Causal Pathways for Biodiversity Mainstreaming at the Global Environment Facility

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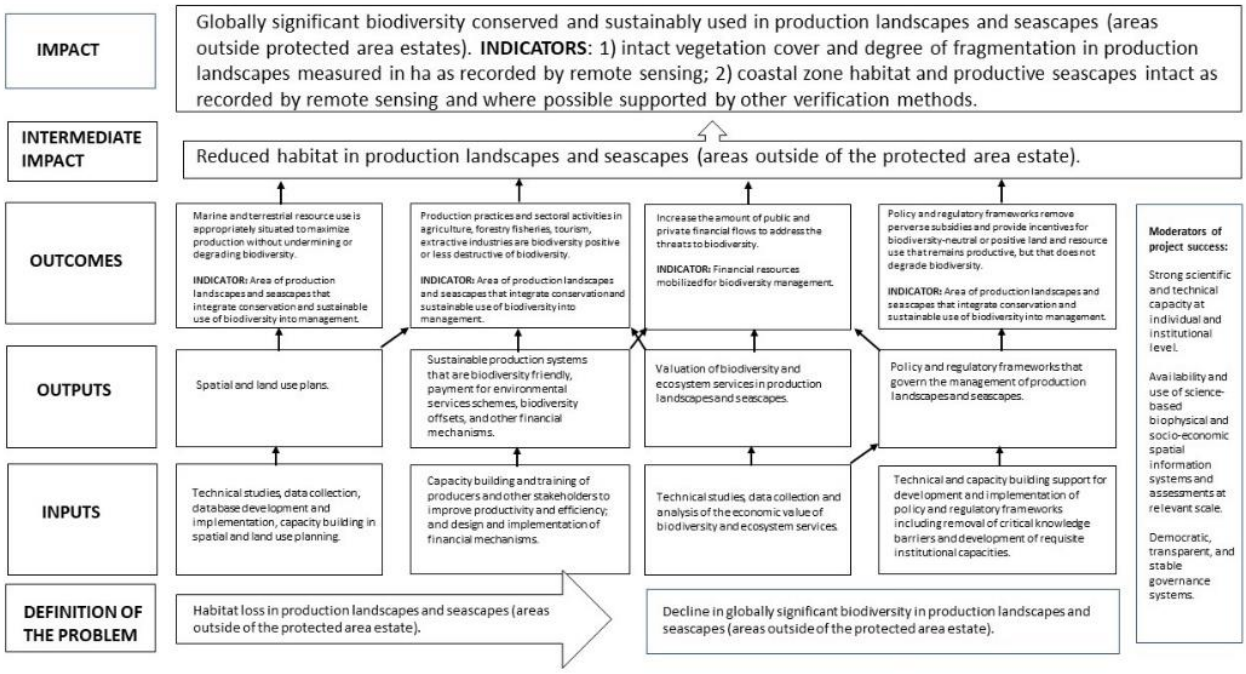
1 Introduction

The linkages among biodiversity, economic growth and development are well recognized in the Sustainable Development Goals (SDGs), which emphasize the interlinked nature of the goals and the challenges to which they respond. There is growing understanding that biodiversity and ecosystem services underpin the maintenance and resilience of key economic sectors that support growth, development and human well-being, including agriculture, forestry, fisheries and tourism.[1] The emerging policy emphasis on "nature-based solutions (NbS)" is based on a related recognition that solutions to societal challenges can often be found through working with nature (rather than relying on engineered or technological solutions), and these often offer significant co-benefits for biodiversity and wellbeing.[2] Research shows that $44 trillion of economic value generation – more than half of the world's total GDP – is moderately or highly dependent on nature and its services and is therefore exposed to nature's loss.[3]

At the same time, the activities of these sectors are the key direct drivers of biodiversity loss (albeit shaped and driven by other economic sectors). For example, the most important direct driver of biodiversity loss in terrestrial systems is land-use change, primarily the conversion of intact native habitats (forests, grasslands and mangroves) into production systems.[4, 5] Consequently, a fundamental element in stemming loss of biodiversity is "mainstreaming" measures to consider and conserve biodiversity across the landscape and into the activities of other (non-conservation) sectors. Such mainstreaming is emphasized in the CBD, most obviously in Article 6(b), which calls upon Parties to "integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies."[6]

The GEF defines biodiversity mainstreaming as "the process of embedding biodiversity considerations into policies, strategies and practices of key public and private actors that impact or rely on biodiversity, so that it is conserved and sustainably used both locally and globally." In 2018, the GEF developed a Theory of Change for biodiversity mainstreaming in production landscapes/seascapes (Figure 1).

