM is presented in the box below:

Box - Outcome mapping applied to IAP- Food Security

IAP-Food Security OUTCOME objectives (progress markers – ladder of change)

Boundary partner group A: Regional and national policy and decision makers (this group contains central national level policy and decision makers and regional policy makers linked to regional fora, such as the African Union and Regional Economic Communities, such as COMESA, ECOWAS and SADC)

1. Expect –IAP-FS expects national and regional policy and decision makers to acknowledge the importance of INRM, sustainability and resilience for sustainable agriculture and food security.

Progress indicator: Interviews, statements, social media outreach from national and regional policy and decision makers refer to the importance of INRM, sustainability and resilience for sustainable agriculture and food security.

2. Like –IAP-FS would like to see national and regional policy and decision makers incorporating references to INRM, sustainability and resilience in agricultural and food security policies and plans.

Progress indicator: Regional and national agricultural and food security policies, strategies and plans refer to INRM, sustainability and resilience.

3. Love –IAP-FS would love to see decisions, investments and implementation of projects that lead to increased sustainability and resilience for food security in SSA.

Progress indicator: Increase in investment flows and number of projects that integrate INRM, sustainability and resilience in agriculture in SSA.

Boundary partner group B: Local decision makers and smallholder farmers (at local level, e.g. province/state and district level there are public decision makers such as province/state governments, and local private decision makers such as farmers and local entrepreneurs. These are the change agents the IAP-FS is trying to reach out to)

1. Expect –IAP-FS expects to see participation from local decision makers and smallholder farmers in IAP projects.

Progress indicator: Local decision makers and smallholder farmers attend meetings and workshops organized as part of IAP projects.

2. Like –IAP-FS like to see improved agricultural practices with regard to INRM, sustainability and resilience in countries reached by IAP projects.

Progress indicator: Local decision makers and smallholder farmers take action and invest in INRM and sustainable agriculture in areas reached by the IAP.

3. Love –IAP-FS love to see increased sustainability and resilience for food security in local communities in areas covered by the IAP.

Progress indicator: Increased area under INRM, reduction in GHG emissions, increased agrobiodiversity, increased land cover, and improved food security and nutrition, in areas reached by IAP projects.

5. Conclusions

There are numerous challenges and opportunities of integrated approaches that need to be addressed in order to maximise the catalytic impact of the GEF. The evolving scientific understanding of social-ecological systems, and factors influencing innovations, scaling up processes and transitions should be harnessed and integrated into GEF's influencing models and theory of change. In this review, we have identified a number of key factors that merit further attention from the GEF and its partners:

Understanding the system – Focusing on drivers to environmental degradation requires a clear system boundary as well as long-term commitment to be effective, as demonstrated in the rapid screening of projects as well as in several large GEF programmatic approaches, where system boundaries are increasingly becoming better defined. However, further analysis is still needed to improve boundary delimitation including better justification of how the system boundary is selected, controlling variables, and what falls outside of the boundary. Moreover, addressing drivers and the barriers to sustainability may require a regime shift, which can take the form of a comprehensive change in the policy, institutional and market environment, as conceptualised by the MLP theory.

Transformative change – A stronger focus on transformative change at the local level is needed, as it is at the local level where niches of innovation, experimentation and learning occur. The approach of 'think global and act local' can be implemented through, for example, increased support to agricultural innovation systems that strengthen local organizational capacity for collective action, while empowering and incentivising local people to scale up sustainable INRM practices. This approach will more clearly make natural resource users positive agents of change.

Enable learning, innovation and adaptive management – OPS5 states (GEF Evaluation Office 2013) that the GEF is lagging behind its agencies in adopting new paradigms to learning. New approaches are needed also in its programmes and projects, as was shown through the rapid screening where limited innovations regarding learning and adaptive management were found. The multi-centre

knowledge management orchestrator approach proposed in Central Asia serves as an example of innovative knowledge management approaches. The GEF should also consider adding as part of its monitoring mechanisms an explicit participatory assessment of lessons learned (i.e., the effectiveness of interventions) during project implementation where key stakeholders are engaged in assessing if/how the project course needs to be adjusted (adaptive management). The Mainstreaming Biodiversity Conservation Through Low-Impact Ecotourism in the *Sistema Nacional de Areas Protegidas* project in Panama can serve as an example of participatory monitoring approaches. Incorporating local stakeholders throughout the entire project cycle could contribute to making the participatory process more collegiate (Biggs 1989) whereby local stakeholders are considered independent, but closely interrelated colleagues with project managers and other public and private stakeholders.

