November 2020

Biodiversity Mainstreaming

A review of current theory and practice

iied

STAP SCIENTIFIC AND TECHNICAL ADVISORY PANEL
An independent group of scientists that advises the Global Environment Facility

gef

UN environment programme

Author information

This report was written by:
Jessica Smith, Steve Bass & Dilys Roe

Corresponding Author: Dilys Roe dilys.roe@iied.org

Jessica Smith is an independent consultant and expert in biodiversity mainstreaming. She runs Peoplesized Ltd.

Steve Bass is a senior associate at IIED working on policy processes for sustainable development.

Dilys Roe is a principal researcher at IIED. Her focus includes mainstreaming biodiversity values into development and climate change decision making.

Acknowledgements

This report was commissioned and funded by the Scientific and Technical Advisory Panel (STAP) to the Global Environment Facility and published with permission by IIED under creative commons licence CC BY-NC-ND 4.0. The authors would like to thank Virginia Gorsevski (STAP) for her valuable review and comments.

IIED is a policy and action research organisation. We promote sustainable development to improve livelihoods and protect the environments on which these livelihoods are built. We specialise in linking local priorities to global challenges. IIED is based in London and works in Africa, Asia, Latin America, the Middle East and the Pacific, with some of the world's most vulnerable people. We work with them to strengthen their voice in the decision-making arenas that affect them — from village councils to international conventions.

Published by IIED, November, 2020

http://pubs.iied.org/17662IIED

Smith J, Bass S and Roe D (2020) Biodiversity Mainstreaming: A review of current theory and practice. IIED, London.

International Institute for Environment and Development
80-86 Gray's Inn Road, London WC1X 8NH, UK
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055
www.iied.org

@iied
www.facebook.com/theIIED

Summary

Biodiversity mainstreaming is a multi-layered and dynamic concept with many definitions that have evolved over time, but the overall goal can be synthesised as better non-biodiversity-focused decision making which serves to improve outcomes for biodiversity itself. This is the first of two reports commissioned by the Scientific and Technical Advisory Panel (STAP) of the Global Environment Facility (GEF) that seek to explore the current status of mainstreaming biodiversity into production sectors — in theory and in practice.

The report first explores a number of key concepts of biodiversity mainstreaming: its diverse goals, the different elements of biodiversity which are the focus of mainstreaming, and whether it is 'one-way' or reciprocal. Then, through a literature review, it explores the following questions: (1) What theories of change have been developed for biodiversity mainstreaming and what theories of change for key recognised pathways for mainstreaming have been developed? (2) Are there typologies for ordering and understanding the wide variety of entry points, pathways and approaches for biodiversity mainstreaming? (3) Are there positive examples of how co-benefits and trade-offs have been explicitly addressed, managed, accounted for or monitored, or emerging approaches or suggestions for doing this? (4) Are there indications regarding the success of particular causal pathways?

The review reveals that while the literature on mainstreaming continues to evolve and improve, its development is hampered by an inconsistent use of terminology and approaches, which prevents the comparison of cases. In particular, while the GEF has developed a theory of change for its mainstreaming portfolio, there was no evidence of other theories of change for biodiversity mainstreaming in the literature. Second, although the literature suggests a number of typologies that could be used to understand mainstreaming approaches, these are loosely defined and not used consistently. Third, there is a rich literature on trade-offs around ecosystem services and poverty alleviation, but little that specifically relates to mainstreaming. Finally, there is little literature on mainstreaming indicators either at the generic level or by causal pathway/mainstreaming approach.

Acronyms

BD	biodiversity
BES	biodiversity and ecosystem services
CBD	Convention on Biological Diversity
EIA	Environmental Impact Assessment
EID	emerging infectious disease
ES	ecosystem services
ESPA	Ecosystem Services for Poverty Alleviation
FAO	Food and Agriculture Organization of the United Nations
GEF	Global Environment Facility
IFAD	International Fund for Agricultural Development
IIED	International Institute for Environment and Development
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IUCN	International Union for Conservation of Nature
MS	mainstreaming
NbS	nature-based solutions
NC	natural capital
NCA	natural capital accounting
NTFP	non-timber forest product
OECD	Organisations for Economic Cooperation and Development
PA	Protected Area
PES	payments for environmental services
SANBI	South African National Biodiversity Institute
SD	sustainable development
SDGs	Sustainable Development Goals
STAP	Scientific and Technical Advisory Panel
ToC	theory of change
UNEP-WCMC	UN Environment Programme World Conservation Monitoring Centre

Contents

Summary 1

Acronyms 2

Introduction to this report 4

What is biodiversity mainstreaming? 5

Goals of biodiversity mainstreaming 13

Elements of biodiversity in focus 13

Direction of mainstreaming 14

Embedded and multiple mainstreaming 15

The literature on biodiversity mainstreaming: an overview 17

Literature reviewed 17

Observations on the state of the literature on biodiversity mainstreaming 19

Theories of change supporting biodiversity mainstreaming 23

Spatial and land use planning 25

Sustainable production systems 26

Valuation of biodiversity and ecosystem services 31

Reforming policy, regulatory and planning frameworks 32

Mainstreaming typologies 35

Co-benefits and trade-offs from biodiversity mainstreaming 38

Co-benefits 39

Trade-offs 40

Mainstreaming indicators of success 42

Summary of findings 43

Reference list 45

Annex 1: Materials reviewed 50

Introduction to this report

This report is the first of two that were commissioned from IIED by the Scientific and Technical Advisory Panel (STAP) of the Global Environment Facility (GEF). The reports seek to explore the current status of mainstreaming biodiversity into production sectors – in theory and in practice. In this report we first review a number of key concepts of biodiversity mainstreaming and then, through a literature review, we explore the following questions:

1. What theories of change for biodiversity mainstreaming have been developed for biodiversity mainstreaming, either generally or in specific sectors/contexts? What theories of change for key recognised pathways for mainstreaming have been developed (eg biodiversity-friendly production systems, biodiversity offsets, accounting and valuation of biodiversity and ecosystem services, spatial/land use planning, payments for environmental services (PES) schemes or reforming policy/regulatory/planning frameworks)?
2. Are there typologies for ordering and understanding the wide variety of entry points, pathways and approaches for biodiversity mainstreaming, either generally or in specific sectors/contexts?
3. Are there positive examples of how co-benefits and trade-offs have been explicitly addressed, managed, accounted for or monitored, or emerging approaches or suggestions for doing this?
4. Are there indications regarding the success of particular causal pathways?

In the second report we apply these same questions to a sample of GEF projects in order to understand the challenges of developing and implementing mainstreaming projects in practice.

What is biodiversity mainstreaming?

Biodiversity mainstreaming is a multi-layered and dynamic concept with many definitions (Table 1).[1] These definitions have evolved over time with some areas of convergence. Commonalities across the definitions include:

- A focus on 'integration' or 'inclusion' of biodiversity (ie assuming its marginalisation) into the 'mainstream' (ie non-biodiversity policy such as economic development, national planning or key production sectors such as agriculture, energy and mining)
- Different levels of mainstreaming, from local upwards (but a focus on national or sectoral policy and practice).

Many definitions, but not all, cover:

- Specificity in terms of sectors targeted
- A process approach to mainstreaming across the whole 'policy' cycle from analysis to planning, implementation and monitoring
- Achievement of joint outcomes — making both biodiversity and 'mainstream' outcomes (such as sustainable livelihoods and agricultural production) better where possible.

Definitions also emphasise different entry-points for mainstreaming including (but not limited to):

1. *Plans (especially national and sectoral development plans)*. Most countries have, at any one point in time, comprehensive strategies or plans that guide project planning and investment. These will invariably have significant implications for biodiversity, but will not always address biodiversity. While they are therefore an essential target of biodiversity mainstreaming, they are often impotent in the absence of points 2 and 3 below.
2. *Processes (especially routine economic planning and budgeting).* Such processes have a strong impact as they are a primary determinant of resource flows. They include public budgeting (preparation, approval, implementation and oversight including public expenditure review), fiscal policy, trade policy and monetary policy (banking and financial supervision and disclosure, inflation rates, debt policy and management). They may or may not have a mandated integration of biodiversity.
3. *Opportunities — responding to politically 'hot' issues with comprehensive implications*. Lasting policy change is often as much in response to major crises, high-profile and often well-resourced political opportunities, or rapid changes in, for example, technology or societal demand as it is to orderly plans or routine government processes.

The need for governance changes is touched upon in most definitions. What this means tends to only become apparent when the guideline documents related to the above definitions are analysed. Some of these guideline documents imply that there are more fundamental changes to the mainstream required — in institutions, systems, information flows, procedures and, indeed, values — if biodiversity is to be effectively integrated. Redford et al. (2015) identified that definitions conceptualising mainstreaming as a form of integration fall short, as mainstreaming "is distinctly different in that it requires permanently modifying that into which it is integrated to ensure the persistence of biodiversity".

The following sections unpack the different ways the term 'biodiversity mainstreaming' is used: its diverse goals (Section 2.1); the different elements of biodiversity which are the focus (Section 2.2); and whether the mainstreaming is 'one-way', such as when applying biodiversity safeguards, or reciprocal ('two-way' or 'multi-way'), such as when improving information on the positive and negative links between biodiversity and development/production (Section 2.3). Subsequent sections then review the scientific literature in order to explore issues such as theories of change and trade-offs — as highlighted in the questions above.

[1] There are also diverse definitions for environmental mainstreaming, as biodiversity mainstreaming can be considered part of environmental mainstreaming (see the description of 'embedded mainstreaming').

Table 1: Principal definitions of biodiversity mainstreaming, highlighting particular dimensions

Entity (source) grouped by sources in chronological order	Definition	Goals of mainstreaming	Elements of biodiversity that are the focus	Sectors mainstreamed into	Pathways and approaches	One-way or reciprocal
Broad definitions						
CBD (2002)	Text of the Convention: Parties should "[i]ntegrate, 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".	Conservation and sustainable Use (of genes, species, ecosystems)	Genes, species, ecosystems per the Convention definition of biodiversity	Sectoral and cross-sectoral	Process-focused and non-political	One-way implied
GEF (2005)	"Mainstreaming biodiversity involves the integration of biodiversity conservation and sustainable use principles into policies, plans, programs, and production systems where the primary focus has previously been on production, economic activity, and development, rather than on biodiversity conservation losses or gains."	Conservation and sustainable Use (of genes, species, ecosystems)		Where the primary focus has previously been on production, economic activity, and development		More emphasis on the actors and motivations from the development side than later definitions, but overall still on getting biodiversity into non-bio

Entity (source) grouped by sources in chronological order	Definition	Goals of mainstreaming	Elements of biodiversity that are the focus	Sectors mainstreamed into	Pathways and approaches	One-way or reciprocal
CBD (2014)	"Integrating or including actions related to conservation and sustainable use of biodiversity in strategies relating to production sectors, such as agriculture, fisheries, forestry, tourism and mining. Mainstreaming might also refer to including biodiversity considerations in poverty reduction plans and national sustainable development plans."	Conservation and sustainable use (of genes, species, ecosystems)		Production sector-specificity: agriculture, fisheries, forestry, tourism and mining	Process-focused	Includes cross-sector plans poverty reduction and national sustainable development
CBD (2019)	"Integrating or including actions related to conservation and sustainable use of biodiversity at every stage of the policy, plan, programme and project cycle, regardless whether international organisations, businesses or governments lead the process."	Conservation and sustainable use of biodiversity			Every stage of the policy, plan, programme and project cycle	

Entity (source) grouped by sources in chronological order	Definition	Goals of mainstreaming	Elements of biodiversity that are the focus	Sectors mainstreamed into	Pathways and approaches	One-way or reciprocal
Huntley and Redford (2104) for GEF STAP and GEF (2016)	"[T]he 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."	Conservation and sustainable use of biodiversity		Focus on sectors that have significant biodiversity impacts, such as agriculture, forestry, fisheries, tourism, extractive industries (gas, oil, and mining) and infrastructure development	Spatial and land-use planning Improving and changing production practices to be more biodiversity-positive Developing policy and regulatory frameworks that remove perverse subsidies and provide incentives for biodiversity-positive land and resource use.	One-way implied

Entity (source) grouped by sources in chronological order	Definition	Goals of mainstreaming	Elements of biodiversity that are the focus	Sectors mainstreamed into	Pathways and approaches	One-way or reciprocal
Sectorally focused definitions						
In agriculture (FAO 2018)	“Biodiversity mainstreaming across the agricultural sectors is the process of embedding biodiversity considerations into all policies, strategies and practices that are adopted by public and private actors who either depend on biodiversity or whose actions have an impact on biodiversity. The purpose of mainstreaming biodiversity in the agriculture sectors it to ensure that biodiversity is conserved and used sustainably.”	Conservation and sustainable use of biodiversity	As relevant to agriculture (eg genetic diversity)	Relevant to agriculture	Any and all	Food security benefit may be implied
In fisheries (Friedmand et al., 2018)	“The progressive, interactive process of recognising the values of biodiverse natural systems in the development and management of fisheries, accepting full accountability for, and effectively responding to, the broader impact of fishing and fishery related activities on biodiversity and related structure and function of ecosystems".	Sustainable biodiversity and ecosystems management	As relevant to fisheries (eg fish species diversity)	Relevant to fisheries		Fishery productivity benefit may be implied

Entity (source) grouped by sources in chronological order	Definition	Goals of mainstreaming	Elements of biodiversity that are the focus	Sectors mainstreamed into	Pathways and approaches	One-way or reciprocal
In sectors generally (Van Winkle, 2015)	"Prevent the negative impacts of production sectors on biodiversity and ecosystem services. Promote activities beneficial to biodiversity."	Conservation and sustainable use of biodiversity	Related to sectors	Eg fisheries, agriculture, forestry	EIA, valuation, accounting, SEA scenario analysis, indicators	Yes (in full version) — highlights direct links with human welfare
In sectors generally (IUCN 2020)	"Biodiversity … needs to be integrated into all sectors and across sectors: biodiversity needs to be mainstreamed."	Biodiversity conservation (in full version)		In and across all sectors		
In sectors generally (IUCN, citing CBD, 2011)	"The integration of the conservation and sustainable use of biodiversity in both cross-sectoral plans such as sustainable development, poverty reduction, climate change adaptation/mitigation, trade and international cooperation, and in sector- specific plans such as agriculture, fisheries, forestry, mining, energy, tourism, transport and others. It implies changes in development models ... and paradigms."	Conservation and sustainable use of biodiversity	As relevant to cross-sectoral and sectoral activities	Cross-sectoral and sector (several listed)	Many	New development models and paradigms, suggests reciprocal
In sectors generally (DEA, 2016)	"Mainstreaming relies on the principle that other sectors (eg mining, tourism and agriculture) will acknowledge their dependence on and responsibility for biodiversity and incorporate biodiversity considerations in their normal business"		As relevant to each sector	Eg mining, tourism and agriculture		Acknowledgement of dependence suggests reciprocal

Entity (source) grouped by sources in chronological order	Definition	Goals of mainstreaming	Elements of biodiversity that are the focus	Sectors mainstreamed into	Pathways and approaches	One-way or reciprocal
Development-oriented definitions						
SANBI (2020)	"Incorporating biodiversity considerations directly into the policies and planning of business or industry and organs of state. Mainstreaming biodiversity ensures that addressing development needs and protecting the environment is not an either-or situation, but rather that development is supported by the sustainable use of natural resources."	Sustainable development			Policies, planning, industry	Yes — biodiversity and development not in opposition but mutually supportive
OECD (2016)	"There are various definitions, but they all give the idea that it involves integrating biodiversity into growth and development processes and in sector policies in a systematic way (notably in agriculture, forestry and fisheries, among others)."			Eg agriculture, forestry and fisheries		Could imply reciprocal with growth and development

Entity (source) grouped by sources in chronological order	Definition	Goals of mainstreaming	Elements of biodiversity that are the focus	Sectors mainstreamed into	Pathways and approaches	One-way or reciprocal
IIED and UNEP-WCMC (2017)	"Biodiversity mainstreaming is a process of getting biodiversity concerns – potentials, needs and risks – fully reflected in development policies, plans and activities in order to achieve sustainable outcomes for both biodiversity and development. It is more than applying 'safeguards' to make sure development processes do no harm to biodiversity. It is also about recognising the potential of biodiversity to achieve desirable development outcomes."	Sustainable development			Policies, plans and activities	Yes — emphasises the positive potentials of biodiversity for mainstream goals (development or production). The definition ignores the potential constraints that biodiversity presents to these goals
African Leadership Group (2017)	"Biodiversity mainstreaming is a process of getting biodiversity concerns – potentials, needs and risks – fully reflected in development policies, plans and activities in order to achieve sustainable outcomes for both biodiversity and development" (in IIED and UNEP-WCMC, 2017: 6)	Defined sectors and goals: strategic approach (eg with limited resources) Joint biodiversity and development		National and sectoral development		Reciprocal

Goals of biodiversity mainstreaming

Within the definitions listed in Table 1, the goal of biodiversity mainstreaming can be synthesised as ***better decision making which serves to improve outcomes for biodiversity itself.*** In the case of reciprocal and sectoral mainstreaming, the definitions imply that biodiversity outcomes may be more secure if development or sectoral outcomes are also well-served. The biodiversity outcomes might range, for example, from simply better recognising and valuing biodiversity, to safeguarding it wisely using biodiversity, reducing pressure on its use, tackling the root causes of biodiversity loss and restoring biodiversity.