Figure 1: Theory of Change: Mainstreaming Biodiversity in Production Landscapes/Seascapes and Sectors in the GEF Biodiversity Strategy.



2 Developing "Causal Pathways" for Biodiversity Mainstreaming Projects

STAP's 2014 guidance on Mainstreaming Biodiversity in Practice[7] recommended that GEF projects on this subject should develop clear theories of change (ToCs) for achieving the intended impacts through biodiversity mainstreaming. It further recommended that project designers: develop common indicators and measurement approaches that furnish data to test these hypotheses implicit in the ToCs; design project monitoring and evaluation (M&E) systems to align with the overall mainstreaming logical framework and standard indicators; and invest adequately in evaluation, synthesis, and publication to ensure that data are translated effectively into insight, learning and progressive improvement. These recommendations remain valid and relevant.

A full ToC for a project or program contains many elements, including a narrative explanation and identification of underlying assumptions. However, the core component of a ToC is one or (more often) a set of "causal pathway(s)" to achieve the desired impact.[8] A causal pathway is defined as 'a backwards mapping from an intervention goal through all the long and short-term outcomes to the outputs needed to achieve it, identifying a logical arrangement of causal links between these (also called an *impact pathway*, *outcomes chain* or *solution tree*).'[9] Clarifying and articulating these causal pathways is a foundational step in project design, enabling recognition of underlying risks and assumptions and appropriate design of monitoring and evaluation. It is important that the pathways be developed *backwards* from the intended goal, and not forwards from the activities that proponents may wish to undertake.

As generic guidance, the GEF ToC clearly lays out some highly relevant causal pathways for mainstreaming biodiversity, providing a very useful starting point for program and project developers. However, there is ample scope to further develop and build on this thinking, and in any specific scenario the ToC will need considerable interpretation and development in order to address its unique characteristics. In particular, project designers need to consider how barriers and opportunities for achieving their intended impacts play out in context, and

what pathways therefore create a *necessary and sufficient* set of interventions in that context. Not all pathways will be relevant to all projects or programs, and additional pathways will often be necessary.

Further, the GEF ToC is primarily geared toward agricultural production landscapes. Biodiversity mainstreaming in the context of, for example, tourism or production of wild non-timber forest products (NTFPs) may require the delineation of different or additional causal pathways to those set out in the GEF ToC. It will therefore always be necessary to adapt, modify and tailor this general ToC in developing a fit-for-purpose ToC for any GEF program or project aimed at biodiversity mainstreaming.

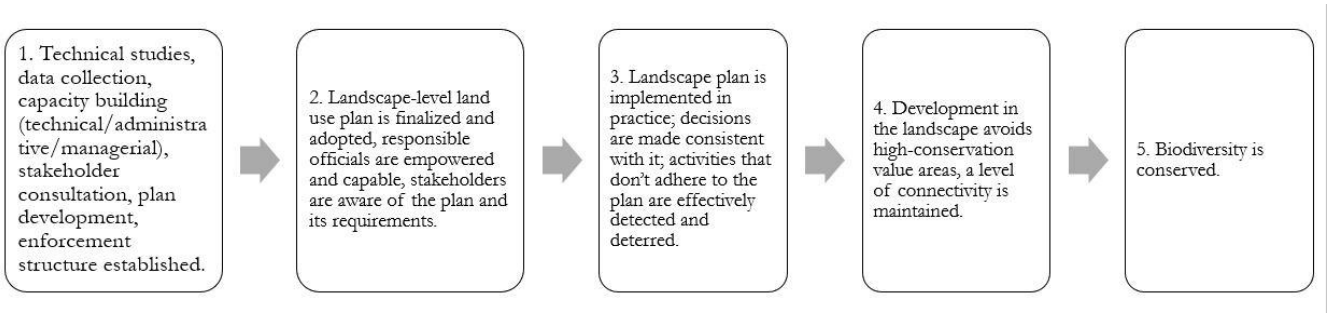
The following section highlights some of the diversity of logical causal pathways that might be relevant, across a broad range of production landscape contexts. These are not intended to be comprehensive, but illustrative. They use the four main pathways in the GEF portfolio-level ToC as an entry point.