Adaptive management in GEF projects and programmes could also be strengthened by using tools such as RAPTA to assess implementation pathways for enhancing resilience, adapting or transforming the system. Some programmes are heading towards that direction such as the Amazon Sustainable Landscapes Programme and the IAP-Food Security, which plan to capture lessons across child projects and ensure take up through south-south exchange, learning routes, etc., where the best initiatives will be evaluated for scaling up. The programmes plan to draw lessons not only from their own child projects, but also from outside in collaboration with external partners, and setting the infrastructure so that lessons captured are integrated into project design and implementation. The GEF could also consider supporting innovation grants under its main programmes to inject new ideas from research and promote innovation systems in the tackling of INRM challenges to achieve global environmental benefits. Further analysis, which falls outside the scope of this paper, is required to assess the specific barriers and opportunities that exist within the GEF project cycle to better incorporate adaptive management.

Communication strategy – GEF programmes and projects need to strengthen their communication strategies with messages tailored to different target groups, including local communities, practitioners, and policy and decision makers across multiple sectors to influence learning and adaptive knowledge management and governance related to integration. Improved communication could also support gradually higher levels of learning, such as single, double and triple loop learning, moving from correcting basic errors and adjusting practices, to unlearning old habits and changing practices, policies and beliefs (e.g. the IAPs), to development of new governance mechanisms and protocols (e.g. CTI) based on several iterative learning cycles.

Incorporate conflict-resolution mechanisms –Avoiding conflicts in complex systems should ideally build on existing institutions and collective action initiatives at the local level and the setting of clear rules. While the existence of conflict-resolution mechanisms does not guarantee that stakeholders will abide by the rules, such mechanisms are essential for the long-term management of complex social-ecological systems. This requires that local stakeholders and officials have rapid access to low-cost local arenas to discuss and resolve conflict among the parties involved. Processes of reaching consensus can also contribute to building social capital. (Ostrom 1990; German et al. 2012).

Achieve short, medium and long-term environmental benefits and impact at scale – following the proposed theory of change for INRM, short-term benefits will first accrue at the local level from implementation of improved INRM technologies and practices that, through spatial planning, strengthening of innovation systems and, financial and incentive mechanisms, are extended to the watershed and/or landscape/seascape scale to sustain and enhance ecosystem services at larger scales and longer time spans. The Overall Performance Study 5 (GEF Evaluation Office 2013) of the GEF concludes that the most effective approach to up scaling and to achieve impact at scale is mainstreaming. To better understand how mainstreaming works and how to design interventions that support it, the mainstreaming concept needs to be further unpacked in the GEF. Mainstreaming

of environmental issues into development projects, or vice versa, should include integrating equity aspects such as gender relations and inclusiveness of vulnerable populations. To mainstream gender aspects into projects, the GEF could consider implementing a gender classification into its programming such as that followed by the Bill & Melinda Gates Foundation, where projects are classified as gender transformative, gender aware and gender neutral. There is also a need to differentiate, as well as to understand, linkages between decision-making and planning processes at different scales and how higher-level processes along the theory of change can influence agent behaviour at lower levels through scaling out, scaling up, nesting, and institutionalization.

Form institutional partnerships – Establishment of multi-stakeholder platforms from national, regional to global level has emerged as a favoured approach in the 2030 agenda to implement the SDGs, and is also manifest in the GEF IAPs. However, partnerships should be based on technical expertise and complementarity among partners and agencies, rather than broad institutional mandates, to justify the transaction costs associated with multi-agency programmes and projects. Technical expertise should be sourced from national, regional to international level on a competitive basis, and local-level partnerships with indigenous-based organizations should also be strengthened. To foster functioning partnerships, setting clear rules for engagement and interaction is as relevant at the international and regional levels as it is at the local level.

To conclude, integration is an important concept that helps addressing complex social-environmental problems. For it to be truly useful and meaningful it needs to be well defined. This report has contributed to 'unpacking the concept' through the identification of integration domains important to consider during problem diagnosis, project design and implementation. It has tested these domains by analysing the extent to which they have been taken into account in a variety of GEF MFA and single focal area projects, as well as in two of the recently developed IAPs. The analysis has shown that integration is not limited to MFA projects, but that also single focal area projects can display integration across several domains, as some of the Latin American cases show. We conclude that integration is a desirable process that can make all project outputs more useful and relevant to a larger number of stakeholders and sectors. However, INRM approaches need to be flexible and the identified integration domains should not become a 'straight jacket' or 'check-list', but be applied when relevant and adjusted to the particular context and social-ecological system.