Elements of biodiversity in focus

The term 'biodiversity' describes the diversity of life on Earth, which is evident at a number of levels from genes through to individuals, populations, species, communities and entire ecosystems. Article 2 of the CBD defines "biological diversity" as the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems, often summarised as genes, species and ecosystems (CBD, 2002).

In recent years, the ecosystem services (ES) concept has gained rapid uptake in the field of biodiversity, and the term biodiversity and ecosystem services (BES) is in now common use. Definitions of biodiversity inclusive of the concept of ecosystem services frame biodiversity as an *asset* to humans, offering:

1. **Functional benefits** — biodiversity sustains many benefits that have financial value and underpin the **economy** (plus some costs, for example from invasive species or zoonoses)
    - *Most natural resource-dependent businesses and national governments emphasise these benefits*
2. **Cultural benefits** — biodiversity is an intimate part of the community, aesthetic and spiritual values that are essential for **society**
    - *Much of civil society emphasises these benefits*
3. **Security benefits** — biodiversity is a foundation of life itself, determining (mostly positively) the health of people and their **environment**
    - *Environmental NGOs, scientists, health professionals emphasise these benefits.*

Notably, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) conceptual framework (Diaz et al., 2015) uses the term "nature's contributions to people" rather than ecosystem services as a way to emphasise the cultural and spiritual values of biodiversity as much as its material and economic values.

The predominant definitions of biodiversity mainstreaming (ie those listed in Table 1) largely assume that biodiversity is positive — beneficial, if not benevolent — and that more biodiversity is better. Other commentators have pointed out, however, that biodiversity can and frequently does come with disservices to humans (Roe et al., 2019) — of which the genetic diversity in coronaviruses leading to our current Covid-19 crisis is one example. An important observation emerges here: how different players view biodiversity is related to their respective and diverse values and roles. Effective mainstreaming starts with the premise that different sectors and individuals have different values and not all will recognise direct or indirect values of biodiversity — and it is important to bear in mind that these are not only positive. Mainstreaming tactics aim to respond as appropriate to these values, with reciprocal mainstreaming taking particular effort to understand the context, aims and drivers of development/production as they affect biodiversity.

Direction of mainstreaming

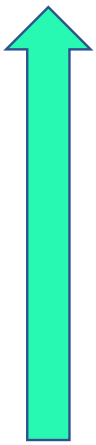
As noted above, some definitions of biodiversity mainstreaming focus solely on biodiversity outcomes, whereas others address both biodiversity and development/sectoral outcomes, maintaining that for biodiversity to be mainstreamed it must involve a two-way relationship with development/production sector objectives. In more detail, "biodiversity mainstreaming is a process of getting biodiversity concerns – potentials, needs and risks – fully reflected in development policies, plans and activities in order to achieve sustainable outcomes for both biodiversity and development. It is more than applying 'safeguards' to make sure development processes do no harm to biodiversity. It is also about recognising the potential of biodiversity to achieve desirable development outcomes" (IIED and UNEP-WCMC, 2017: 7), particularly where there is some dependence on biodiversity by the sector. Applying 'biodiversity safeguards' is indeed the most common (if not yet universally and adequately applied) way to achieve the goals of 'one-way' biodiversity. But reciprocal mainstreaming adds the dimension of integrating understanding of development contexts and goals in order to better inform biodiversity plans and activities — promoting synergies with development where possible and anticipating and managing trade-offs where needed, for the benefit of multiple stakeholders.

In the broader environmental mainstreaming literature, the term 'interplay management' has been used to describe this bi-directional process. This implies "pursuing collective objectives through conscious efforts by one or more actors to address and improve the interactions and effects of institutions" (Oberthür and Stokke, 2011). It is closely related to the concept of "policy coherence [which] describes a situation of synergy between different policy areas" (Mickwitz et al., 2009) as well as "an ability to deal with trade-offs and can be understood as the aim of policy integration or mainstreaming" (Karlsson-Vinkhuyzen et al., 2017: 146).

The CBD itself notes that the overriding priority of developing countries is poverty reduction rather than biodiversity conservation. The case can be made that the two are mutually dependent — biodiversity underpins environmental goods and services which poor people cannot afford to buy, such as flood protection, food and health. The loss of biodiversity poses risks to hard-won development gains by compromising agricultural adaptive capacity, exacerbating natural disasters, reducing carbon storage and damaging important global and local heritage (Roe et al., 2019). Biodiversity needs to be mainstreamed into development sectors in order to maintain this contribution. But equally it can be argued that concerns for biodiversity can compete with current means of securing priority needs such as food and energy, particularly in terms of competition over land. Development (and livelihood) priorities — both national and local — therefore also need to be mainstreamed into biodiversity policy, and just as biodiversity safeguards may be needed in development sectors, so too may social safeguards be needed in biodiversity sectors (with implications for GEF's Protected Area projects as well as for its production sector projects). Individual country's National Biodiversity Strategy and Action Plans (NBSAPs) increasingly reflect this reciprocal emphasis, highlighting the achievement of mainstream development aims such as job creation and food security, and prioritising biodiversity activities that will directly contribute to them.

A further reason for a reciprocal mainstreaming approach in developing countries is the piecemeal development of post-colonial and post-conflict institutions here, as well as policy incoherence (Acemoglu and Robinson, 2008). Mainstreaming is needed because *institutions in these states* are not yet integrated — one type of institution needs to influence the behaviour, and indeed sometimes the policies, of another in order for (in this case) biodiversity goals to be achieved. Figure 1 illustrates how institutions for nature have come to be better integrated with institutions for development. Based on observation, it identifies four basic approaches, which often correspond to stages in the evolution of national governance but can be simultaneous: from (1) institutions being separate and siloed, to (2) recognising one another's mandates by incorporating safeguards to protect the other's work, to (3) working together to produce synergies or joint outcomes where current rules and incentives permit, to (4) greater institutional reform that allows for much greater possibility of synergies and acceptable trade-offs by changing prevailing incentives and rules. Over time, an institutional integration trajectory can generally be observed. For mainstreaming to be accelerated and scaled up, a more deliberate approach to understanding current governance may be needed, so that appropriate mainstreaming tactics (the centre column in Figure 1) may be selected (Bass, 2015).

Institutional convergence of 'nature' and 'people' objectives



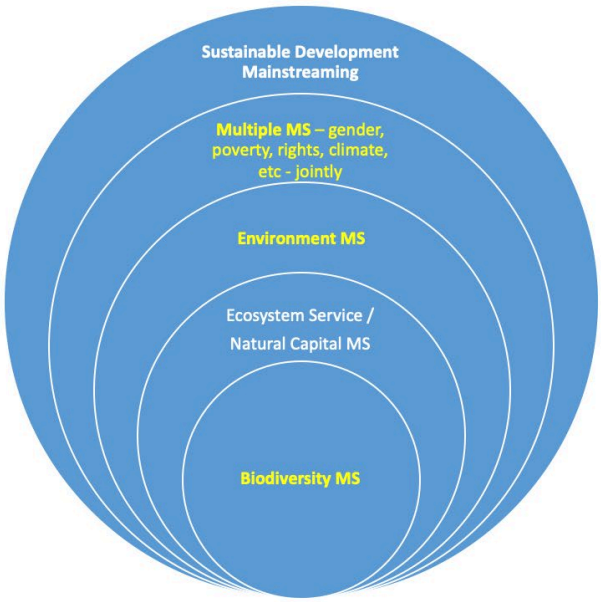
Nature/envt institutions – how they treat people/devt	**>>> Institutional integration <<< approaches**	**People/devt institutions** – how they treat nature
4 Nature *with* people Resilient and adaptive landscapes; CBNRM; 2010>	**4 Structural reform for SD** *'Do more by changing the rules'* – so people + nature thrive together	**4 Development *with* nature** Resilient systems; wealth/natural capital accounts; SDGs: 2010>
3 Nature *for* people Ecosystems approach, Millennium Eco Assessment; 1990s-2000s	**3 Synergies** *'Do good'* win-wins where economic + governance rules allow	**3 Nature *co-benefits* from devt** Sustainable land/NR/livelihoods, green enterprise; MDG7; 2000s>
2 Nature *despite* people Tackling habitat loss; cleaning up pollution: 1970s-90s	**2 Safeguards** *'Do no harm'* to the 'other' agenda. EIA and SIA	**2 Devt *'doing no harm'* to nature** Land/NR management; 1990s>
1 Nature *without* people Protected areas; 1950s>	**1 Silos** *Separate agendas* often conflict	**1 Devt by *converting* nature** Land and NR 'development'; 1950s>

Figure 1: Illustration of the need for institutional integration approaches (Source: Bass, S (2015) Conceptual Frameworks for Integrating Sustainable Development Dimensions – Paper for UNDESA/UNEP/UNDP Workshop on SD integration tools, Geneva, 14-15 Oct 2015. © United Nations)

Embedded and multiple mainstreaming

'Embedded mainstreaming' is a term we suggest to refer to achieving biodiversity mainstreaming goals through a broader approach — often through an environmental mainstreaming, sustainability or SDG mainstreaming strategy. This has emerged in response to political economy realities described in IIED and UNEP-WCMC (2017): "The environment sector is congested: everyone is trying to show that their area is more important than anyone else's. The sector should work together to build an alliance around common approaches and messages." The choice is often a tactical one, depending on the political, scientific or public visibility or tractability of biodiversity in relation to other issues.

Figure 2 elaborates the concept of embedded mainstreaming. It is termed a 'real-world typology' as, in practice, in a resource-poor environment and with competing priorities the only real chance of attracting attention to biodiversity is to bundle it within environment mainstreaming, natural capital mainstreaming and sometimes even climate change or sustainability mainstreaming. Figure 2 illustrates that the choice between direct biodiversity mainstreaming or embedded biodiversity mainstreaming depends on whatever issue receives the highest level of attention. In turn, the choice of tactic depends on how integrated the institutional setup already is in the country, and at what scale biodiversity is best handled (national, local, sector, etc).



Choice of mainstreaming (MS) approach depends on:

- **Political economy of biodiversity** – is there appetite to treat BD seriously, compared to env, NSs, NC, SD, etc? > Either focus MS on BD, or *'nest'* it within these issues.
- **Institutional maturity** – need to match MS tactics with a country/sector's institutional entry points :
  1. Siloed institutions > *'campaigning' MS* to sensitise about BD's importance & our dependence on it
  2. Safeguarding stage > *'negative' MS* focused on minimising damage to BD – PAs, EIA, etc
  3. Synergies stage > *'positive' MS* focused on investment case for win-wins – PES, bioeconomy
  4. Structural reform stage > *systemic MS of BD* in gov & biz mandates and machinery – NCA, valuation, plans
- **Tractable scale** – focus MS on the scale where issues are resonant and there is capacity e.g. national vs local, priority sectors, land uses or landscapes/ecosystems

Figure 2: Embedding biodiversity mainstreaming in mainstreaming of closely related themes

'Multiple mainstreaming' refers to combining a number of important mainstreaming objectives from across development, environmental, social and climate domains. This is an increasing trend according to the OECD, with the European Commission, Sida and IFAD, for example, combining several cross-cutting issues critical to the quality of development — such as gender, climate and environment, peace and security and poverty reduction — into joint initiatives, joint units and sometimes joint screening procedures. This approach is unleashing innovation in the way that sectors, for example, are viewed (OECD, 2019). Multiple mainstreaming is considered to offer benefits primarily through improved innovation (IFAD, 2012), coordination and coherence to promote greater collaboration and synergies; reduce duplication of effort in implementation and save time in reporting; open up funding opportunities; unify government ministries strategies, message and external image; and show, for example, how issues such as health, climate change, land degradation and water relate strongly to biodiversity — making the argument for biodiversity mainstreaming more powerful. The early signs are that it also reduces the 'mainstreaming fatigue' that officials feel when constantly asked to handle the needs of one single issue after another. The other side of the coin is that investment in joint approaches to mainstream can ensure greater resources and visibility are accorded to all issues (OECD, 2019: 20-21).

Those working on biodiversity mainstreaming have widely claimed that biodiversity has had less attention than other environmental mainstreaming themes (eg Karousakis, 2018; UNDP and UN Enviromment, 2019). Therefore, combining biodiversity with other issues such as public health or climate mainstreaming could be valuable in many circumstances, using other political priorities — for example, health in the case of the current Covid-19 crisis — to elevate a more marginal topic (OECD, 2019). (This approach is also widespread in the GEF project portfolio, where projects are often 'multi-focal area' or use a theme such as food security or urbanisation as an entry point, or are asked to report on specific issues such as gender (required of all GEF projects). This is described in the report of Activity 3 of this assignment, which is a review of agency experience with biodiversity mainstreaming, and in GEF IEO, 2019).

The literature on biodiversity mainstreaming: an overview

Literature reviewed

Our review of biodiversity mainstreaming focuses on the last five years of practice (2015–2020) in order to build on — and not duplicate — an earlier review conducted for the GEF (Huntley and Redford, 2014). We identified relevant literature through searches of online databases Web of Science, Scopus, Primo and Google Scholar. We searched for the terms “biodiversity mainstreaming” and “mainstreaming biodiversity”, then “integrating biodiversity” and “biodiversity integration” and analysed the top 50 most-cited publications in English. We also searched for the Spanish term "integración de la biodiversidad" and the French term "intégration de la biodiversité" for the top 10 most-cited publications in the same period. These resources were consolidated with the English language results. Duplicate materials available in multiple databases and/or languages were excluded. The list of publications was reviewed and supplemented by a search of resources from known authorities such as the CBD, IIED, UNEP-WCMC, Birdlife International, SANBI and the Humboldt Institute, which were not (yet or at all) indexed, or had fewer citations because they were newly published. Further additions were made with expert input and during spot checks for specific topics. Overall, we captured 90 publications and then ranked these by relevance in order to narrow the list down to the 50 top resources. The heatmap in Figure 3 provides an overview of the 50 documents reviewed (listed in Annex 1). Most were global in nature, plus a large concentration from Africa and the OECD, and most covered several ecosystems (or CBD thematic programmes of work) and several economic and production sectors.