2.1 Spatial and Land Use Plans

The first GEF ToC pathway uses land use/spatial planning to ensure that production activities are sited in a way that avoids or minimizes the impacts of production on high-conservation value areas of the landscape and maintains landscape connectivity. The following scenarios explore dimensions of the causal pathways to impact land-use planning interventions across a range of contexts.

Scenario 1: Relatively intact natural habitat. Problem: Agricultural or forestry expansion and intensification is expected in coming years, driven by economic priorities.

Pathway 1

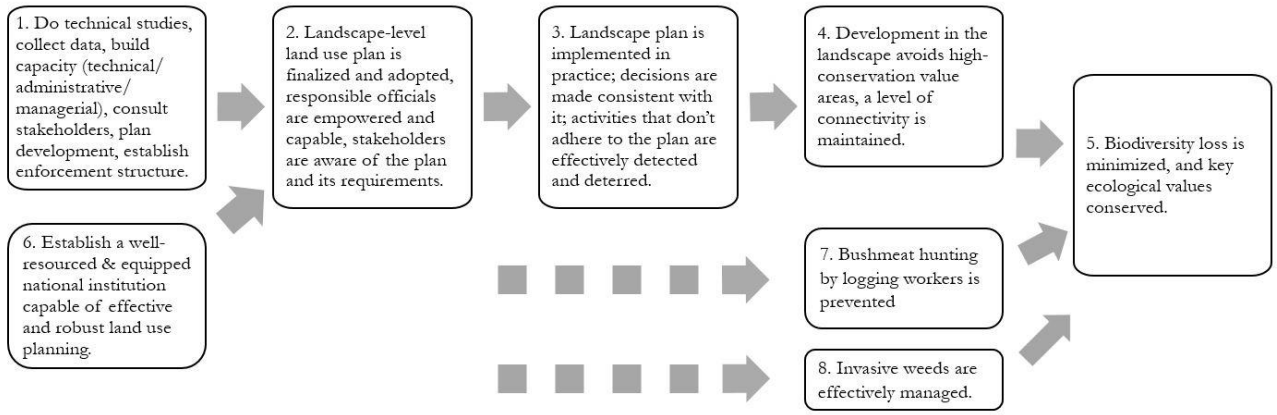


While at first this appears to be a logical chain of events, in fact there are numerous assumptions embedded in this pathway, if presented as shown – the linkage from each box to the next depends on many assumptions. First, it is important that a ToC aims at a feasible impact. However, if agriculture or forestry moves into a previously unexploited or only lightly exploited area, some biodiversity is likely to be lost, even if a sound land-use planning system is in place and implemented. Conserving patches of high-conservation value area, even if this effectively conserves all species (virtually impossible to ensure in practice, particularly if invertebrates, fungi, etc. are considered) does not change the loss of biodiversity through the destruction of the remaining areas of the landscape. The impact (Box 5) needs to reflect this, changing to e.g. biodiversity loss is reduced.

Further, this example highlights that to reach the desired impact, the ToC must include *all* of the outputs or outcomes required to bring about the desired impact – they must be necessary *and* sufficient. So, for example, good land use planning (Box 2, 3) could minimize the impact of production activities on biodiversity by conserving high quality areas of habitat and ensuring connectivity (Box 4). But this does not mean the biodiversity in the conserved areas will persist: runoff of pesticides or fertilizers from agriculture could exterminate amphibians in remaining habitat patches or poison birds; forestry workers could hunt bushmeat in

forest fragments, devastating vulnerable species and those that depend on them; invasive weeds could invade from disturbed areas and degrade native vegetation. The revised pathway below indicates some additional elements that could be included (Boxes 6,7,8) to strengthen this part of the ToC.