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Annex 1
Review of Relevant Reports

Review of STAP reports with a focus on INRM and systems thinking

STAP report	Systems thinking (problem diagnosis)	Integration domains (design)	Implementation and governance (implementation)	Practical applications and reflections
1. The Resilience, Adaptation and Transformation Assessment Framework: from theory to application (RAPTA) 2. Guidelines on designing projects in a rapidly changing world	The RAPTA framework includes four elements integral to systems thinking, and at the stage of diagnosis emphasizes the importance of: • System description, and • Assessing the system, including general and specified resilience, and adaptation and transformation needs. It also recommends developing a theory of change	RAPTA aims to integrate understanding of the social-ecological system at multiple scales, and to e.g. integrate activities from the local, to project, to GEF focal area objective and is thus addressing both spatial and vertical integration	In the implementation phase RAPTA emphasizes: • Adaptive governance and management • Multi-stakeholder engagement – this is considered important throughout the project cycle, but is consolidated in the implementation phase.	The RAPTA framework addresses many dimensions of integration and could become a useful tool in designing INRM interventions. RAPTA could also be useful at an upstream and strategic level to identify sensitive social-ecological systems that will approach a threshold without GEF support. It could help in identifying where GEF could make a difference in safeguarding global environmental assets by providing support at critical points in the theory of change building on the strengths of its network. RAPTA could also be used in programme and project design, but more efforts are needed to identify how it complements other project development tools and manuals already in use in the GEF agencies. In addition, more specific guidance would be useful on e.g. how to develop a sound theory of change that integrates systems thinking and resilience, how to identify thresholds in a system, and indicators to measure general and specified resilience. More concrete examples of when transformation of a system has been successful are also needed.

3. A Conceptual Framework for Governing and Managing Key Flows in a Source-to-Sea Continuum (S2S)	The S2S framework includes: • Characterization of the system using DPSIR • Defining a theory of change based on the four order of outcome framework	S2S systems are linked from one or more closely connected segments, to the river basin, a sea and its drainage area to the global system. It emphasizes the need to define the appropriate scale for an intervention.	S2S emphasizes the need for: • Integrated governance • Engagement of key stakeholders	The S2S framework could become a complement to the Transboundary Diagnostic Analysis (TDA) and Strategic Action Program (SAP) approach advocated by the GEF IW focal area and enable better targeting of critical flows threatening global environmental assets while also enhancing integration across GEF focal areas in addressing these flows. The approach offers a theory of change that can guide governance and management responses in a source-to-sea system. However, there are many remaining challenges related to integration of assessment tools used in the different focal areas of the GEF and there is also a need to harmonise indicators along the source-to sea continuum for management approaches, such as SLM, (Integrated Water Resources Management (IWRM), Integrated Coastal Management (ICM) and other forms of spatial planning and management.
4. The use of the Normalized Difference Vegetation Index (NDVI) to assess land degradation at multiple scales: a review of the current status, future trends, and practical considerations	N/A	NDVI as a proxy for land cover change could be used as a proxy indicator for global benefits integrated across the GEF focal areas.	N/A	NDVI could be used as a proxy indicator for land cover change with implications for all the GEF natural resources management focal areas and integrated approaches, as it can, together with ancillary data, be used to assess trends in land degradation, biodiversity and carbon stocks, as well as in productivity. However, access to datasets as well as national monitoring capacity have to be enhanced for more widespread uptake of the indicator for monitoring of impacts of INRM.
5. Managing Soil Organic Carbon for Global	The report focuses on the role of Soil Organic Carbon (SOC)	SOC management requires integrating demands for	The report suggests taking advantage of	Designing projects that include judicious application of nutrients to the soil, including

Benefits	management in delivering global environmental benefits. Understanding SOC is important given the potential that soils have on contributing to climate change mitigation, and to ecological approaches to agriculture, and agricultural pro-poor development. SOC management requires an integrated landscape scale and systems thinking approach.	improving crop yields and restoring soil fertility with the local socio-economic conditions, particularly of resource-poor farming households, and the impact of changes in land management practices in their livelihoods. Given the uncertainty of SOC stocks, sound knowledge management, rigorous tracking and monitoring of SOC is required in land use management projects.	developments in remote sensing to monitor SOC. Inherent complexity in SOC means increasing knowledge will not result in straightforward SOC management rules but in better understanding of a complex system with potential multiple benefits.	organic matter, combined with integrated pest management and soil moisture conservation. At the same time, as organic matter is in demand for other uses such as firewood and charcoal, setting the goal for its use in agriculture should be established in considering the context of resource-poor farming households. The consideration of the need to balance inputs for agriculture and other uses show an integration of development concerns into SOC management.