Output	Count		Sector	Count
Biodiversity-related certification	18		All / several	33
PES schemes	12		Agriculture (large-scale or other)	15
Biodiversity-friendly production systems	6		Extractives: mining, oil & gas	9
Reforming policy, regulatory and planning frameworks	5		Development and poverty reduction	9
Valuation of (and accounting for) biodiversity and ecosystem services	2		Water, Fisheries and Aquaculture (inc integrated catchment management)	9
Spatial and land use plans	2		Small scale agri	7
Sustainable production systems	2		Finance	6
Biodiversity offsets	1		Forestry	5
Several / Other	0		Ecosystem Services and Ecological Infrastructure	4
Natural Capital Accounting	0		Tourism and Wildlife	1
			Use of wild products	0
			Marine and Coastal	0
Region	**Count**			
Global	22			
Middle East & Africa	15		**Linked to GEF**	
OECD and North–South cooperation	9		N	27
South–South cooperation	3		Y	19
Latin America	2			
Asia-Oceania	1			
			Scale	**Count**
			All / Other	20
Ecosystem / PoW	**Count**		National	7
All / several	30		Sector-level	7
Agricultural Biodiversity	6		International cooperation	7
Dry and Sub-humid Lands Biodiversity	4		Landscape level	5
Marine and Coastal Biodiversity	3		Project level	0
Mountain Biodiversity	1			
Forest Biodiversity	1		**Experimental / RCT approach**	
Island Biodiversity	0		N	58
Inland Waters Biodiversity	0		Y	1

Figure 3: Heatmap of literature reviewed

Observations on the state of the literature on biodiversity mainstreaming

Recorded progress towards biodiversity mainstreaming is very slow worldwide (Whitehorn et al., 2019), despite the attention focused on this via the CBD (especially COP 13) and extensive finance available through the GEF (GEF IEO, 2019). Whitehorn et al. (2019) find that countries are only just setting the foundations for mainstreaming biodiversity, primarily via their NBSAPs. The CBD found that only 28% of 159 parties had conducted valuation studies of biodiversity, 20% stated that biodiversity has been integrated into national development plans, and 13% mentioned reciprocal integration of biodiversity and development plans (CBD, 2018).

Huntley and Redford (2014) state that, although much has been written about how and why mainstreaming should be done, there is much less on what has been done and what has been learned from mainstreaming practice, notably on what works and what doesn't. Drutschinin et al. (2015) call for more case studies to compare performance of different mainstreaming efforts in different country contexts and circumstances. This request was responded to by a number of organisations (including the CBD, Birdlife International, IUCN, the OECD and individual CBD focal points of countries), which provided case studies especially in advance of the CBD COP 13. Unfortunately, however, there was no common conceptual framework for analysing the case studies, and thus comparability can be difficult. There are also issues of attribution (ie linking the mainstreaming intervention to the outcome) in some cases (noted by Shih and Mabon, 2018). South Africa remains disproportionately represented in this literature, as Redford et al. (2015) noted.

The literature on biodiversity mainstreaming tends to be separate from, and somewhat less reflective than, the wider literature on environmental mainstreaming, in which authors have noted that biodiversity tends not to be a top agenda item — albeit one which is increasing in profile (OECD, 2019). Progress in other areas, such as nature-based solutions (NbS), has not always been drawn on and nor does the literature necessarily make an explicit reference to biodiversity mainstreaming (eg Watkin et al., 2019).

The wider literature on environmental mainstreaming has more detailed coverage of the level of institutional integration that a country or sector has reached, emphasising that we need to mainstream because the current institutional set up still excludes it (IIED and UNEP-WCMC, 2017). It also emphasises that so much mainstreaming goes wrong because it assumes the wrong level of institutional capacity and need (Bass, 2015; OECD, 2019). A broad assumption in the environmental mainstreaming literature is that for mainstreaming to be enduring, it must deliver value to the 'mainstream' outcome into which it is being mainstreamed. This is less evident in the biodiversity mainstreaming literature.

Fourteen resources addressing biodiversity mainstreaming from the past five years are presented as an annotated 'top reads' list in Box 1. The list includes a mix of peer-reviewed papers and consolidated 'lessons learned' publications on biodiversity and environmental mainstreaming more generally.

Box 1: Fourteen top reads on biodiversity mainstreaming for 2015–2020

1. **Biodiversity Mainstreaming in Practice: A Review of GEF Experience (GEF, 2016) and Evaluation of GEF Support to Biodiversity Mainstreaming (GEF IEO, 2019).** The 2016 publication introduces the GEF's theory of change for biodiversity mainstreaming, and in 2019 an independent review of the mainstreaming portfolio considered how it has been applied and if earlier lessons have been cascaded to improve the portfolio. The independent review validated the theory of change, but indicated it has been unevenly applied to projects.
2. **Mainstreaming Biodiversity and Development – Guidance from African Experience (IIED and UNEP-WCMC, 2017).** This IIED-WCMC 'mother of all guidance' is based on experience and brings together a set of component issue guides. Although a synthesis, it includes illustrative cases and highlights the importance of reciprocal mainstreaming and associated 'co-benefits', and developmental entry points and targets. The ten-point 'roadmap' for biodiversity mainstreaming ('from > to') suggests useful shifts towards closer integration.
3. **Natural Capital Accounting (NCA) for Mainstreaming Biodiversity in Public Policy (Ruijs and Vardon, 2018).** This report provides as overview of policy choices/trade-offs and accounting for biodiversity changes, showing what different types of accounts can offer to mainstreaming biodiversity, analytical methods and various country cases of NCA to get biodiversity considerations integrated into economic policy.
4. **Mainstreaming Biodiversity in Production Landscapes (Mijatović et al., 2018).** This review covers 14 projects in 36 countries undertaken by UN Environment as a GEF implementing agency over the past 17 years. The rich body of experience is supported by dozens of scientific papers produced with GEF support and valuable partnerships with FAO, Bioversity International and national partners.
5. **Mainstreaming biodiversity for Sustainable Development (OECD, 2018).** This report highlights examples of good practice and remaining challenges in mainstreaming biodiversity at the national level; mainstreaming biodiversity in the agriculture, forestry and fisheries sectors; biodiversity mainstreaming in development co-operation; and monitoring and evaluating biodiversity mainstreaming. Insights are drawn from 16 predominantly megadiverse countries (or those with biodiversity hotspots), spanning a range of income groups. A detailed case study of South Africa (Manuel et al., 2016) fed into this comprehensive review.
6. **Biodiversity loss is a development issue: A rapid review of evidence (Roe et al., 2019).** This paper frames the purposes of biodiversity mainstreaming very well. It unpicks misunderstandings and sets out the evidence that biodiversity loss is much more than an environmental problem — it is an urgent development challenge.
7. **Mainstreaming biodiversity in economic sectors: An analytical framework (Karlsson-Vinkuyzen et al., 2017).** This paper identifies an innovative repertoire of mainstreaming opportunities from beyond government. It presents a framework for identifying the opportunities for mainstreaming biodiversity in governance in economic sectors such as forestry.
8. **Making the case for biodiversity in South Africa: Re-framing biodiversity communications (Maze et al., 2016).** This application of market research to biodiversity helped the conservation sector to see the importance of making connections to the land reform and water agendas. Proponents moved away from the concept of ecosystem services to a home-grown approach to encouraging investment in ecological infrastructure. Comprehensive market research supported this paradigm shift and emphasised that in a developing country, clearly linking biodiversity messaging to economic growth, job creation and sustainability will better gain the attention of a policymaker audience.

9. **Biodiversity and Development Handbook (USAID, 2015a).** This is an extremely detailed manual for project developers to support mainstreaming of biodiversity in different processes and sectors, covering good practice for identifying and designing suitable pathways, M&E, and an overview of topics. Its companion piece is a **Biodiversity and Development Research Agenda** (USAID, 2015b), which details knowledge gaps at the intersection of biodiversity and development that warrant attention from researchers.
10. **Mainstreaming Natural Capital: The Rise of Ecosystem Services in Biodiversity Conservation (Suarez, 2017).** This challenging political economy perspective considers the trade-offs involved with the biodiversity community's wide adoption of natural capital and ecosystem services as predominant lenses.
11. **Greening Development Co-operation: lessons from the OECD Development Assistance Committee (OECD, 2019).** This is the result of the OECD-DAC Peer Learning on Environmental Mainstreaming. It points to the following 'building blocks' for effective environmental mainstreaming (EM), with examples of best practice for each: (1) policy commitment and mandate for EM, (2) robust EM system and tools, (3) interdisciplinarity and capacity for EM, (4) knowledge and learning for EM, and (5) helping developing country systems for 1-4. It points to trends towards 'multiple mainstreaming' as being more effective than pushing one issue (eg innovative new holistic coordination units and policies, integral management systems, mainstreaming as a method not a 'campaign') and the value of finance targets, but also highlights the much greater need for biodiversity to be included in this. In other words, environmental mainstreaming is going ahead but biodiversity is currently not well mainstreamed into it.
12. **Accelerating Sustainable Development in Africa (UNDP and UN Environment, 2017).** This report summarises what PEI achieved through it's multi-decade programme in several African countries with case studies of sectors as well as of institutional innovations. It promotes PEI's "Four I's" pathways based on learnings — (1) integrated evidence, (2) integrated institutions (breaking down silos), (3) involvement and empowerment of local actors, (4) investment (new finance mechanisms and focus on government expenditure) — and progress metrics and monitoring.
13. **Mainstreaming Indigenous and local communities' connections with nature for policy decision-making (Sangha et al., 2019).** This paper emphases the role of Indigenous and local peoples' connections with nature in mainstreaming. It describes a clear three-step approach for policy decision-making including applying relevant ES evaluation techniques to mainstream the role of ES in enhancing peoples' wellbeing. It highlights Indigenous and local values of natural systems, including livelihoods, social, cultural, and spiritual values, and capabilities, beyond the livelihood opportunities typically considered for informing international developmental policies.
14. **Learning about social-ecological trade-offs (Galafassi et al., 2017) and Evaluating taboo trade-offs in ecosystem services and human wellbeing (Daw et al., 2015).** Based on research in coastal Kenya, these papers apply innovative participatory methods to unpack the necessary but challenging problems of noneconomic and difficult-to-evaluate values, such as cultural identity, employment, the wellbeing of poor people, or particular species or ecosystem structures. They identify cases of 'taboo' trade-offs between morally incommensurable values.

A question not directly addressed by the biodiversity mainstreaming literature is: when is it enough to reach just the 'silo' or 'safeguards' stages of mainstreaming? Do all issues need to be fully mainstreamed? According to the wider mainstreaming literature, three factors are critical: (1) institutional maturity; (2) sector; and (3) level of dependence. In more detail, the answer will vary from sector to sector, and can change over time as social expectations evolve and license to operate needs renewal. A key consideration is how directly reliant the sector is on biodiversity. With agriculture, for example, biodiversity is intricately woven into the prospects for sustainability of the sector, whereas with the extractive industries the relationship is more indirect. In the latter case, for example, the relationship depends more on financial institutions' policies and societal norms around access and management of biodiversity resources than a direct need for biodiversity *per se*.

In its recent 'Nature Risk Rising' (WEF, 2020), the World Economic Forum outlines the level of dependency on biodiversity (used interchangeably with the word 'nature' in the report) by different sectors, both directly and through their supply chains (see Figure 4).The figure suggests that those sectors with the highest dependencies would benefit most from biodiversity mainstreaming.

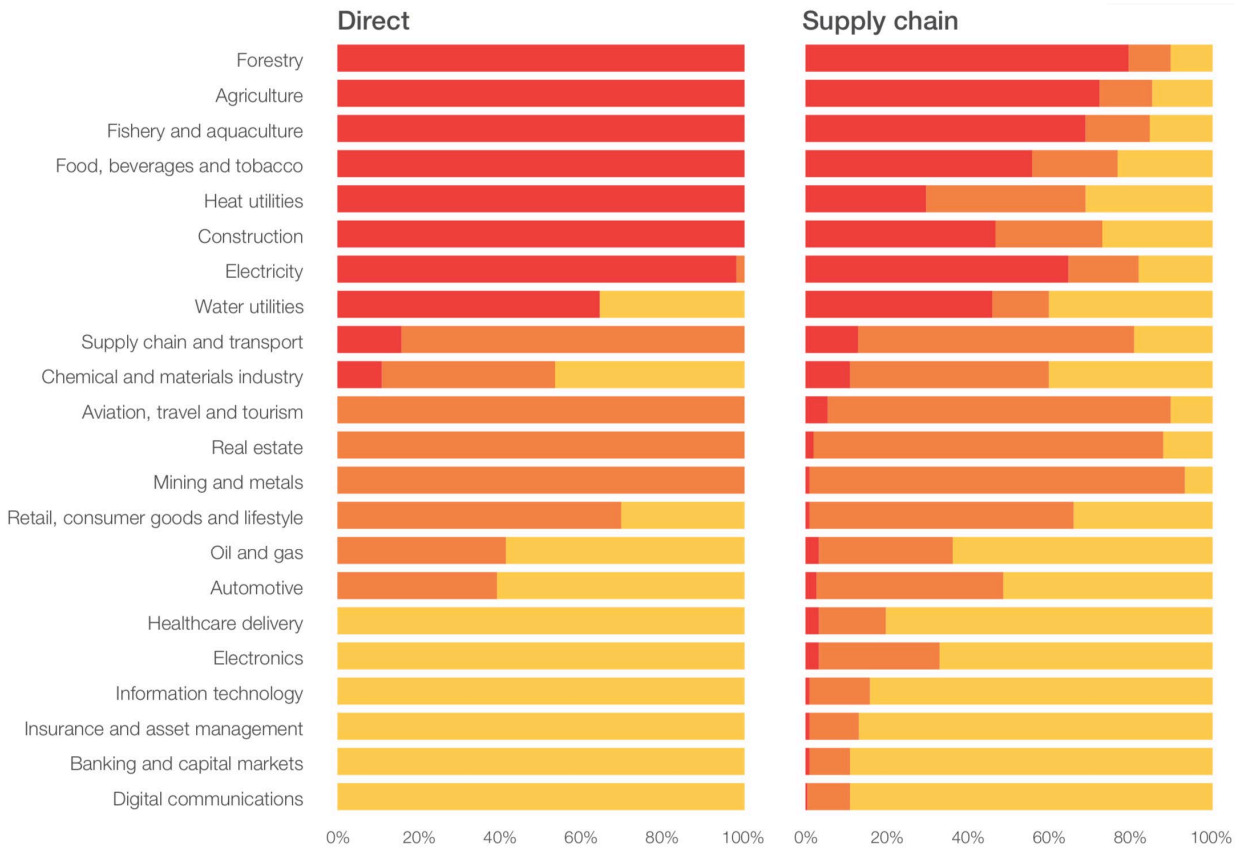


Figure 4: Sector direct and supply chain dependence on nature (Source: WEF (2020) Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy. New Nature Economy Series. World Economic Forum in collaboration with PwC. © World Economic Forum. CC BY-NC-ND 4.0)

The questions of dependence and risks also bring us to consider the role of mainstreaming in keeping society operating within planetary boundaries. Guiding policy principles for this objective (Sterner and Coria, 2011) turn out to be closely aligned to the tenets of biodiversity mainstreaming — for example that inherent complexities necessitate interdisciplinary collaboration, and links across planetary boundaries often necessitate considering two or more of them together (both because policy approaches tackling one boundary may lead to 'ancillary' benefits elsewhere and because of potential conflicts).

Theories of change supporting biodiversity mainstreaming

Theories of change (ToCs) have been used increasingly in recent years by biodiversity and development project developers, project proponents and stakeholders to illustrate the causal links and sequences of events needed for an activity or intervention to lead to a desired outcome or impact. A ToC articulates the assumptions, risks and mitigation plans underlying each step in the chain, and how the proposed interventions lead to the achievement of desired outcomes and impacts (Vogel, 2012).

ToCs are less known for their value as a management tool, but Kotschy et al. (2019) note that they can play key functions at the project level during its lifespan, for example:

- Helping project leaders navigate the ever-changing project context, including via a more detailed specification of assumptions and risks
- As a graphic that can be used by project partners and stakeholders as a short-hand reminder of the overall strategic intention of the project
- To guide the development of communications products by clarifying which messages are most important to communicate to whom, how the different project components and activities are linked and how they combine to tell a bigger story to different audiences
- As an (updated) record of the project's intentions, approach and understanding of how impact will be achieved, during and beyond the project lifespan, documenting changes from the design to closing stages.