Pathway 1 (revised)



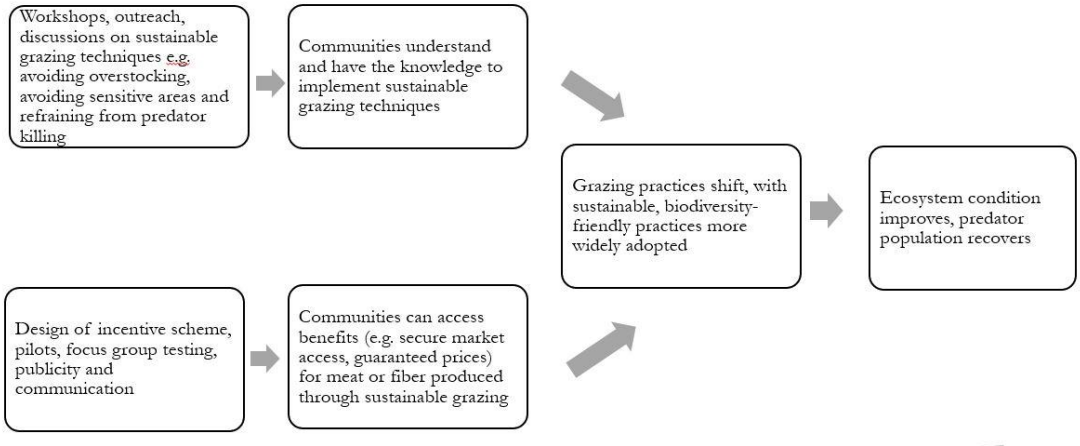
In fact, each arrow hides a variety of assumptions (some of which may be addressed in the other GEF ToC pathways). For example, between Box 1 and Box 2, just having good studies, plan, consultation and structures does not assure the empowerment of officials and implementation of the plan, at least not without some heroic assumptions about the rule of law, lack of corruption and limited political influence of losers under the plan.

Nor does having a plan and capable officials (Box 2) assure the detection and action on unauthorized activities (Box 3), which might require resourcing a policing function, community support and reporting, and avoiding corruption. These assumptions may be legitimate in some contexts but making them explicit helps to ensure this. For example, the capability to undertake land use planning (Box 2) requires institutions capable of carrying it out, so if this does not yet exist then another related pathway here could be establishing such an institution – providing one of the critical outputs that can support an outcome of effective land use planning.

2.2 Sustainable Production Systems

The second pathway of the GEF ToC involves shifting production toward more sustainable practices, through capacity-building and training of producers and other stakeholders, and the design and implementation of financial incentive mechanisms.

Scenario 2: Rangeland grazing. Problem: Overgrazing, land degradation, persecution of predators

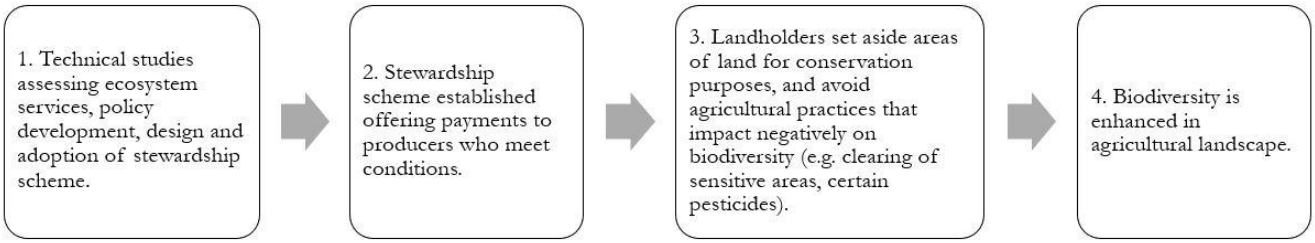


In this scenario, it is important to note that capacity-building is essential, but alone it is unlikely to shift behavior. There is often a strong economic incentive for producers to follow biodiversity-negative practices (this is frequently why they have been adopted). Changing this situation is likely to require not only the understanding/ability to carry out the more biodiversity-friendly practices, but also the incentive to do so.

In this example, local communities are able to access benefits provided by an initiative if they agree to adopt sustainable practices. The benefits could include a secure market for their livestock, being able to sell them on their rangelands rather than needing to drive them to market, or a guaranteed price. This illustrates how achieving an outcome such as the adoption of biodiversity-friendly practices often relies on the achievement of more than one output (i.e. there is not a set of disconnected outputs each leading to their associated outcomes).