Annex 2
Projects Analysed During Rapid Screening

Name of Project	Project GEF ID	Country
Mount Kenya East Pilot Project for Natural Resource Management (MKEPP)	1848	Kenya
MENARID: Institutional Strengthening and Coherence for Integrated Natural Resources Management	2732	Iran
SFM Strengthening Community Based Forest and Watershed Management (SCBFWM)	3443	Indonesia
Establishing Integrated Models for Protected Areas and their Co-management	4839	Afghanistan
MENARID: Support to Sustainable Land Management in the Siliana Governorate	2709	Tunisia
Mainstreaming Sustainable Land and Forest Management in Dry Mountain Landscapes	5353	Armenia
Integrated Natural Resource Management in the Baikal Basin Transboundary Ecosystem	4029	Russian Federation, Mongolia
Integrating Water, Land and Ecosystems Management in Caribbean Small Island Developing States (IWEco)	4932	Antigua And Barbuda, Cuba, Dominican Republic, Jamaica, St. Kitts And Nevis, St. Lucia, St. Vincent and Grenadines, Grenada, Barbados, Trinidad and Tobago
SFM Sustainable Land Management of the Upper Watersheds of South Western Haiti	3132	Haiti
Conservation and Sustainable use of Biodiversity and Land in Andean Vertical Ecosystems	3831	Bolivia
Integrated and Sustainable Management of Transboundary Water Resources in the Amazon River Basin Considering Climate Variability and Climate Change	2364	Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, Venezuela
Protecting Biodiversity and Multiple Ecosystem Services in Biological Mountain Corridors in Chile's Mediterranean Ecosystem	5135	Chile
Conservation and Sustainable Use of Biodiversity, Forests, Soil and Water to Achieve the Good Living (Buen Vivir / Sumac Kasay) in the Napo Province	4774	Ecuador
Conservation of Coastal Watersheds to Achieve Multiple Global Environmental Benefits in the Context of Changing Environments	4792	Mexico
PRC-GEF Partnership: Land Degradation in Dryland Ecosystems: Project I-Capacity Building to Combat Land Degradation	956	China
Improving Sustainability of PA System in Desert Ecosystems through Promotion of Biodiversity-compatible Livelihoods in and around PAs	4584	Kazakhstan
Promotion of Sustainable Biomass-based Electricity Generation in Benin	5752	Benin
GGW: Agriculture Production Support Project (with Sustainable Land and Water Management)	4908	Chad
Food-IAP: Sustainable Land and Water Management Project, Second Additional Financing	9340	Ghana
GGW Natural Resources Management in a Changing	5270	Mali

Climate in Mali		
GGW: Nigeria Erosion and Watershed Management Project (NEWMAP)	4907	Nigeria
Food-IAP: Climate-Smart Agriculture for Climate-Resilient Livelihoods (CSARL)	9133	Swaziland
SFM Strengthening Sustainable Forest Management and the Development of Bio-energy Markets to Promote Environmental Sustainability and to Reduce Green House Gas Emissions in Cambodia	3635	Cambodia
Sustainable Management of Peatland Ecosystems in Indonesia (SMPEI)	5764	Indonesia
Mindanao Rural Development Program Phase II - Natural Resource Management Project	2975	Philippines
LME-EA: Coastal Resources for Sustainable Development: Mainstreaming the Application of Marine Spatial Planning Strategies, Biodiversity Conservation and Sustainable Use	4659	Vietnam
R2R Implementing an Integrated Ridge to Reef Approach to Enhance Ecosystem Services, to Conserve Globally Important Biodiversity and to Sustain Local Livelihoods in the FSM	5517	Micronesia
R2R Strengthening the Management Effectiveness of the National System of Protected Areas	5510	Papua New Guinea

Annex 3
Non-Grant Instrument Projects

Non-Grant Instrument Projects
5754 Climate-Smart Agriculture Fund for Latin America and the Caribbean
9277 Risk Mitigation Instrument for Land Restoration
9058 Impact Investment in Support of the Implementation of the Nagoya Protocol on Access and Benefit Sharing

Given the complexity and uncertainty of today's socio-environmental challenges, it is important to allow for innovative 'outside the box' projects, which can test new ideas and approaches. The non-grant instrument of the GEF was highlighted as a financial instrument that gave GEF agencies the possibility to innovate and allowed different approaches to test ideas and mechanisms that can contribute to GEBs in a 'safer space' not available in private sector finance. NGI projects also provide the opportunity to work directly with the private sector, whose involvement in GEF projects as a main beneficiary is normally limited. Three such projects, currently under preparation by the IDB, were identified.

The IDB is setting up a "**Climate-Smart Agriculture Fund**" (Fund) to address the challenges faced by agricultural companies in accessing funds to test climate-smart approaches. Investments in climate-smart practices are longer term and require additional capital, which is often in short supply for agricultural companies, whose finance is linked to the growing seasons and thus have difficulty accessing long-term credit; there is also significant information and capacity barriers, which contribute to perceptions that many climate-smart agriculture investments are higher-risk. The fund will incentivize companies in Latin America and the Caribbean (LAC) to make investments that will increase agricultural productivity and returns while reducing climate vulnerability, greenhouse gas emissions and/or enhancing biodiversity and ecosystem services. The proposed Fund will finance select private sector projects that require concessional loans or guarantees to be viable.