The GEF has a ToC for its mainstreaming portfolio (GEF, 2016 and Figure 5). Beyond this, we were unable to find any other depictions of a clearly articulated ToC for generic biodiversity mainstreaming in the literature (as opposed to a situation-specific strategy). However, the ToC for the UKAid-funded Ecosystem Services for Poverty Alleviation (ESPA) research programme (Figure 6), while not explicitly for biodiversity mainstreaming, does seek to depict how co-produced research aims to integrate ecosystem services and biodiversity information in development policy and practice to achieve joint environment and development outcomes. Otherwise, the lack of generic mainstreaming ToCs is perhaps not surprising. IIED and UNEP-WCMC (2017) suggest that ToCs should be context-specific rather than generic. We were able to find some ToCs for the major mainstreaming approaches described in the GEF ToC as outputs. These are reviewed briefly below.

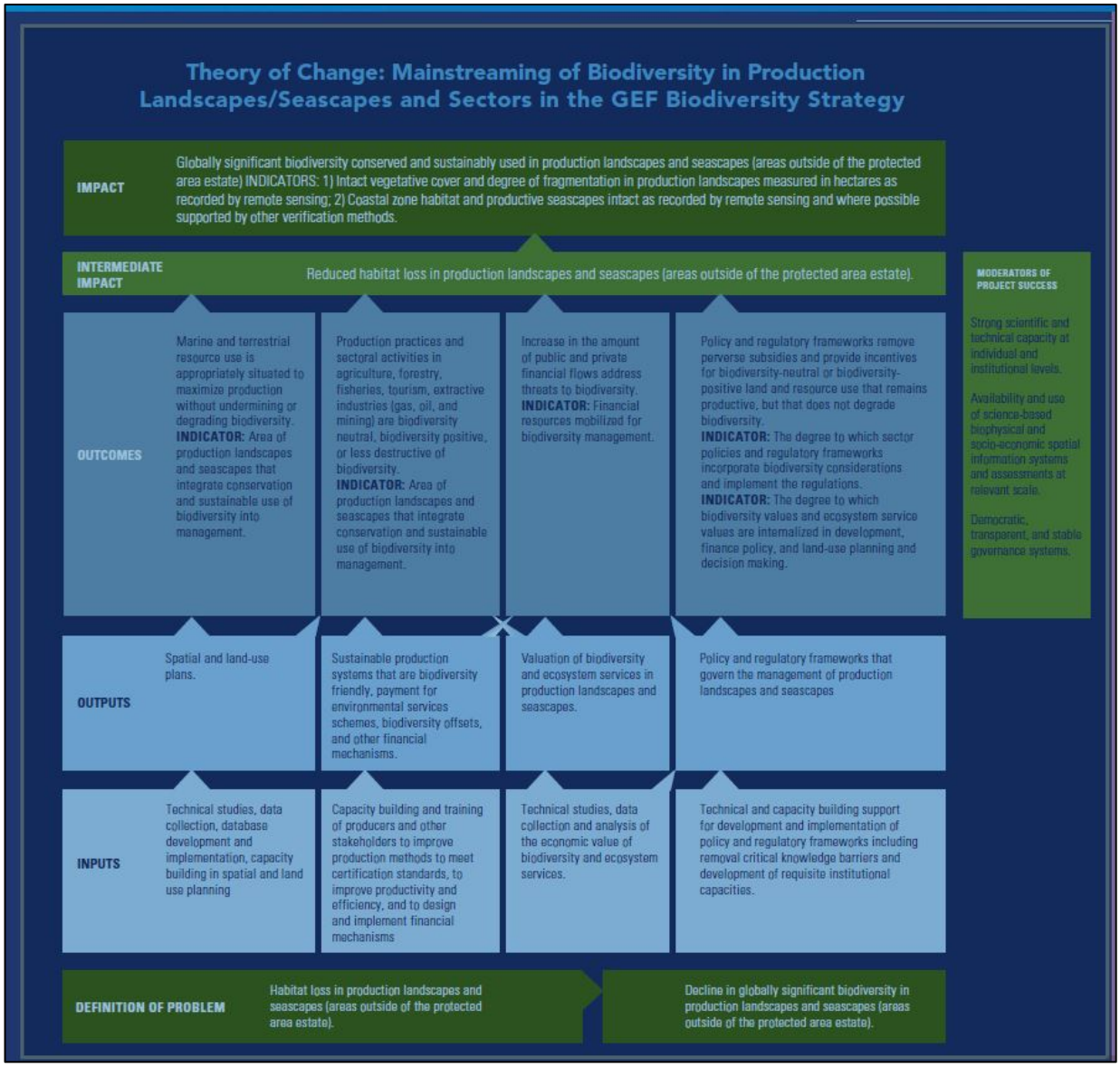


Figure 5: GEF ToC for biodiversity mainstreaming (Source: GEF Secretariat (2016) Biodiversity Mainstreaming in Practice: A Review of GEF Experience. GEF. © Global Environment Facility)

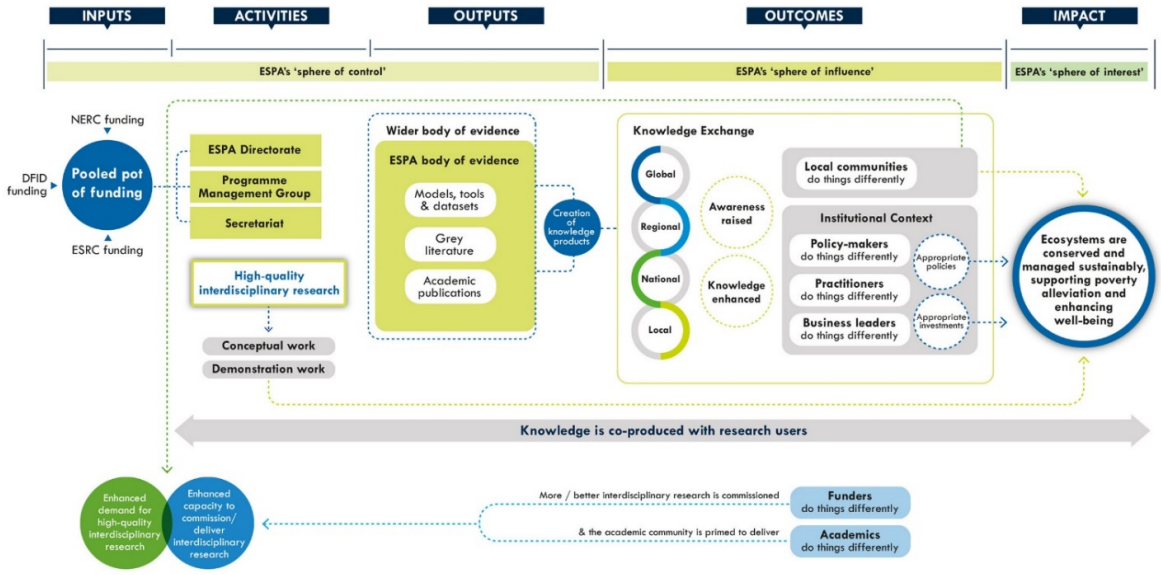


Figure 6: Updated ESPA ToC (Source: ESPA (2016) ESPA Impact Strategy 2016-2017. © Research Into Results (RIR) Limited)

Spatial and land use planning

A ToC for biodiversity mainstreaming though spatial and land use planning is strongly suggested (although not explicitly described as such) in Cadman et al. (2010), and has informed South Africa's emphasis on spatial data products as part of its mainstreaming strategy (Holness et al., 2018). Indeed, all South African provinces have developed spatial biodiversity plans using methods of systematic conservation planning to identify areas for managing and conserving biodiversity (Holness et al., 2018). However, a formalised ToC has not been not articulated for this.

The closest to a spatial and land use planning approach is perhaps that described in Sayer et al. (2016), who present a ToC for landscape management (Figure 7) showing "the causal pathway and feedback loops driving progress towards improved landscape performance… [It] can provide a framework for developing metrics and opportunities for the use of technology and citizen science. Competing claims for resources establish the need for ongoing review and continuous adaptation." A weakness of this ToC is that it does not use an established format that clearly identifies project inputs, outcomes, risks and assumptions, for example.

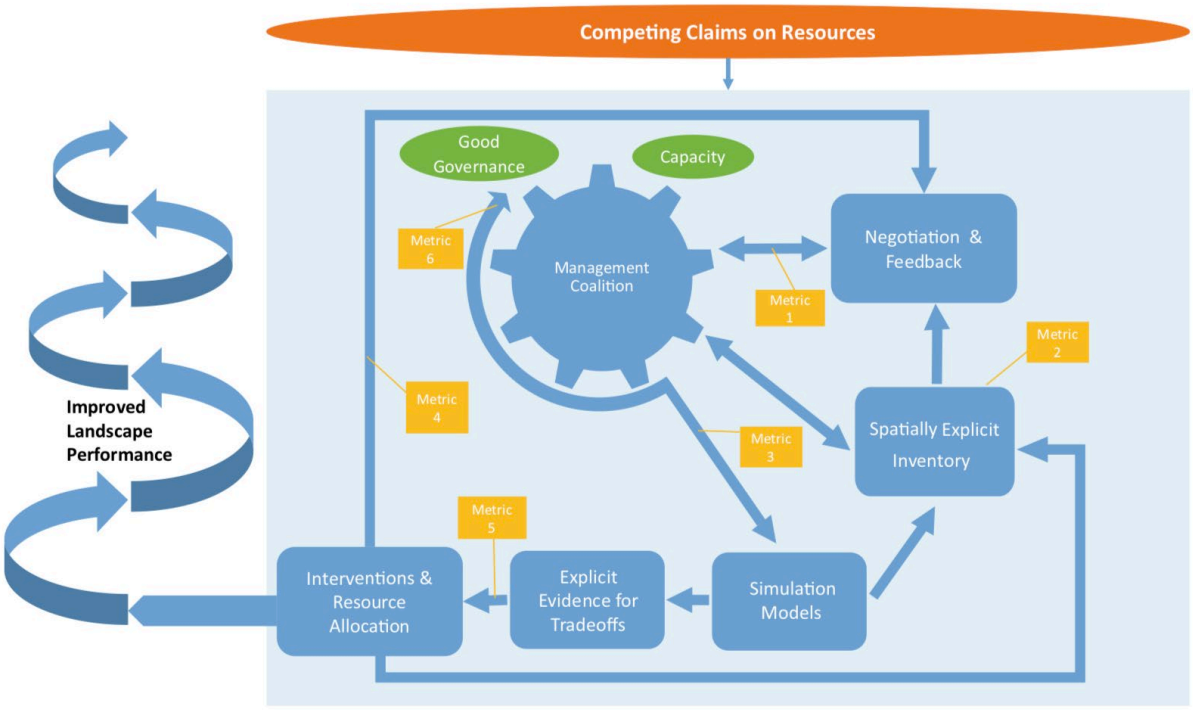


Figure 7: Generic ToC for landscape management (Source: Sayer, J, Margules, C, Boedhihartono, AK et al. (2016) Measuring the effectiveness of landscape approaches to conservation and development. Sustain Sci 12, 465–476. © Springer Nature)

Sustainable production systems

Biodiversity-friendly production systems

A number of publications express the rationale for biodiversity-friendly production, and the steps required in given production systems or value chains, but we have not found this in the form of an articulated theory of change in scientific or technical publications (though they may exist in in-house organisational documents). An excellent series of mainstreaming case studies by IUCN and Birdlife International (2017) allude to ToCs for biodiversity-friendly production systems. To support conservation and sustainable use of a valuable pollinator, the agave, in Mexico, for example, the ToC is based on linking academics with stakeholders in tequila and mezcal supply chains (producers, distillers, bottlers, marketers, and bartenders). However, the details of these ToCs are not published alongside the case narratives (potentially suggesting the ToCs may not have been actively used as management tools).

TEEBAgriFood (May et al., 2018) has published what the authors called a ToC (but which could be considered more of a broad schematic of relationships) for their work improving public knowledge and decision-making processes around agri- and food-related ecosystem valuation (Figure 8). The ToC recognises forces that drive and condition the political economic context, including institutions that mediate the prospects for change (such as markets and property rights) are also essential building blocks in the ToC, but are beyond TEEBAgriFood's immediate domain. While very high-level and simplified, the ToC is useful in emphasising pathways towards (1) mainstreaming TEEBAgriFood as an analytical basis and, in consequence, (2) reforming food systems and restoring the ecosystems upon which they depend. The ToC addresses the challenge that valuation information alone often fails to motivate change.

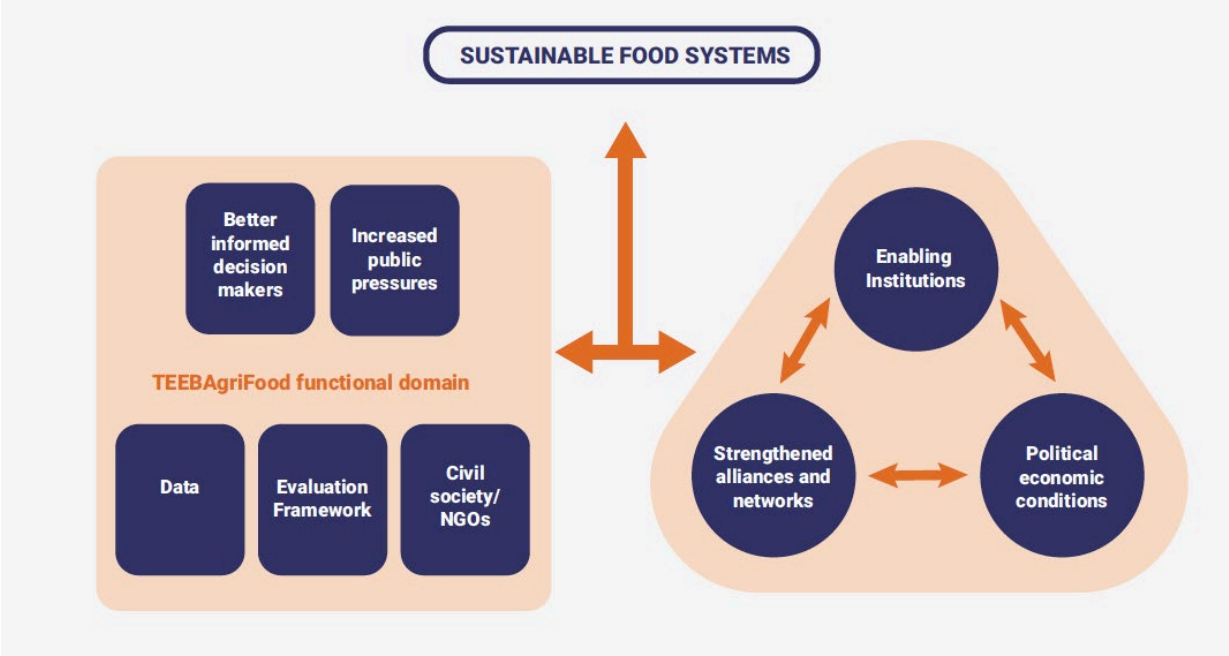


Figure 8: TEEBAgriFood theory of change (Source: May, P, Platais, G, Di Gregorio, M, et al. (2018) The TEEBAgriFood theory of change: from information to action. In: TEEB for Agriculture & Food: Scientific and Economic Foundations. Geneva: UN Environment. Chapter 9, 333-375. © UN Environment)

Biodiversity-related certification

WWF has supported a number of biodiversity-related certification schemes. Their strategy over the years has evolved to integrating biodiversity into broader, more integrated sustainability certification rather than stand-alone efforts (Smith, 2018). WWF has published its ToC for market transformation, of which certification is a considerable component. As shown in Figure 9, this is very broad-brush so needs further efforts to interpret for individual project planning. These approaches are used actively within mainstreaming strategies in the Grassland and Biodiversity and Land Use projects in South Africa, for example, which will be reviewed in the third activity of this assignment (a review of agency projects).