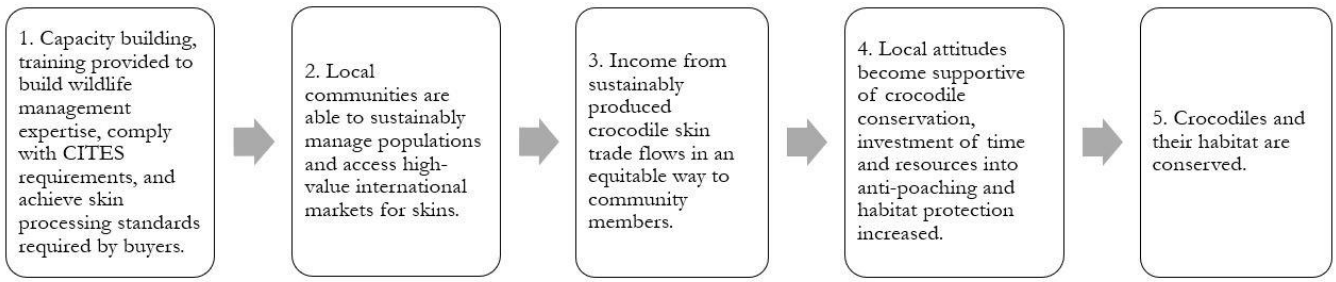
Note also that the impact in this case, which needs to be reflected in the ToC (including indicators), is not only about conserving habitat, but about stopping killing of certain species (c.f. the GEF ToC). Conserving biodiversity outside of protected areas involves multiple dimensions – including conserving habitat, maintaining connectivity, reducing illegal or unsustainable killing or harvest, reducing spread of invasive plants and animals, and reducing nutrification and toxic chemical impacts. ToCs should incorporate and monitor as many of these as are relevant in the specific context in order to adequately capture biodiversity impacts. It would be good practice to identify all of these but then note where some are being enacted by others – for example, a different project may already be targeting invasive plants and animals; the current project then does not need to address that causal pathway, but should acknowledge it as a necessary, related project as there may need to be some coordination.

Scenario 3: Intensive agriculture in highly modified landscape. Problem: agriculture is replacing natural habitat, wildlife populations are declining, and impacts are exacerbated by pesticide use.



Here a stewardship scheme – a familiar form of payments for ecosystem services (PES) - is established to incentivize biodiversity-positive production activities. Such schemes have functioned effectively in many contexts. The *durability* of such an approach, however, will rely on the availability on an enduring flow of revenue to reward the producers involved (see Scenario 6).

Scenario 4: Wildlife (crocodile) harvest and trade. Problem: crocodiles declining, habitat is being degraded.



Here crocodiles - as dangerous predators that take livestock and threaten people - impose local costs. Small scale trade generates few benefits, wetland/riparian habitats are lost to agriculture or other uses, and crocodiles are declining due to habitat loss and occasional retaliatory killing. In this causal pathway, communities are provided with training and support to enable them to manage wildlife populations sustainably, meet the requirements of their country's CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) legislation in order to gain relevant permits to trade internationally, and gain the skills to produce products to the quality standards required by international markets. This greatly increases the local benefits from trade, which leads to local support for and investment in habitat protection, anti-poaching and crocodile management efforts.

Potentially missing elements include the collaborative development and demonstration of approaches to managing crocodile populations sustainably (additional input to Box 2) – these may already be readily available (in which case they just need to be mobilized), but if they are not, then this needs to be added in a way that encourages ready ownership and uptake by local communities. Similarly, for income to flow back down a supply chain in equitable ways (Box 3), there may need to be institutional developments either by the value chain or by government to permit this. These institutional developments may depend on actions under the GEF ToC pathway 4 and should be explicitly incorporated in the overall ToC. And there is an assumption that if benefits are equitable (Box 3), then local attitudes will become supportive (Box 4); this is an example of a presumed linkage which should be made explicit so that it can be tested.

2.3 Valuation of Biodiversity and Ecosystem Services

This pathway relies on making the benefits that biodiversity and ecosystem services ("natural capital") provides to societies and economies visible and distinct, to motivate and underpin their integration into planning and decision-making, and to mobilize political support and financial flows.[10]

As production activities often produce current benefits to individuals while their environmental costs are borne by the public or future generations, valuation alone will not typically affect change, but must be accompanied by reforms in regulation, policy and finance that produce e.g. price signals or incentives in favor of biodiversity-friendly activities, or lead to use of holistic cost-benefit analyses to guide decisions.[11] Valuation underpins the concept of "natural capital" to refer to biodiversity and natural resources, emphasizing the flow of benefits or ecosystem services they generate for people.