The **Risk Mitigation Instrument for Land Restoration** responds to the increasing need of the IDB's private sector window to invest in the restoration of degraded lands as a means of bringing low productivity land into production and decreasing deforestation pressure. Such investments however, have longer payback periods and represent various types of high financial risk, making them difficult to finance with IDB's own capital. The GEF contribution would be used to provide first-loss guarantees and subordinated loans in order to reduce risk to IDB's ordinary capital by assuming risky positions in projects' financial structures, enabling the IDB and co-lenders to finance projects that they would normally be unable to, thereby levering equity investments and providing scale to projects.

The **Impact Investment in Support of the Implementation of the Nagoya Protocol on Access and Benefit Sharing** is being setup under the premise that mainstreaming biodiversity conservation into productive sectors via Small and Medium Enterprises (SMEs) with vested interests in sustainable management of natural resources and indigenous genetic material is imperative. One key barrier for SMEs to gain strength and grow their operations while protecting the biodiversity of the region is access to investment capital and technical assistance. SMEs with a nature conservation dimension are faced with additional obstacles to access financing because they are innovative in scope and primarily operate in rural areas. The objective is to break this barrier through investment capital and technical assistance to SMEs forming part of value chains connecting users and providers of nature-based products or genetic resources. This project is the first of its kind, and if successful could serve as an example to establish similar funds in other regions. The executing agency of this project is EcoEnterprises, a women-owned and -managed fund, the first such in Latin America.

Annex 4
Tools and Approaches for Integrated Natural Resources Management

Tools for Design and Implementation of INRM

Tool Name	Purpose	Scale of Analysis	Indicators Measured
Multidimensional Poverty Assessment Tool (MPAT)	Household survey that captures the dimensions of rural poverty. A thematic indicator that assists M&E design, targeting, and prioritization. https://www.ifad.org/topic/overview/tags/mpat	Household; Village	Food and Nutrition Security, Domestic Water Supply, Health and Health Care, Sanitation and Hygiene, Housing, Clothing and Energy, Education, Farm Assets, Non-farm Assets, Exposure and Resilience of a Household to Shocks, Gender and Social Equality
Land degradation Surveillance Framework (LDSF)	To provide a biophysical baseline at the landscape level, and a monitoring framework for assessing land degradation and the effectiveness of rehabilitation http://landscapeportal.org/blog/2015/03/25/the-land-degradation-surveillance-framework-ldsf/	Landscape	Soil Organic Carbon, Soil Health, (multiple parameters), Soil Hydrology Vegetation Cover, Land Cover, Classification, Land Degradation Land Use, Plant Biodiversity, Soil and Water Conservation
Self-evaluation and Holistic Assessment of climate Resilience of farmers and Pastoralists (SHARP)	Self-assessment used to access and increase the resilience of farmers and pastoralist to climate change http://www.fao.org/in-action/sharp/en/	Individual; farm	Resilience
Resilience, Adaptation Pathways and Transformation Assessment (RAPTA)	A framework to embed concepts of resilience, adaptation and transformation into project design, implementation, and assessment http://www.stapgef.org/the-resilience-adaptation-and-transformation-assessment-framework	Multi-scalar	Resilience
Diversity Assessment Tool for Agrobiodiversity and Resilience (DATAR)	A framework composed of a household survey and participatory mapping activity that measures on farm crop, tree, and livestock genetic diversity http://agrobiodiversityplatform.org/cropbiodiversity/datar-supporting-farmers-and-rural-communities-in-the-maintenance-and-use-of-agricultural-diversity-agrobiodiversity-to-improve-sustainable-production-and-resilience/	Landscape	Resilience; Biodiversity

EX-Ante Carbon Balance Tool (EX-ACT)	Estimates the impact of agriculture and forestry development projects on carbon-balances; land based accounting system http://www.fao.org/tc/exact/ex-act-home/en/	Multi-scalar	GHG mitigation; wide range of development applications
Land Degradation Assessment in Drylands Mapping Tool (WOCAT-LADA)	Information from questionnaires is linked to GIS software to produce maps that has areal calculations on various types of land degradation and SLM/conservation. Can be used to: spatially map land degradation; plan, support and monitor SLM activities; set program priorities https://www.wocat.net/en/about-wocat.html	Multi-Scalar	Land degradation
Vital Signs	Gathers and spatially orients a number of sustainability indicators. Depicts the connection between agriculture, nature and human well-being. http://vitalsigns.org/	Regional; Sub regional	Sustainable Agricultural Production, Water Availability and Quality, Soil Health, Biodiversity, Carbon Stocks Climate Resilience, Household Income, Nutrition and Market Access
Rural Environmental Registry System (SICAR)*	SICAR is a georeferenced web system used in Brazil. The tool is expected to enable documentation of over 5 million rural properties. It is linked to law 12.651/2012, which regulates land use and management on private properties. The law states that after five years from the date of its publication, financial institutions shall not grant agricultural credit, in any of its forms, for owners of rural properties that are not enrolled in the SICAR and hence are not proving its compliance with the Law.	Rural properties	Economic, social and environmental data of rural property