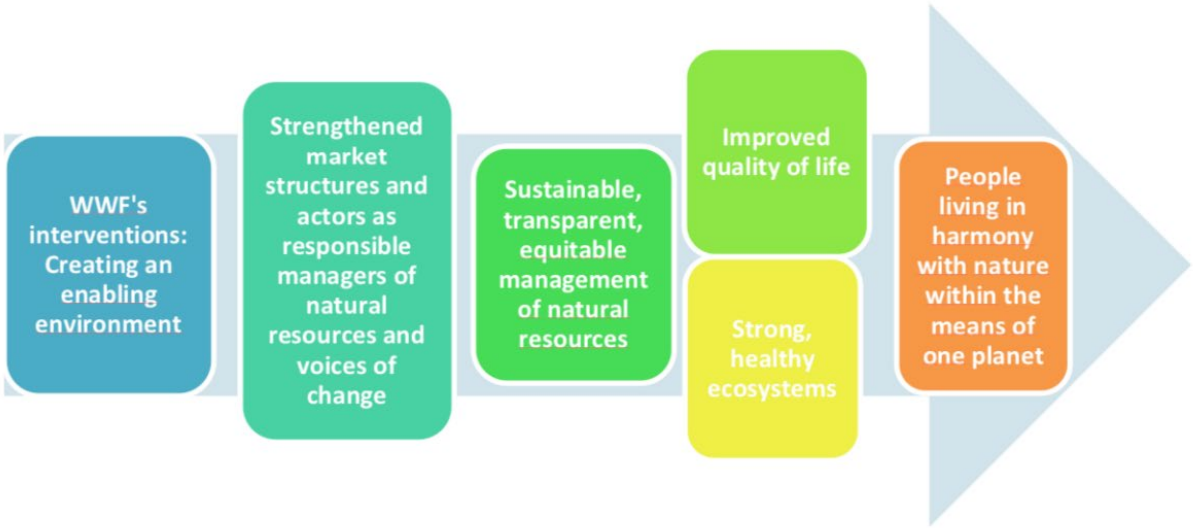


Figure 9: WWF's ToC for market transformation (Source: WWF (2017) Making Markets Work for People and Nature: 2017 Annual Report. © WWF - World Wide Fund for Nature. CC BY-SA 3.0)

PES schemes

Börner et al. (2017) have developed a ToC for the factors determining the environmental and welfare effects of a payment for environmental services (PES) scheme, based on a review of impact evaluation studies of such programmes (Figure 10). The ToC revolves around four key factors. The programme costs affect (1) the number of PES participants for a given budget, and hence (2) the direct impact the programme has on participants. Direct effects may in turn result in (3) indirect, or spillover, effects. The direct and indirect effects will then determine environmental outcomes through (4) the link between PES programme conditions and actual provisions in ecosystem services. For each of these four factors, as well as factors shaping welfare impacts, the authors distinguish between those relating to the context (light shading in Figure 10), design (medium shading), and implementation (dark shading) of the programme. This overlaps with, but is not the same as, the usual assumption, input, output and outcome framing of a ToC. While the authors refer to Figure 10 as a ToC, another perspective is that it is a representation of how factors influencing the outcome interact, but missing key elements of a ToC such as impact pathways and clear differentiation between factors within and outside of the project's control.

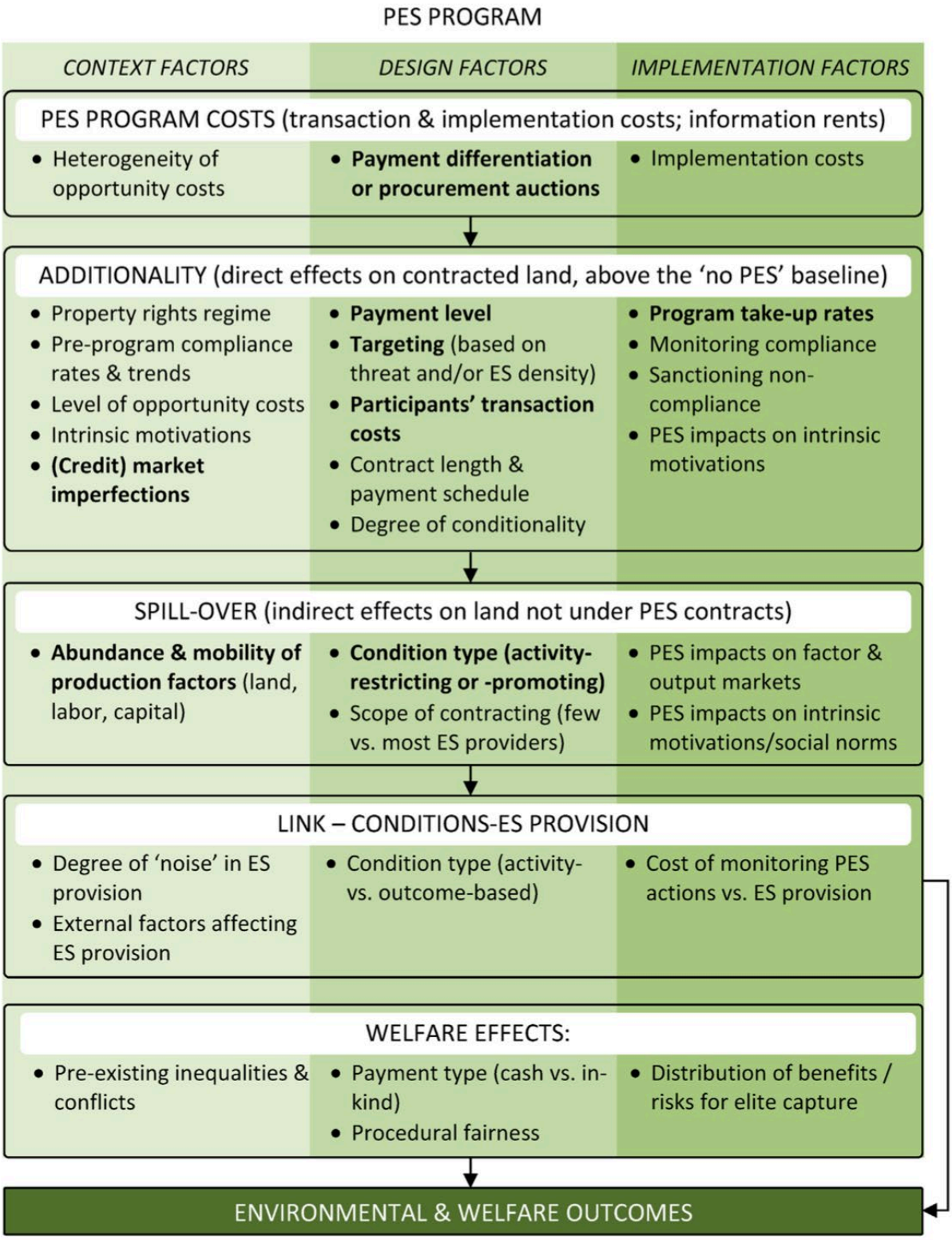


Figure 10: ToC for determining environmental and welfare effects of a PES scheme (Source: Börner, J, Baylis, K, Corbera, E, et al. (2017) The Effectiveness of Payments for Environmental Services. World Development, 96, 359-374. © Elsevier Ltd.)

Engel (2015) suggests designs for PES based on evaluation of good practice but does not articulate a generic ToC. Perhaps one of the most detailed ToCs we identified was that developed by the Fundaçao Amazonas Sustenavel (FAS) for the Brazilian PES scheme *Bolsa Floresta* (FAS 2017: 40 and Figure 11).

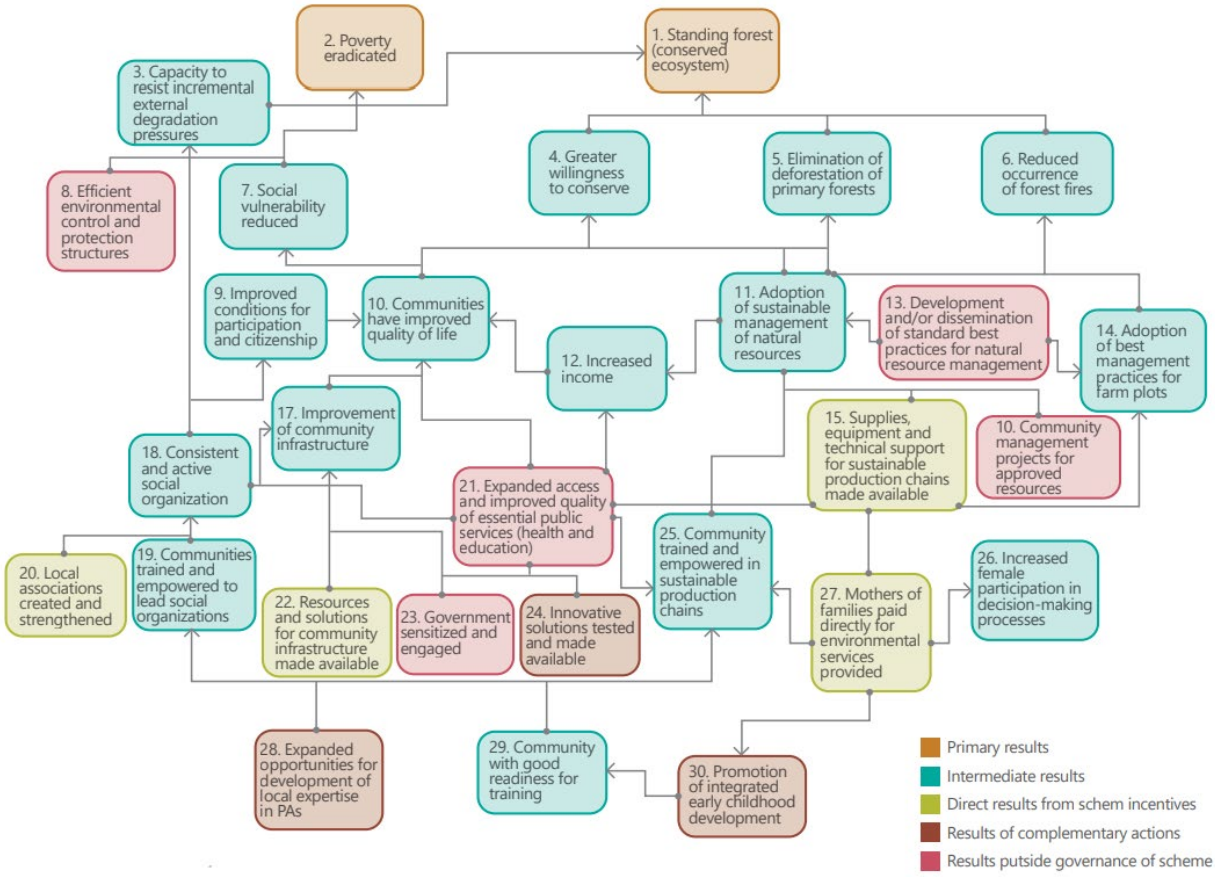


Figure 11: ToC for the Brazilian Bolsa Floresta PES Scheme (Source: Fundação Amazonas Sustentável (FAS) (2017) Designing Innovative Schemes for Payments for Environmental Services. FAS, Manaus. © Fundação Amazonas Sustentável)

The ToC assumes that the conservation of the ecosystem (box 1 in Figure 11) results from a wide range of interlinked and causal factors including, inter alia, a greater willingness to conserve (4) on the part of local people, which in turn requires communities with a higher quality of life (10) and the adoption of sustainable natural resource management (11). This is brought about as a result of standards for best practices (13); availability of supplies, equipment and technical assistance (box 15); and trained communities (25). The adoption of best practices (14) is incentivised by the dissemination of information (13) and by direct transfers of resources (27). This ToC is a good example of an appropriate level of specificity, and the colour coding is helpful to determine when results should be expected. It lends itself well to assembling relevant indicators.

Biodiversity offsets

Biodiversity offsets are the final step of the 'mitigation hierarchy' — a framework for addressing the biodiversity impacts of development projects. The previous steps in the hierarchy are 'avoid', 'minimise' and 'restore', with offsetting being the recommended action to be applied to any residual impacts once these other steps have been exhausted. Offsets do not provide a standalone or complete theory of change for biodiversity mainstreaming; nevertheless, their success can be supported by a broader theory of change for mainstreaming in the project landscape. (More generally, no one pathway can provide a standalone and complete theory of change for biodiversity mainstreaming. If they become magic bullets, this often proves to be the enemy of embedded, multi-path mainstreaming.) According to Githiru et al. (2015: 823) "having a predetermined theory of change built into the biodiversity offset management plan will help defend any later claims" specifically around the offsetting principle of additional conservation outcomes, which stipulates that a biodiversity offset should achieve conservation outcomes above and beyond the results that would have occurred if the offset had not

taken place. However, no published ToC for an offset management plan was identified in the literature — although these are likely to be confidential to immediate stakeholders given potential contentions.

Valuation of biodiversity and ecosystem services

There are numerous efforts currently underway to operationalise the concept of ecosystem services operational and to link it with economic analysis and decision making — national, local and global ecosystem assessments providing one such example. Gallagher et al. (2017) provide a detailed guide to valuation of biodiversity and ecosystem services projects and programmes from planning to communication (Figure 12). This is not a ToC *per se* but gives common ingredients to the user such as tips on the formal and informal institutional, political, legal, economic and social setting of this work.

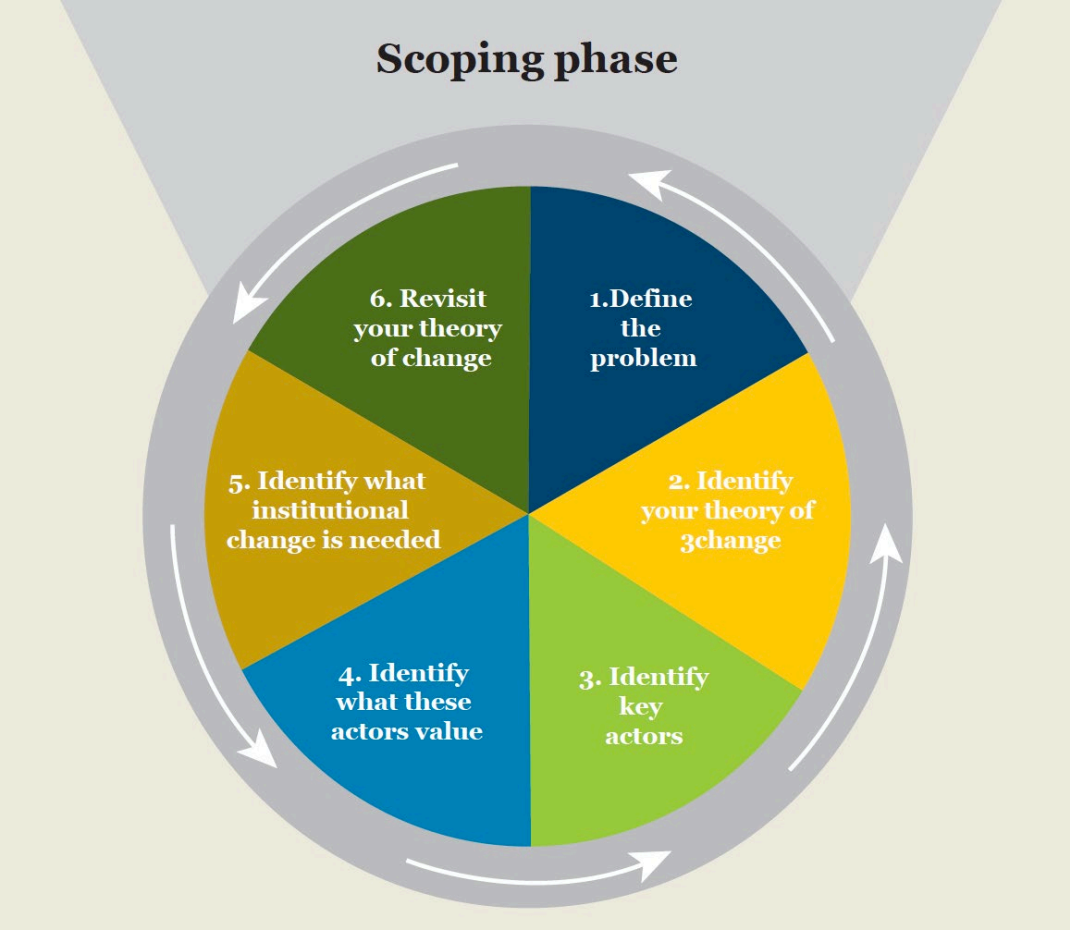


Figure 12: Guide to developing a ToC for BES valuation (Source: Gallagher, L, McKenzie, E, Feger, C, et al. (2017) Creating successful valuing nature initiatives: A guide to analysing local context and developing strong theories of change. Luc Hoffmann Institute, Gland, Switzerland. © Luc Hoffmann Institute).