Scenario 5: Tourism in an area with attractive natural values. Problem: tourist activities are degrading shared natural values, such as coral reefs, beaches, water quality, or forests.

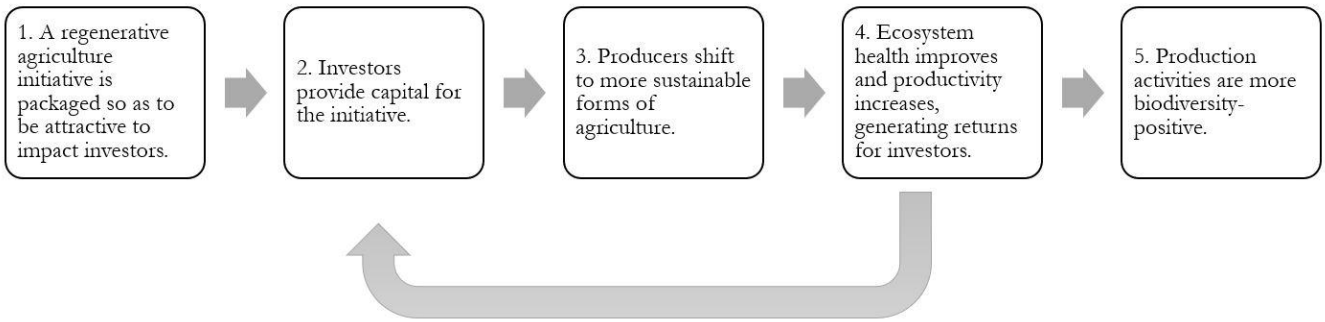
This is a good example of a logic chain that may be *necessary* (if decision makers and industry do not know about the value of maintaining their natural resources, they are unlikely to act) but is unlikely to be *sufficient* (just providing this information is unlikely to trigger all the actions in this pathway, given the issues of perceived costs, vested interests and free riders that usually arise). Changes such as the one implied by this causal pathway depend on aligning technical solutions (mechanisms such as levies) with appropriate institutional arrangements

(the existence of relevant organizations and regulations, in this case, with sound governance arrangements), and societal values (both policy and industry decision-makers accepting the culture change involved compared to a more exploitative approach). It also requires a clear-eyed view of the power dynamics and vested interests in the situation – who is likely to want to "game" the system or undermine the solution, and are there ways to minimize the chances of this? All such factors should feature in the ToC, either addressed in causal pathways or (if beyond the control of the project), as assumptions, to be closely monitored to ensure their state continues to support the desired outcomes.

Scenario 6: Established commercial agriculture. Problem: Land degradation, biodiversity loss.

Catalyzing financial flows to biodiversity conservation is the focus of emerging approaches that harness the concept of natural capital to facilitate and enable investment of private capital in "nature" (in some form) as an income-generating asset. "Impact" investors seek a demonstrable environmental or social benefit, as well as financial return. The logic here is that these financial flows will enable producers to shift to forms of production (e.g. sustainable agriculture, nature-based tourism, sustainable forestry) which are both biodiversity-friendly and yield a reasonable financial return.

Generating a change in this agricultural production through mobilizing private investment could take the form of the following causal pathway.



In this scenario, improvements in ecosystem condition and resilience have significant co-benefits in terms of productivity, generating returns for investment and creating a positive feedback loop to stimulate more investment and wider uptake of improved practices. Such feedback loops are common and should be explicitly included in a ToC – and monitoring can be established to detect if they are occurring. The improvement in ecosystem condition here also allows for generation of carbon credits and possibly biodiversity offsets, which could also be sold, thereby strengthening the feedback loop.

Note that mobilizing funding for biodiversity conservation does not necessarily involve the establishment of innovative investment vehicles. It could involve, for example, establishing regulations that require businesses to manage and avoid their biodiversity impacts, thus catalyzing their investment – a more conventional causal pathway.