*Not part of the IAP-Food Security

Elements of INRM innovation systems[4]

Approach	Description
Modern ICT and rural extension	Modern extension is focusing on: • Client-oriented: Extension message needs to be tailored to the demands of the clientele and specific biophysical and socio-cultural conditions; • Broadened scope: Following the recognition that a farmer should be considered a person with a number of educational needs, the scope of extension is a process of changing from a focus on technology transfer of agricultural techniques to cover a much wider scope of issues related to rural livelihoods in a broad sense; • Participatory extension methods: There is a search for improved methodologies that respond better to farmers' demands, and a shift towards more broad based, participatory and group focused approaches. Farmer experimentation has a central role in participatory extension; • Change of attitude: One of the biggest challenges for implementation of demand-driven services is change of attitude, i.e., behavioural and attitudinal change on the part of all actors involving a shift from a top-down supply-driven context to a bottom-up articulation of needs and demands involving lateral sharing. While traditional media such as radio and television have played a major role in extension and development communication, growth in the internet and increased access to and use of mobile technology are seen as game-changer. The architecture of information communication has also moved from centralised to decentralised governance.
Farmer Field Schools (FFS)	FFS usually comprise a group of between 20 and 25 farmers who regularly meet over a defined period of time to study the 'how and why' of a situation in a given context under the guidance of a trained facilitator. Apart from technical issues, group dynamic exercises and sessions addressing the 'topic of the day are integrated in the learning process.
Participatory Technology Development (PTD)	PTD involves collaboration between researchers and farmers in the analysis of agricultural problems and testing of alternative farming practices. Participatory technology development is an approach that promotes farmer driven technology innovation through participatory processes and skills building involving experimentation to allow small scale farmers to make better choices about available technologies.
Participatory Learning and Action Approach (PLAR)	PLAR is a farmer based education approach centred on adult learning of 20 to 25 farmers, making use of experiences of the group members. The main goal of this approach is to encourage farmers to discover and come up with innovations as opposed to farmers being recipients of technologies. PLAR facilitation involves use of modules, curriculum and social setting to help farmers translate scientific understanding and technological options. Once farmers have the capacity to interpret these scientific technologies, the farmers' knowledge, motivation,

[4] Extract from FAO IAP-Food Security PPG report, 2016. Wide-scale and enhanced uptake of INRM to foster sustainable and resilience in production landscapes and agro-ecosystems.

	capacity, interest and objectives are improved prompting a behavioural change towards sustainable natural resource management.
Farmer to Farmer Approach (F2F)	F2F extension is defined here as the provision of training by farmers to farmers, often through the creation of a structure of farmer promoters and farmer trainers.
Diversity Field Fora (DFF)	The DFF approach was developed in low-heritability environments in West Africa to strengthen the capacity of farmers to analyse and manage their own crop's plant genetic resources. Low-heritability environments are those in which seedling establishment and breeding of locally adapted varieties are difficult due to extreme spatial and temporal heterogeneity in crop-environment conditions, including the unpredictability of seasonal distribution of rain in the Sahel.
The Catchment Approach for Soil Conservation	The Catchment Approach aimed to involve local communities in soil and water conservation. It is a focused approach to integrated land and water management, including soil and water conservation, where the active participation of the villagers - often organized through common interest group - is central.
Landscape Approach and Integrated Landscape Management	All landscape approaches have five elements in common: 1) Landscape interventions are designed to achieve multiple objectives, including human well-being, food and fibre production, climate change mitigation, and conservation of biodiversity and ecosystem services. 2) Ecological, social and economic interactions among different parts of the landscape are managed to seek positive synergies among interests and actors or reduce negative trade-offs. 3) The key role of local communities and households as both producers and land stewards is acknowledged. 4) A long-term perspective is taken for sustainable development, adapting strategies as need to address dynamic social and economic changes. 5) Participatory processes of social learning and multi-stakeholder negotiation are institutionalized, including efforts to involve all parts of the community and ensure that the livelihoods of the most vulnerable people and groups are protected or enhanced.

Annex 5

Non-GEF Programmes Analysed

Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy (European Commission: HORIZON 2020 - Work Programme 2016 – 2017)

The EU supports work programmes that leverage research and innovation to address major societal challenges linked to the EU's policy framework. This Work Programme aims at bringing Research and Innovation at the heart of major primary sectors - such as agriculture and fisheries -, to face the new challenges ahead, taking advantage of new potential in the biological, ecological, technical and information technology domains. This Work Programme has four calls, addressing all the bioeconomy sectors from the sustainable exploration of the oceans and seas and the development of a blue economy, to climate-smart agriculture, new models for development in rural areas, new biobased goods and services.