Ruckelshaus et al. (2015) evaluated applications of ecosystem service information (including valuation information) in 20 decision contexts. They developed pathways (shown in Figure 13) which "approximates our 'theory of change' for the links between: 1) specific inputs and activities (joint production of BES information using simple tools in an iterative, interactive science-policy process); 2) intermediate outcomes in terms of shifting perspectives, generating awareness and buy-in; and 3) penultimate outcomes in terms of integrating the values of nature into specific policies, plans and projects". Their paper has been cited over 250 times, showing that the level of interest in the topic is high.

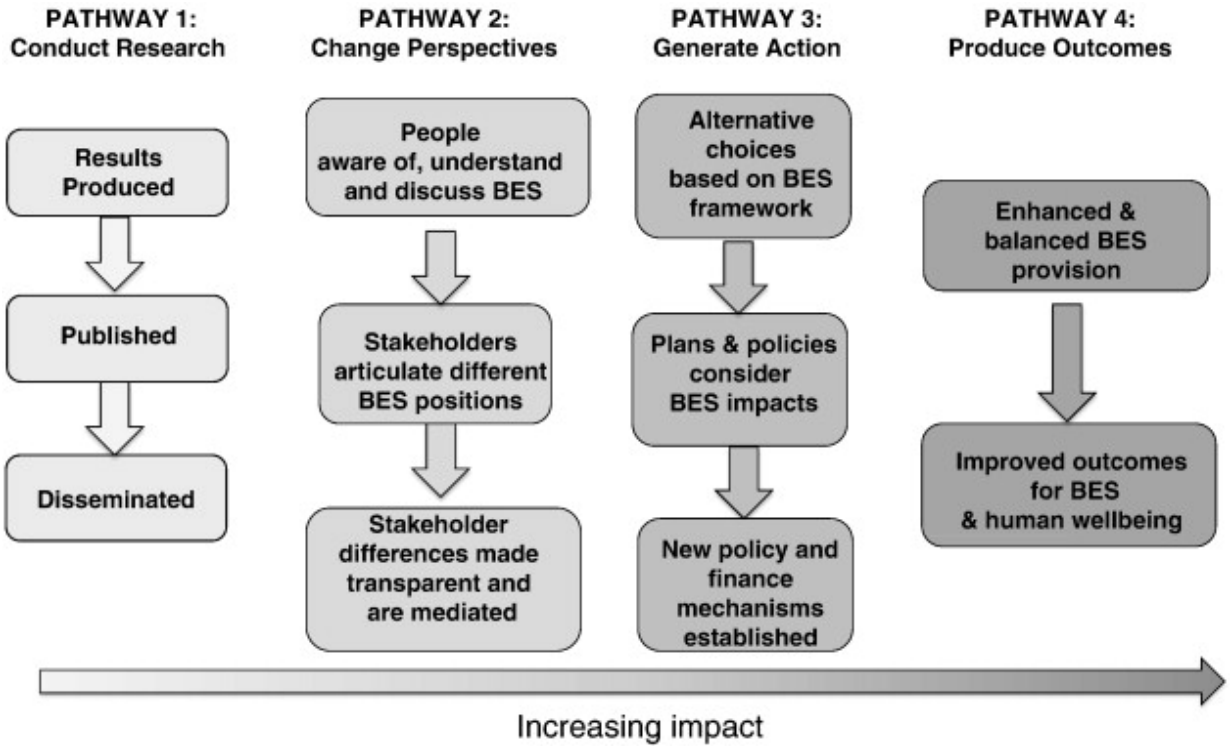


Figure 13: Pathways for and levels of impact of BES information on decisions (Source: Ruckelshaus, M, McKenzie, E, Tallis, H, et al. (2015) Notes from the field: Lessons learned from using ecosystem service approaches to inform real-world decisions. Ecological Economics 115, 11-21. © The Authors. CC-BY-NC-ND.)

Reforming policy, regulatory and planning frameworks

This approach is where most of the historical experience in mainstreaming exists so we expected to find a rich body of ToCs here, but again we struggled to find much documented. Figure 14 provides a useful depiction (though not quite a ToC) of how all the biodiversity mainstreaming entry points relate from a development co-operation perspective (OECD, 2018). This is a good example of showing multiple levels in a single schematic. Drawing out the entry points allows much more precise thinking about what needs to change at each level and how to achieve that.

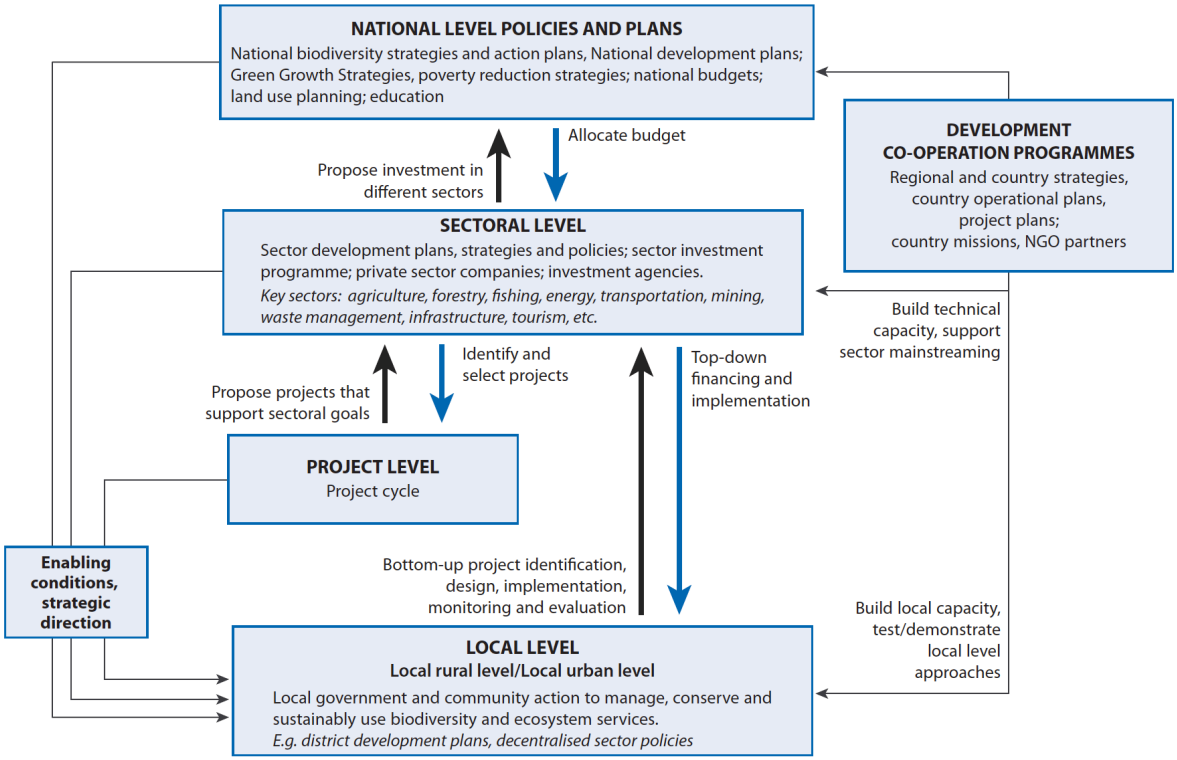


Figure 14: Entry points for mainstreaming biodiversity and development (Source: OECD (2018) Mainstreaming Biodiversity for Sustainable Development, Éditions OCDE, Paris. © OECD)

The 'PEI programmatic approach' (Figure 15) is a form of ToC for poverty–environment mainstreaming that is notably participatory and adaptive. Its key characteristics are summarised as:

- *A focus on ministries of finance and/or development planning* to coordinate and lead mainstreaming
- Choosing to mainstream selected environmental and natural resource issues *linked to poverty reduction, gender equality and inclusive growth* that are capable of being supported by economic analysis to demonstrate relevance to economic decision makers
- Including environment and natural resource issues throughout the *whole budgeting and investment cycle,* from preparation, to approval, to implementation, to oversight (initially the focus was primarily on national plans, but in later years the impetus shifted to integrating environmental and natural resource issues into actual government budgets and their implementation in sectors and at subnational levels)
- *Building long-term relationships within government institutions* — drafting mainstreaming expert committees and sector working groups.

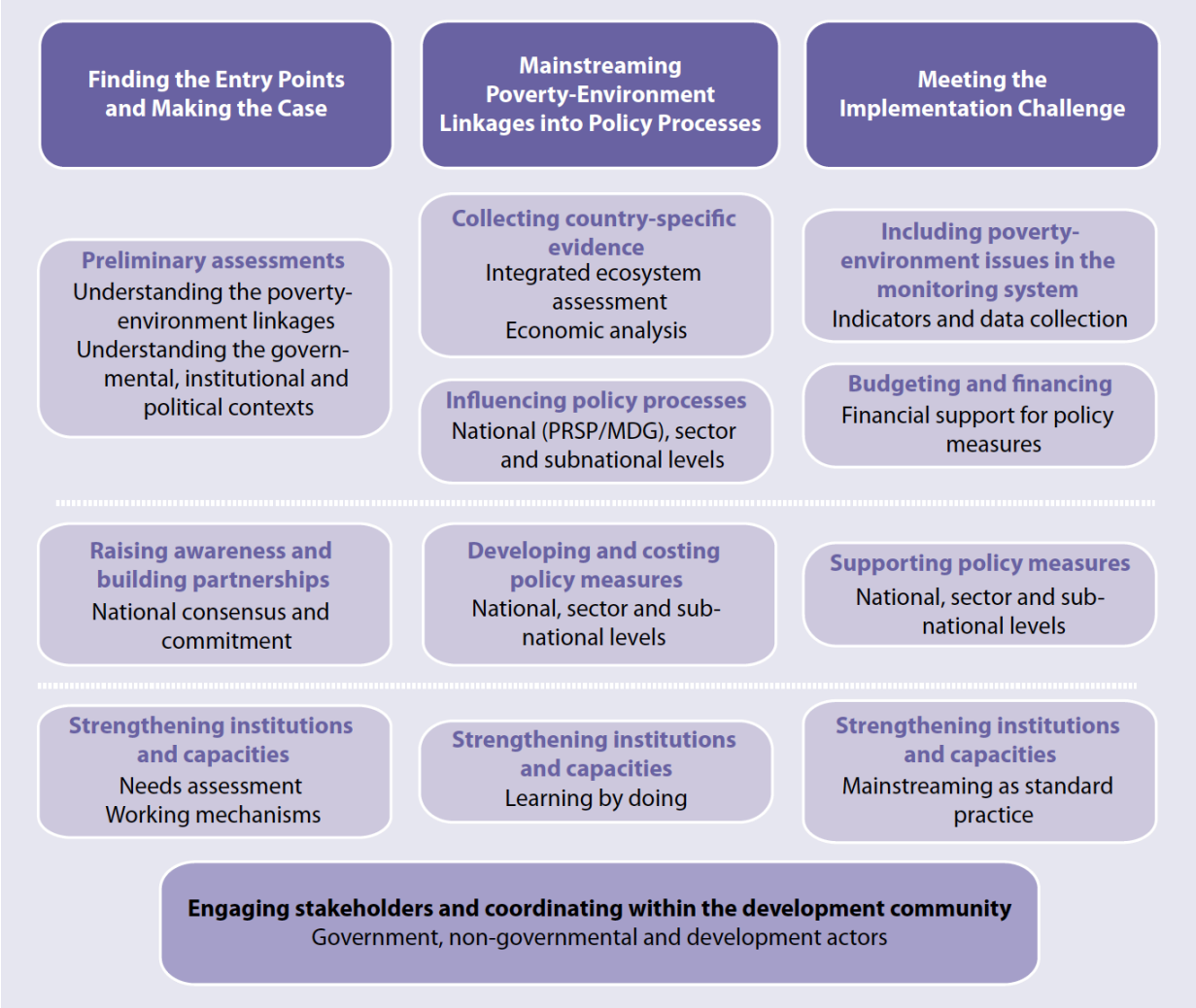


Figure 15: PEI's programmatic approach (Source: UNDP-UNEP (2009) Mainstreaming Poverty-Environment Linkages into Development Planning: A Handbook for Practitioners. UNDP-UNEP Poverty-Environment Facility. © UNDP-UNEP)

Overall, the literature on biodiversity mainstreaming is notable for its lack of an overarching ToC for biodiversity mainstreaming, despite the priority it has been afforded in the CBD and by international organisations. Although ToCs should be context-specific rather than generic, an overarching framework would certainly help to clarify the concept and to situate different approaches within that broader framework.

Mainstreaming typologies

The literature reveals a number of potential typologies for *describing how mainstreaming is carried out in practice*, based on which dimension is under consideration. These are potentially useful for ordering and understanding the wide variety of entry points, pathways and approaches for biodiversity mainstreaming. But no set of such typologies is tightly defined and widely used as yet. This has limited the extent to which the literature on biodiversity mainstreaming is coherent, synthetic, and/or comparative. With these caveats in mind, the general typologies (or dimensions) that characterise biodiversity mainstreaming are:

1. By economic and production sector (very common)
2. By process entered — various types, such as land use planning and market-based mechanisms (common)
3. By stage in the public policy cycle — considering mainstreaming in public policy analysis, in decision making, in investment, in review and in dialogue (common)
4. By mainstreaming instrument deployed — for example, safeguards, information provision and M&E systems (common)
5. By policy instrument developed — for example, regulatory (command-and-control) approaches, economic instruments, information and other, or voluntary instruments
6. By the scale of intervention — for example, international, national or on the ground
7. One-way or reciprocal goal — various forms of two-way relationships
8. By institutional maturity curve or stage — based on level of sophistication in integrating goals and functions
9. By intensity of production landscape — from higher to lower impact land uses
10. By ecosystem type — for example, grasslands or drylands.

Table 2 expands on these typologies (dimensions) in more detail and provides illustrative examples. More consistent use of these typologies by mainstreaming proponents would assist in comparability of mainstreaming experiences.

Table 2: Typologies of mainstreaming approaches

Typology	Detail and example(s)
Economic and production sectors	Long list of sectors, eg agriculture (large-scale or other), small-scale agriculture, use of wild products, development and poverty reduction, extractives (mining, oil and gas, forestry), marine and coastal, water, fisheries and aquaculture (including integrated catchment management), tourism and wildlife, ecosystem services and ecological infrastructure, finance. Used by CBD, GEF and others (very common).
Scale	Scale: international cooperation, national, sector level, landscape level, project level. Used by CBD, GEF, OECD, donors and others involved in mainstreaming (very common).
Institutional maturity	Organisations such as IIED, UNEP-WCMC, OECD and others consider that mainstreaming can be largely viewed as an institutional development task. This task is considered necessary because the institutional frameworks for development and for biodiversity are separate or 'siloed', running along 'streams' that do not converge. According to IIED and UNEP-WCMC (2017), successful mainstreaming starts with identifying the major institutions with a mandate for biodiversity, those for development, and those for integration, as well as particular players who present strong potentials or threats to mainstreaming. Progress in how the national institutional framework integrates biodiversity may be assessed in relation to four levels (UNDP and UN Environment, 2017): • Silos — no integration. Little cooperation and sometimes conflict between biodiversity and development institutions. Cognitive, informational and incentive barriers. • Safeguards — 'do no harm' (eg using an environment impact assessment to minimise developmental damage to biodiversity and a social impact assessment to minimise social damage from biodiversity activities). • Synergies — 'do what we can for co-benefits' (eg 'win-win' biodiversity and development joint pilots and schemes). As biodiversity-development coordination improves, biodiversity mainstreaming spreads as stakeholders become aware of dependence on biodiversity. • Full integration — 'do more by changing the rules' (eg structural change that enables far more win-wins in rights, distributive, fiscal, financial reforms and so on). Normalised action: understanding biodiversity-development synergies and trade-offs, setting biodiversity priorities and optimising co-benefits.