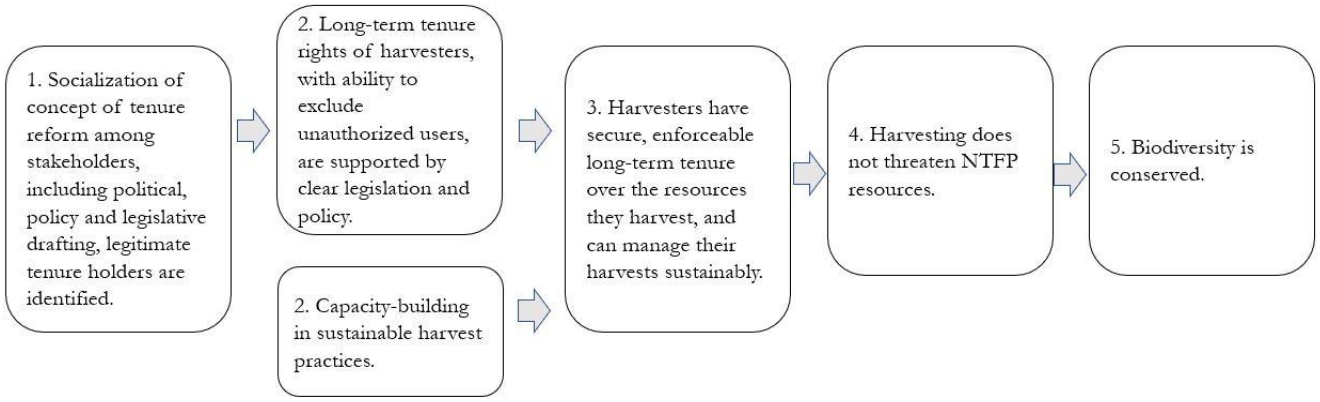
2.4 Policy, Regulatory and Planning Reform

In the GEF ToC, the pathway to impact of work in this area includes technical and capacity building support, including removal of critical knowledge barriers and development of requisite institutional capacities, contributing to policy and regulatory frameworks that incentivize biodiversity-friendly productive land use.

In practice, policy and regulatory changes or reform will typically underpin most pathways for biodiversity mainstreaming and may be an essential step for many of the pathways set out above. A key question when developing causal pathways for the project is considering what changes to the policy, regulatory and planning are required and how they will help achieve the desired objectives. This will be highly variable and context-specific, depending on what features of the current system are raising threats or impeding change (e.g. perverse incentives, inadequate penalties, sectorally-fragmented decision making), and what policy/regulatory changes are required as steps in particular causal pathways (e.g. tenure reform, participatory decision making, coordinated cross-sectoral review and decision making processes). A key issue for the GEF is to ensure that benefits that might be achieved locally are not offset by diversion of losses to elsewhere in the country; so an almost universal need is for the pathway to include some form of national approach to avoiding such 'leakage'.

Scenario 7: Non-timber forest product (NTFP) harvest by local Indigenous people from forest or woodland. Problem: unmanaged access and harvest, low prices (necessitating high extraction volumes).