Innovation is supported following the interactive innovation approach. The interactive innovation approach under the agricultural European Innovation Partnership1 (EIP-AGRI2) fosters the development of research into practical applications and the creation of new ideas thanks to interactions between actors, the sharing of knowledge and effective intermediation. In this interactive innovation model, building blocks for innovation are expected to come from science, but also from practice and intermediaries, such as farmers, advisors, businesses, NGOs, etc. Key for interactive innovation is to include existing (sometimes tacit) knowledge into scientific work: end-users and practitioners are involved, not as a study-object, but in view of using their entrepreneurial skills and practical knowledge for developing the solution or opportunity and creating co-ownership. For example, calls to support this Work Programme include themes such as:

- Permanent grassland – farming systems and policies
- Functional Biodiversity – Productivity gains through functional biodiversity – effective crop pollinators and pest predators interplay
- Socio-Eco-Economics – Socio economics in ecological approaches
- Farming for tomorrow: developing an enabling environment for resilient and sustainable agricultural systems
- Promoting and supporting eco-intensification of aquaculture production systems: inland (including fresh water), coastal zone and offshore
- Understanding food value chain and network dynamics
- Innovative agro-food chains: unlocking the competitiveness and sustainability potential

Lesson for the GEF: GEF needs a mechanism to support innovations linked to its main Objectives and large programmes based on a competitive application process, using e.g. the interactive innovation approach. For example, major future GEF integrated programmes could set aside a certain percentage of funds for 'innovation grants' up to the size of an MSP that will support the major components of the programme and bring in new ideas based on calls for proposals. The key themes for grant applications could be pre-defined and based on innovation needs identified under each objective. The selection committee could be composed of members from STAP, GEFSEC and the lead GEF agency for the programme as well as independent experts.

Ecoagriculture Partners – Integrated Landscape Management

EcoAgriculture Partners strives for a world where agricultural communities manage their landscapes to simultaneously enhance rural livelihoods, conserve biodiversity and ecosystem services, and sustainably produce crops, livestock, fish, and fibre. An integrated landscape initiative is defined as a project, programme, platform, initiative, or set of activities that (Denier et al. 2015):
(1) Explicitly seeks to improve food production, biodiversity or ecosystem conservation, and rural livelihoods;
(2) Works at a landscape scale and includes deliberate planning, policy, management, or support activities at this scale;
(3) Involves inter-sectoral coordination or alignment of activities, policies, or investments at the level of ministries, local government entities, farmer and community organisations, NGOs, donors, and/or the private sector; and
(4) Is highly participatory, supporting adaptive, collaborative management within a social learning framework.

Ecoagriculture supports (i) innovative solutions, (ii) enabling environment, and (iii) strategic partnerships to achieve agricultural outcomes, conservation outcomes, livelihood outcomes, and governance, institutions and social capital outcomes.

Lesson for the GEF: The GEF can use the integrated landscape management approach to scale up multiple benefit outcomes that support both conservation and livelihood objectives.
Denier, L., Scherr,S., Shames, S., Chatterton, P., Hovani, L., Stam, N., 2015. The Little Sustainable Landscapes Book: Achieving sustainable development through integrated landscape management. Global Canopy Foundation 2015.

Soil Security Programme (NERC)

The Natural Environment Research Council (NERC) is the UK's largest funder of independent environmental science, training and innovation, delivered through universities and research centres. The overarching aim of the Soil Security Programme is to deliver improved forecasts of the response of the soils system to changes in climate, vegetation or management at scales of analysis which match the scale of decision making.

The soil system provides many essential ecosystem services that are crucial to food security, climate mitigation, and water cycling, and changes in the way we manage the land surface have resulted in widespread degradation of soils and their ability to deliver ecosystem services. Soils are highly complex; a range of physical, chemical, and biological factors interact to regulate their functioning and their ability to resist and recover from perturbations, such as drought. Moreover, these controls on soil functioning, and their response to perturbations, are likely to vary across different spatial and temporal scales, and across different soil conditions and land types; in other words they are highly scale- and context-dependent.

A key challenge of this programme, therefore, is to deliver for the first time a truly integrated and multi-disciplinary understanding of the physical, chemical, and biological controls on soil functioning, and the relative importance of these factors for soil functioning at different spatial and temporal scales and in different contexts. The programme aims to gain an integrated and predictive understanding of controls on: (i) the ability of soils to perform multiple functions in different contexts and at different scales, ranging from the field, to the landscape, and Earth-system scale; and (ii) the ability of soils and their functions to resist, recover, and ultimately adapt to perturbations such as those caused by land-use change and extreme climatic events.