Typology	Detail and example(s)
Process entered	• Policy and regulatory frameworks • Plans (spatial, land use, development, etc) • Management regimes and production practices • Financial mechanisms. Almost all biodiversity mainstreaming involves at least one of these processes. For example, GEF and other donors have used this kind of typology as examples of eligible activity areas.
Public policy process/cycle	Considering steps such as diagnosis, dialogue, planning, financing, implementation, M&E and revision. Countries and those supporting countries to develop mainstreamed NBSAPs, for example, have used this kind of process-focused typology.
Policy instruments	The OECD database on Policy Instruments for the Environment (PINE) provides information on countries with biodiversity-relevant taxes, charges and fees, tradable permits, and other instruments. OECD (2019) categorises mainstreaming efforts by sector and instrument. Public budgeting, expenditure reviews and accounting are identified as common instruments especially in the OECD (OECD, 2018). Taxation, and notably environmental fiscal reform, is emerging as an innovative set of instruments, capturing the attention of policymakers in developed and developing countries, spanning mainstreaming and financing of biodiversity objectives.
Reciprocal	The extensive work of IIED and UNEP-WCMC (2013 to present) to advance biodiversity and development mainstreaming is notable here, including statements from Maun and Entebbe and a range of toolkits including political economy analysis. Biodiversity is considered within UN PEI's environment-poverty mainstreaming approach.

Co-benefits and trade-offs from biodiversity mainstreaming

The prospect of synergies and co-benefits from mainstreaming biodiversity is part of the foundational rationale for stakeholders to work together, as opposed to asserting only the policy and legal context connected to biodiversity. Not pursuing co-benefits implies at best a very limited form of mainstreaming, corresponding to the **silo stage** (stage 1 in Table 2), where parties are not minded to work together and simply assert regulations. Doing this will never get proponents beyond perhaps a more regular **safeguard stage** (stage 2). There has to be an intention to work together if you are to get to the **synergies stage** (stage 3), and even more so to **fully integrated** (stage 4), which requires a reform of the overall governance regime so that there is no longer a marginalisation of biodiversity.

Understanding and realising the benefits from biodiversity for mainstream goals — for example, for development, health or job growth — are core tasks of mainstreaming, and this holistic approach is inherent in the Sustainable Development Goals. At the same time, trade-offs may also exist where management choices that include biodiversity imply the loss of other opportunities or have differential impacts on stakeholders. In the IIED and UNEP-WCMC (2017) definition, "biodiversity mainstreaming is a process of getting biodiversity concerns – potentials, needs and risks – fully reflected in development policies, plans and activities in order to achieve sustainable outcomes for both biodiversity and development". A key factor is the deliberate focus on both the opportunities and risks, as well as the costs and benefits, of biodiversity reflected in mainstream sectors and vice versa.

This section considers positive examples of how co-benefits and trade-offs related to biodiversity mainstreaming have been explicitly addressed, managed, accounted for or monitored. It also considers any emerging approaches or suggestions for doing this. Unfortunately, *within the explicit context of biodiversity mainstreaming*, very little has been published on this topic in the scientific literature (although the project literature promotes 'win-wins'). An exception is Drutschinin et al. (2015: 29–33), who provide a number of good governance, engagement and management principles to address trade-offs and maximise co-benefits in biodiversity mainstreaming at the same time:

- Build strong governance, institutions and legal frameworks
- Ensure open, multi-stakeholder dialogue
- Compensate communities that are negatively affected
- Adopt a precautionary approach
- Adopt a landscape or ecosystem approach
- Encourage policy coherence for development that considers biodiversity, ecosystem services and poverty reduction.

From the wider environmental mainstreaming literature, UNDP and UN Environment (2015: 8) addresses head-on that: "[p]overty-environment linkages can be positive or negative, creating virtuous or vicious circles for environmental preservation and poverty reduction. While trade-offs may be necessary, poverty-environment mainstreaming aims at achieving the best balance between environmental preservation and poverty reduction for the benefit of the poor and long-term environmental sustainability." This is summarised in Figure 16.

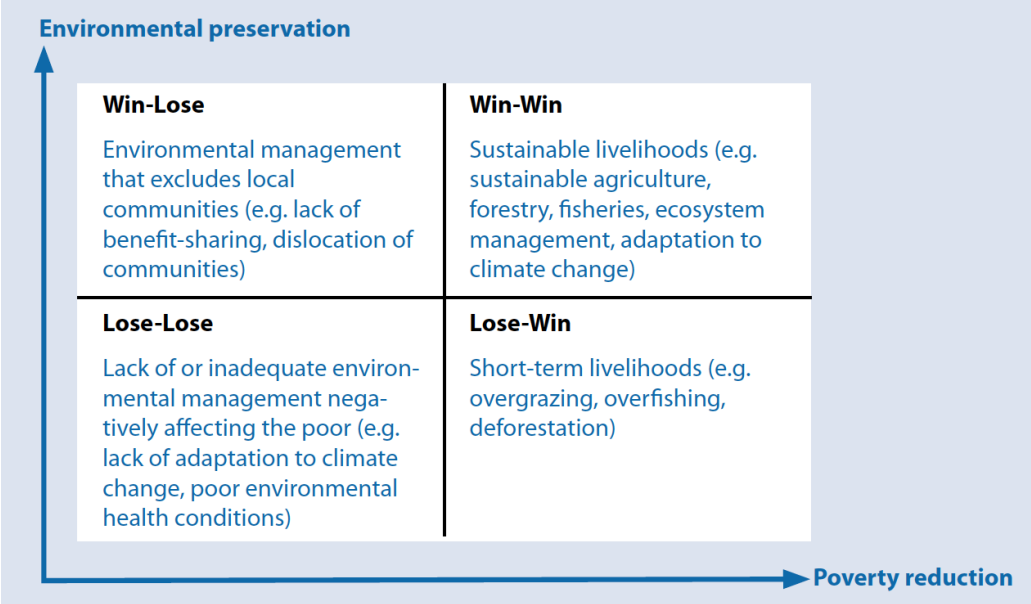


Figure 16: Examples of positive and negative poverty-environment linkages (Source: UNDP-UNEP (2009) Mainstreaming Poverty-Environment Linkages into Development Planning: A Handbook for Practitioners. UNDP-UNEP Poverty-Environment Facility. © UNDP-UNEP)

Howe et al. (2014) suggest that taking a trade-offs approach (as opposed to a win-win approach), and then having an awareness of and accounting for factors that predict a trade-off (private interests, provisioning versus other ES, local stakeholders, etc) and the reasons why trade-offs are often the outcome, may be the most effective route to creating synergies.

There is the question of selecting *priorities* from the (long) list of co-benefits and trade-offs. This is important as mainstreaming often fails by offering too comprehensive an agenda. Success requires consideration of the *economics* of mainstreaming and the *political economy* of tractable, practical mainstreaming.

Co-benefits

'Embedded' and 'multiple' mainstreaming (described in Section 2) are strategies recommended to promote co-benefits and synergies (OECD, 2019). Quatrini and Crossman (2018: 5) report an increase in OECD-funded synergistic actions that cover all three Rio Convention markers on land, biodiversity and climate: "The number of synergistic activities reported as beneficial for all three Conventions registered nearly a threefold surge between 2008 and 2013, marking a 20.5% increase in their relative share of the total number of activities reported for the six years". This is also supported by the large number of mainstreaming projects that are multi-focal area (ie also linked to climate or land, for example) increasing in the GEF portfolio in the past decade (GEF IEO, 2019).

A few examples of how co-benefits have been explicitly addressed, managed, accounted for or monitored, or emerging approaches or suggestions for doing this, do appear in the literature but are not explicitly linked to biodiversity mainstreaming. For example, the links between biodiversity mainstreaming and health have grown in prominence rapidly, especially since February/March 2020 when the coronavirus pandemic was in ascendancy. The links between biodiversity mainstreaming and human health, including pandemic risks related to wildlife, were highlighted to the UN Environmental Management Group in recent years (Machalaba, 2018). Berthe et al. (2018) identify shared drivers between biodiversity loss and recent emerging infectious diseases (EIDs) from wildlife and propose joint efforts in mainstreaming, building on the integrated 'One Health' concept (which has recently experienced a resurgence due to Covid-19).

Nature-based solutions (NbS) are promoted as win-wins for both biodiversity and major societal challenges, including health, but primarily focus on climate change and can vary widely (Seddon et al., 2020). Reid et al. (2019) review a number of ecosystem-based adaptation (one form of NbS) case studies with ecosystem benefits demonstrated alongside social benefits across agricultural/cropland, forest, riverine, coastal, dryland, wetland and grassland. However, the links with mainstreaming of biodiversity are not explored in any sources we identified.

PES schemes, although not originally designed to have social as well as environmental benefits, have increasing moved towards being more concerned with these co-benefits through political realities (various authors cited in Schrekenberg et al., 2018). Schrekenberg et al. (2018: 200) argue that "pro-poor and justice outcomes should not be a 'co-benefit' but instead a prerequisite" to PES scheme development especially those which are user-pays schemes. Hejnowicz et al. (2014) evaluate dozens of PES schemes using a capital asset framework, and find that they provide a range of co-benefits but vary considerably in their outcomes.

Trade-offs

'Ecosystem Services for Poverty Alleviation: Trade-offs and Governance' (Schrekenberg et al., 2018) is a considerable piece of scholarship that brings together many of the 900 scientists supported by ESPA on this topic for ecosystem services (not specifically biodiversity). They conclude that "[t]rade-offs should not be a surprise – they are inevitable. Preparing and planning for trade-offs is necessary and not just a way to avoid undesirable outcomes; exploring trade-offs, especially with respect to poverty and environ mental resources, can reveal many potential opportunities" (p. 308). They cite ESPA-funded and other research that emphasises how trade-offs operate on multiple dimensions across different spatial and temporal scales, with many feedbacks and non-linearities (see also Daw et al., 2015). As a result, they show how, when planning for ecosystem services to be a 'route out of poverty', it is too easy for the result to be simply a 'safety net' or even a 'poverty trap'; ill-informed, non-participatory mainstreaming can lead to unintended effects. Possible trade-offs include:

- Between different biodiversity and environment objectives, especially global values versus local values (eg offsets)
- Between biodiversity and social/economic objectives
- Between spatial locations (Daw et al., 2015)
- Between social groups (Roe et al., 2019) or between individual groups and system-level objectives (trade-offs affecting marginalised people can be overlooked if they are excluded from assessment processes; Daw et al., 2015)
- Between time periods (Daw et al., 2015).
- A trade-off from one perspective may appear to be a synergy from another (as in the case of improved sustainable non-timber forest product (NTFP) trade, where some household incomes grew but overall inequality increased). Therefore, assessments can conceal or reveal trade-offs based on what ecosystem service outcomes are valued and from whose perspective (Campbell et al., 2010).

There are a number of tools for exploring trade-offs which, although not designed specifically for mainstreaming, are highly relevant. Schrekenberg et al. (2018) note the value of mapping social-ecological systems dynamics, and of co-production of knowledge among scientists and local communities — and making this available to decision makers. Citing Galafassi et al. (2017) and Daw et al. (2015), they discuss some participatory examples including for managing 'taboo' or hidden trade-offs. Drutschinin et al. (2015), Sayer et al. (2016) and others provide detailed overviews of models and other tools used in trade-off analysis, with highlights listed in Table 3.

Table 3: Selected tools used in trade-off analysis, and relevance to mainstreaming

Tool for analysing trade-offs	Relevance to biodiversity mainstreaming
Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE) for finance[2]	Tool to visualise how the economy depends on and impacts nature, and how environmental change can create risks for businesses
Integrated Valuation of Ecosystem Services and Tradeoffs (InVEST)[3]	Enables decision makers to assess quantified trade-offs associated with alternative management choices and to identify areas where investment in natural capital can enhance human development and conservation
Vital Signs[4]	Data and diagnostic tools to better inform agricultural decisions and monitor outcomes, integrating agriculture, ecosystem services and human wellbeing dimensions
Landscape Outcomes Assessment Methodology (LOAM) and LOAM-in-Practice[5]	Enables those working on landscape-scale initiatives to be better able to measure, monitor and communicate the nature and extent to which a landscape is changing over time with respect to a small number of agreed conservation and livelihood outcomes
Open Source Impacts of REDD Incentives Spreadsheet (OSIRIS)[6]	Analyses how much countries would get paid by various REDD initiatives to leave their forests intact, and by how much carbon emissions would be reduced as a result
Marxan[7]	Provides decision support to a range of conservation planning problems
Vensim[8] and STELLA[9]	Industrial-strength simulation software packages (customisable)

[2] https://encore.naturalcapital.finance/en
[3] www.naturalcapitalproject.org/
[4] http://vitalsigns.org/
[5] http://wwf.panda.org/?120980/Landscape-Outcome-Assessment-Methodology-
[6] https://openei.org/wiki/Open_Source_Impacts_of_REDD_Incentives_Spreadsheet_(OSIRIS)
[7] www.uq.edu.au/marxan/
[8] https://vensim.com
[9] www.iseesystems.com/store/products/stella-simulator.aspx

Mainstreaming indicators of success

Defining indicators in a project design is useful in order to have a shared metric that project proponents and stakeholders agree on to measure success. IIED and UNEP-WCMC (2017) propose an approach to developing reciprocal mainstreaming indicators that covers the process, inputs, impacts, outputs and outcomes of mainstreaming (Figure 17). Beyond this, the literature was sparse on mainstreaming indicators, highlighting a key gap in learning.