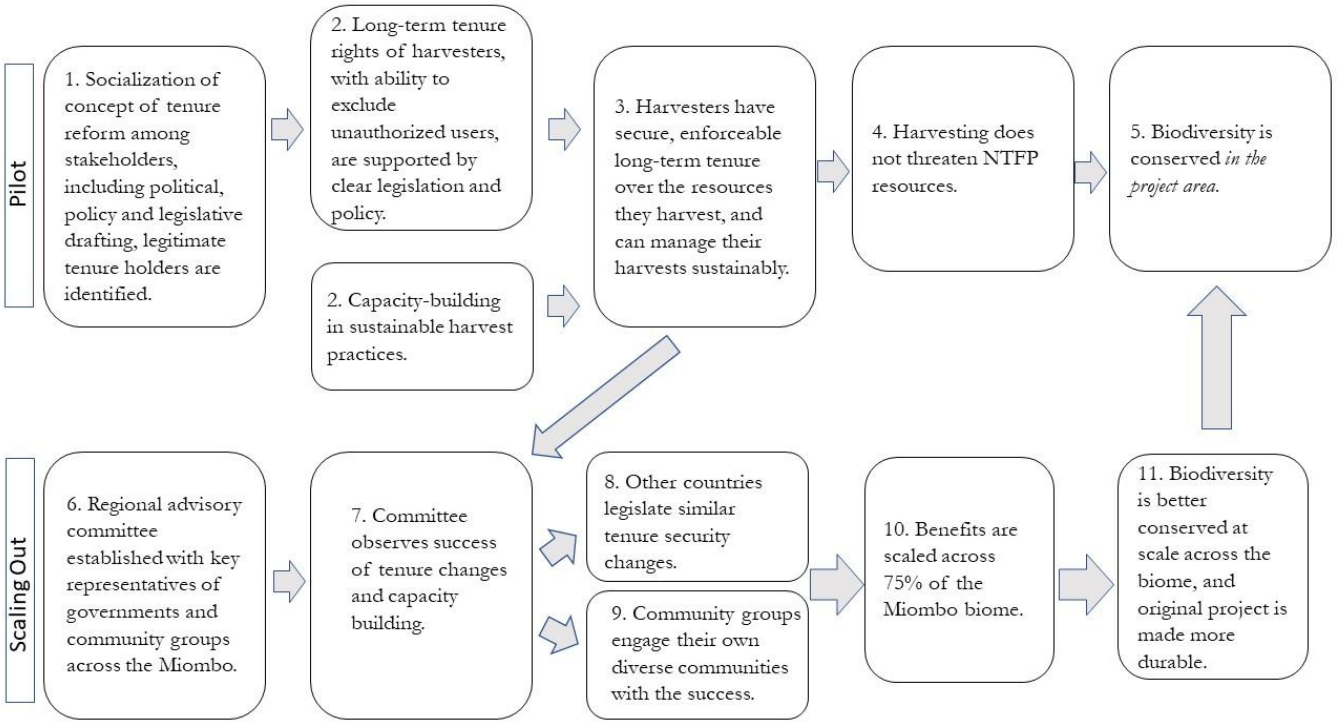
An important pathway to address this situation could begin with land and resource tenure reform in order to clarify and strengthen communal property rights of the harvester group, averting a "tragedy of the commons". This would mean that harvesters then had a clear incentive to protect the resource from other unauthorized users, to limit their own harvest to sustainable levels, and otherwise to invest time and resources into conserving the resource. A basic pathway capturing this logic is set out here. Capacity-building to support harvesters in determining what harvest practices are sustainable is included as one element likely to be important, but other key elements in this pathway could be scientific and technical studies to establish sustainable harvest levels and techniques; improvement of enforcement capacity to provide official backup to harvesters in addressed unauthorized use; or support in marketing and value-adding to enable harvesters to gain increased returns from the resource, thereby increasing the incentive to steward it carefully and foster its expansion.



2.5 Scaling Outcomes for Transformational Impact

As the GEF emphasizes the need to achieve change at scale from its investments, many projects have a pilot phase, perhaps establishing that a particular approach to protection or a change in market incentives will work as intended to achieve biodiversity benefits; but then these need to be scaled across a whole biome or through an entire value chain to achieve more transformation impact. Taking a pilot to scale often requires quite different activities to the initial trial. STAP recommends that proponents develop a separate (but linked) ToC for this scaling process; also that this be done at the same time as the pilot is designed, in case there are adjustments to the pilot that should be made to make later scaling more likely.

For example, local people harvest many non-timber products such as traditional medicines and fruits from Miombo woodlands across several countries in southern Africa. A pilot study to improve the sustainability of these practices might successfully follow the causal pathway shown in section 4.4, scenario 7, at a local level. However, this would only have improved the biodiversity status of a small part of the Miombo biome in one country; overharvesting could move to other areas, undoing the local benefits. To scale this up, a second phase might engage community groups across the whole Miombo region to show the benefits of the improved policies and management; it might establish some value chain standards for local marketing of the medicines and require source area labeling at markets (however challenging this may be); it might require the development of some form of Miombo products co-operative; all of this might require some inter-governmental agreement on a consistent approach across countries, perhaps backed by equitable sharing of benefits from tourism. Whatever the proposed approach, it is important to develop the ToC early; for example, if the strategy is to engage communities across the region, it may be important to convene some representatives from diverse regions during the pilot project, so they feel ownership of the ideas being tested. If an inter-governmental agreement is needed, then the need for this should be socialized with at least a subset of countries early on. The pathway below illustrates how Scenario 7 might be extended to account for one of these scaling options.



The GEF biodiversity mainstreaming ToC (Fig.1) illustrates how a high-level set of pathways can frame a more detailed and context specific ToC. In practice, it is possible to provide pathways that are more detailed and specific, but still simplified, which could then be further elaborated in an interactive ToC process with local stakeholders. These causal pathways could be systematically documented, enabling a consistent approach to be developed to testing what precise logic works in different contexts, and thereby helping accelerate and improve project design and learning feedbacks.

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