The programme is awarding grants and small grants on a competitive basis and encourages the establishment of research consortia that bring together scientists from a range of disciplines. It has three phases: 1. Research – commencement, team meetings and establishing a community; 2. Knowledge exchange – establishing boundary partners, shaping outputs, and monitoring and evaluation; and 3. Dissemination – academic, technology transfer/commercialisation, and policy and practitioner.

Lesson for the GEF: Addressing complex environmental challenges requires an integrated science-driven systems approach that brings together expertise from a range of disciplines and existing national and international platforms. Assessment of natural capital and development of land management incentives are key for sustainable management of soils. Phasing of impacts from programme team, to boundary partners, and finally to policy makers and practitioners could assist in mapping outcomes.
http://www.nerc.ac.uk/research/funded/programmes/soilsecurity/#xcollapse5,
https://www.soilsecurity.org/

Learning Routes (IFAD-Procasur)

Within the framework of the joint IFAD-funded programme, "Learning Routes: a Knowledge Management and Capacity-Building Tool for Rural Development in East and Southern Africa", the Procasur Corporation supports knowledge management and capacity-building strategies aimed at scaling up best practices and innovations that contribute to reducing poverty among IFAD stakeholders in the region. The Learning Route is a planned journey with the learning objectives to (i) address the knowledge needs of development practitioners; and ii) map the experiences of local actors who have tackled similar problems in innovative ways, with successful results, and have accumulated knowledge that is potentially useful to others.

The Learning Route allows for an experiential encounter between "learning travellers" and "knowledge hosts", both having mutually useful experiences and knowledge to exchange. In this encounter, participants learn distinctive lessons that bring them face-to-face with their previous knowledge and experience. The main goal of a Learning Route is that participants are able to identify potentially useful innovations, understand and learn from them, and then successfully adapt and apply them to their own organizations and contexts. A Learning Route is a cumulative process that begins with the identification of the relevant KNOWLEDGE to be documented and disseminated, followed by the acquisition of KNOW-HOW by learning from innovative experiences, and concluding with the INNOVATION being adapted by Learning Route participants in their own organizations and contexts.

In the preparatory phase, the organizers of the Route: i) Identify the target groups that need the Route's knowledge and define the learning objectives of the Route; and ii) identify, document and systematically organize the existing knowledge according to the Route's learning objectives. The implementation phase involves preparing and implementing a Learning Route for 15 to 25 participants with visits to relevant knowledge hosts. The objective is for participants to learn in person how these organizations and their partners have satisfied needs or resolved problems similar to those they themselves face, and to acquire the know-how developed from that experience to support their own innovations. The Learning Route does not end with the journey, since the main goal is for participants to implement their innovation plans at project level and with their organizations and institutions. This stage is crucial and tests how well participants have acquired the learning sought, and how they can best apply that learning to their particular context.

Lesson for GEF: investing in knowledge management, through i.e. mapping the learning route should be considered an integral part of project design related knowledge management. In addition, competitive and targeted grants could enhance learning and innovation across projects and programmes for larger impact. Learning routes is also an interactive and efficient way of scaling up best practices and innovations.
Guidelines for the Implementation of in-country and project-scale learning routes. IFAD & Procasur, 2015. ISBN-978-92-9072-566-4.

Creating Gender-Responsive Agricultural Development Programmes - Bill & Melinda Gates Foundation

Evidence shows that if women farmers across the developing world had the same access as men do to resources such as land, improved seed varieties, new technologies, and better farming practices, yields could increase by as much as 30 per cent per household and countries could see an increase of 2.5 to 4 per cent in agricultural output. Women have also been shown to be more likely than men to reinvest income in the health of children and other family members and in a more varied and nutritious family diet. The Bill & Melinda Gates Foundation ask their grantees and partners to adopt three priorities in ensuring that programmes are gender responsive:

- **Know her.** Programmes should take into account the context and circumstances of women farmers.
- **Design for her.** Programmes must use the information collected about women farmers to inform program design.
- **Be accountable to her.** Programme objectives should include women's active involvement and progress be evaluated in terms of women's successes as well as household successes.

Some of the programmes the foundation supports account for gender differences and inequalities from the start, with an emphasis on gender equity and transforming relationships between women and men. These programmes are considered **gender transformative**. Most of the agricultural programmes it supports consider how women and men will participate and benefit, and they strive to benefit both and harm neither. These programmes are considered **gender aware**. Projects that do not account for gender differences are called **gender neutral** and are not supported by the foundation.
Lesson for the GEF: The GEF could also consider classifying projects into gender transformative, gender aware and gender neutral and link it to its funding priorities and eligibility criteria, and its theory of change
http://www.gatesfoundation.org/What-We-Do/Global-Development/Agricultural-Development/Creating-Gender-Responsive-Agricultural-Development-Programs