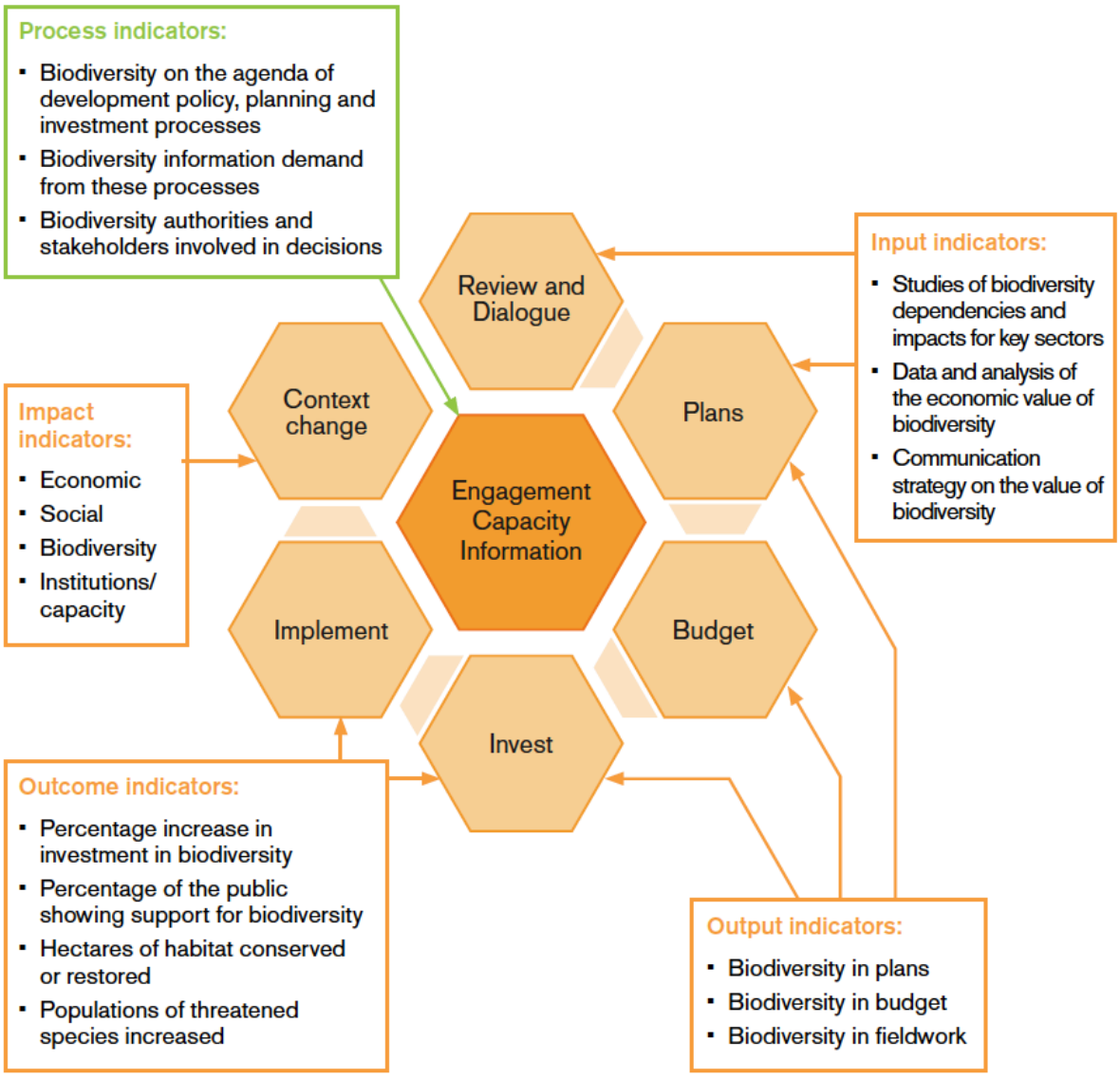


Figure 17: Indicators for reciprocal mainstreaming (Source: IIED and UNEP-WCMC (2017) Mainstreaming biodiversity and development: guidance from African experience 2012-17. IIED, London. CC BY 2.0)

Summary of findings

This review sought to explore a number of key questions to shed light on the theory and practice of biodiversity mainstreaming. Table 4 outlines the key questions and main findings from the literature.

Table 4: Summary of findings for key questions of the review

Question 1: What theories of change for biodiversity mainstreaming have been developed? What theories of change for key recognised pathways for mainstreaming have been developed (eg biodiversity-friendly production systems, biodiversity offsets, valuation of biodiversity and ecosystem services, spatial/land use planning, PES schemes, reforming policy/regulatory/planning frameworks)?	The GEF has developed a ToC for their mainstreaming portfolio, but we found no other ToCs for biodiversity mainstreaming in the literature. ToCs do exist for a number of specific approaches, but these are often implicit rather than explicit and generally lack detail.
Question 2: Are there typologies for ordering and understanding the wide variety of entry points, pathways and approaches for biodiversity mainstreaming, either generally or in specific sectors/contexts? What are they?	There is no clearly defined typology for mainstreaming, but the literature suggests a number of typologies that could be used to understand mainstreaming approaches. These are loosely defined and not used consistently in the literature. They are grouped as: – Economic and production sectors – Scale – Institutional – Process entered – Public policy process/cycle – Policy instruments – Reciprocal – Institutional maturity – Intensity of production.
Question 3: Are there positive examples of how co-benefits and trade-offs have been explicitly addressed, managed, accounted for or monitored, or emerging approaches or suggestions for doing this?	There is a rich literature on trade-offs around ecosystem services and poverty alleviation, but little that is specifically about biodiversity mainstreaming. Useful examples exist for identifying and managing trade-offs, even those that are may be hidden or taboo. A range of tools, both quantitative and participatory, exist and can help explore trade-offs and co-benefits. One author noted approaching the synergies from the trade-offs as a strategy, while others emphasised the moderating effects of governance for success in synergies and trade-offs.
Question 4: Are there indications regarding the success of particular causal pathways? And what indicators are projects using to track this?	We found very little literature on mainstreaming indicators either at the generic level or by causal pathway/mainstreaming approach.

In addition to answering the key questions of the review, a number of lessons to inform biodiversity mainstreaming ToCs and principles have emerged:

1. *Time and timing*: mainstreaming is, as widely reported, a long-term endeavour, but stepwise targets can be defined. Opportunistic timing is critical.

2. *Decision-making cycles and entry points* (whether policy or, for example, production/value chain processes): look for opportunities to increase coherence and continuity to embed biodiversity across the full policy cycle. Is there appetite to treat biodiversity seriously, compared to the environment, natural capital, sustainable development or another allied concept? Consider if biodiversity should be 'nested' within environment mainstreaming, or mainstreaming a set of cross-cutting issues (the latter is a new trend; OECD, 2019). The strategic mainstreamer looks to where issues are resonant and there is capacity to handle mainstreaming (eg national vs local, priority sectors, land uses or landscapes/ecosystems).
3. *Institutional context, maturity and mandates:* the moderators of success that affect mainstreaming barriers and success are often well beyond a project's control. Which can realistically be influenced? Also, carefully examine national and local governance contexts and how they treat nature; there is a vast difference between what will be feasible in, for example, Costa Rica versus Brazil. Mainstreaming tactics should be matched with how far country/sector institutions are able to respond (a poor match leads to mainstreaming failure). Entry points depend upon the stage a country/sector is at:
    - Siloed institutions — 'campaigning' mainstreaming to sensitise about biodiversity's importance and our dependence on it
    - Safeguarding stage — 'negative' mainstreaming focused on minimising damage to biodiversity (Protected Areas, Environmental Impact Assessments, etc)
    - Synergies stage — 'positive' mainstreaming focused on investment case for win-wins (PES, bioeconomy)
    - Structural reform stage — systemic mainstreaming of biodiversity in government and business mandates and machinery (NCA, valuation, plans).

    A key institution needs a strong mandate to promote biodiversity (GEF IEO, 2019).
4. *Multiple values:* ensuring voice and participation, raising champions and recognising that mainstreaming is about values. Different stakeholders will have different views of biodiversity. Mainstreaming proponents should consider all views of biodiversity and ensure that information delivered on biodiversity is relevant to different actors.
5. *Collaboration*: mainstreaming requires both learning and leading (sometimes simultaneously), mixing formal and informal methods, and skilled convening powers. Food, water, health and other nexus issues present great opportunities for identifying co-benefits, underlying causes of biodiversity problems, and promoting reciprocal mainstreaming (eg One Health).
6. *(Holistic) frameworks:* national sustainable development or green economy plans open the door to mainstreaming.
7. *Information needed:* think of what information, to whom, what are their values, and what purpose can they use the information. Information is especially needed on biodiversity-economy interaction 'tipping points' and 'distance to planetary boundaries' (Sterner and Coria, 2011). Evidence is very important, and what evidence on biodiversity is available will influence outcomes.
8. *Disciplines needed:* mainstreaming is, by its very nature, an undertaking that requires multiple stakeholders, perspectives and disciplines.
9. *Tools and mechanisms:* environmental and quality management systems, PEER and Natural Capital Accounting mean that mainstreaming is a recognised 'methodology', not simply a 'campaign'. Be precise, especially on spatial and stakeholder group coverage and financial targets for biodiversity.
10. *Learning and continuous improvement*: mainstreaming is always a work-in progress and requires ongoing reflection and updating approaches.

Reference list

Acemoglu, D and Robinson, J (2008) The Role of Institutions in Growth and Development. Commission on Growth and Development Working Paper No. 10. World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/28045.

Bass, S (2015) Conceptual Frameworks for Integrating Sustainable Development Dimensions, Paper for UNDESA/UNEP/UNDP Workshop on SD Integration tools, Geneva, 14–15 October.

Berthe, F, Bouley, T, Legall, IC, Machalaba, CC, Plante, CA and Seifman, RM (2018) One health: operational framework for strengthening human, animal, and environmental public health systems at their interface. Working Paper. World Bank, Washington, DC. http://documents.worldbank.org/curated/en/961101524657708673/One-health-operational-framework-for-strengthening-human-animal-and-environmental-public-health-systems-at-their-interface.

Blicharska, M, Smithers, RJ, Mikusiński, G, Rönnbäck, P, Harrison, PA, Nilsson, M and Sutherland, WJ (2019) Biodiversity's contributions to sustainable development. *Nature Sustainability* 2 1083–1093.

Börner, J, Baylis, K, Corbera, E, Ezzine-de-Blas, D, Honey-Rosés, J, Persson, UM and Wunder, S (2017) The Effectiveness of Payments for Environmental Services. *World Development* 96 359–374.

Cadman, M, Petersen, C, Driver, A, Sekhran, N, Maze, K and Munzhedzi, S (2010) Biodiversity for Development: South Africa's landscape approach to conserving biodiversity and promoting ecosystem resilience. South African National Biodiversity Institute, Pretoria.

Campbell, BM, Sayer, JA and Walker, B (2010) Navigating trade-offs: Working for conservation and development outcomes. *Ecology and Society* 15(2) 16.

CBD (2002) Text of the Convention on Biological Diversity. www.cbd.int/convention/text/.

CBD (2011) NBSAP Training Package (Version 2.1). Module 3: Mainstreaming biodiversity into national sectoral and cross-sectoral strategies, policies, plans and programs. www.cbd.int/doc/training/nbsap/b3-train-mainstream-revised-en.pdf.

CBD (2014) *Global Biodiversity Outlook 4*. www.cbd.int/gbo4/.

CBD (2018) Update on progress in revising/updating and implementing National Biodiversity Strategies and Action Plans, including National Targets. CBD/COP/14/5/Add.1. 14th Conference of the Parties, Sharm El-Sheikh. https://www.cbd.int/doc/c/3d50/c310/2e8a0f5f3b44fd8c0df5f7f3/cop-14-05-add1-en.pdf

CBD (2019) What is biodiversity mainstreaming? www.cbd.int/development/about/mainstreaming.shtml.

Child, B (2014) Grasslands project terminal evaluation. SANBI, UNDP and GEF. https://info.undp.org/docs/pdc/Documents/ZAF/Grasslands%20Project%20Final%20Report%2023%20September%202014.pdf.

Daw, T, Coulthard, S, Cheung, W, Brown, K, Abunge, C, Galafassi, D, Peterson, G, McClanahan, T, Omukoto, J and Munyi, L (2015) Evaluating taboo trade-offs in ecosystems services. *Proceedings of the National Academy of Sciences* 112(22) 6949–

DEA (2016) National Biodiversity Research & Evidence Strategy (2015-2025). www.environment.gov.za/sites/default/files/docs/biodiversity_strategy_implementationplan.pdf.

Diaz, S, Demissew, S, Carabias, J et al. (2015) The IPBES Conceptual Framework — connecting nature and people. *Current Opinion in Environmental Sustainability* 14 1–16.

Drutschinin, A, Casado-Asensioi, J, Corfee-Morloti, J and Roeii, D (2015) Biodiversity and Development Cooperation. OECD Development Cooperation Working Papers. OECD Publishing, Paris.

Engel, S (2015) The Devil in the Detail: A Practical Guide on Designing Payments for Environmental Services. *International Review of Environmental and Resource Economics* 9 131–177.

ESPA (2016). ESPA Impact Strategy 2016-2017.

FAO (2018) FAO Biodiversity Mainstreaming Platform. www.fao.org/3/CA2403EN/ca2403en.pdf.

FAS (Fundação Amazonas Sustentável) (2017) Designing Innovative Schemes for Payments for Environmental Services.

Friedman, K., Garcia, S., Rice, J. (2018) Mainstreaming biodiversity in fisheries. *Marine Policy* 95 209–220. https://doi.org/10.1016/j.marpol.2018.03.001.

Galafassi, D, Daw, T, Munyi, L, Brown, K, Barnaud, C and Fazey, I (2017) Learning about social-ecological trade-offs. *Ecology and Society* 22(1) 2.

Gallagher, L, Mermet, L and Bhaskar, V (2017) Creating successful valuing nature initiatives: A guide to analysing local context and developing strong theories of change. Luc Hoffmann Institute, Gland, Switzerland. http://archive-ouverte.unige.ch/unige:113218.

GEF (2005) Mainstreaming Biodiversity in Production Landscapes. Working Paper 20. www.stapgef.org/mainstreaming-biodiversity-production-landscapes.

GEF (2016) Biodiversity Mainstreaming in Practice: A Review of GEF Experience.

GEF IEO (2019), Evaluation of GEF Support to Biodiversity Mainstreaming.

Githiru, M, Wilburn King, M, Bauche, P, Simon, C, Boles, J, Rindt, C and Victurine, R (2015) Should biodiversity offsets help finance underfunded Protected Areas? *Biological Conservation* 191 819-826.

Hejnowicz, A, Raffaelli, DG, Rudd, MA and White, PCL (2014) Evaluating the outcomes of payments for ecosystem services programmes using a capital asset framework. *Ecosystem Services* 9 83–97.

Holness, S, StephensII, S, GinsburgII, A, BottsIII, EA, Driver, A, ManuelI, J Maze, K, Wickens, P, Lutsch, W, Malebu, T, Mohasoa, P and MudauI, S (2018) Bridging the research-implementation gap: Mainstreaming biodiversity into the South African mining sector. *Bothalia* 48(1) 1-7.

Howe, C, Suich, H, Vira, B et al. (2014) Creating win-wins from trade-offs? Ecosystem services for human well-being: a meta-analysis of ecosystem service trade-offs and synergies in the real world. *Global Environmental Change* 28 263–275.

Huntley, BJ and Redford, KH (2014) Mainstreaming Biodiversity in Practice: a STAP advisory document. Global Environment Facility, Washington, DC.

IFAD (2012) IFAD Initiative for Mainstreaming Innovation. https://webapps.ifad.org/members/eb/107/docs/EB-2012-107-INF-8.pdf.

IIED and UNEP-WCMC (2012) A Rapid Diagnostic Tool: Biodiversity Mainstreaming – Integrating Biodiversity, Development and Poverty Reduction. IIED, London. https://pubs.iied.org/G03694/.

IIED and UNEP-WCMC (2013) Ten steps to biodiversity mainstreaming. IIED, London. https://pubs.iied.org/14625IIED/.

IIED and UNEP-WCMC (2014) Developing a business case for biodiversity. IIED, London. https://pubs.iied.org/14627IIED/.

IIED and UNEP-WCMC (2015a) Stories of change: mainstreaming biodiversity and development. IIED, London. https://pubs.iied.org/17305IIED/.

IIED and UNEP-WCMC (2015b) Putting biodiversity at the centre of development: a checklist for reviewing the mainstreaming potential of a country's NBSAP. IIED, London. https://pubs.iied.org/17572IIED/.

IIED and UNEP-WCMC (2016) Mainstreaming biodiversity. A guide to selecting strategic development targets. IIED, London. http://pubs.iied.org/17586IIED/.

IIED and UNEP-WCMC (2017) Mainstreaming biodiversity and development guidance from African experience 2012-17. IIED, London.: https://pubs.iied.org/pdfs/17608IIED.pdf.

IUCN (2020) Mainstreaming Biodiversity. www.iucn.org/theme/global-policy/our-work/mainstreaming-biodiversity.

IUCN and Birdlife International (2016) Biodiversity Mainstreaming fact sheets. http://datazone.birdlife.org/info/mainstream.

Karlsson-Vinkhuyzen, S, Kok, MTJ, Visseren-Hamakers IJ, et al. (2017) Mainstreaming biodiversity in economic sectors: An analytical framework. *Biological Conservation* 201(Part A, June) 145–156.

Karousakis, K (2018) Evaluating the effectiveness of policy instruments for biodiversity: Impact evaluation, cost-effectiveness analysis and other approaches: An overview of methodologies and evidence across terrestrial and marine ecosystems. OECD Environment Working Paper 141.

Kotschy, K, Bredin, IP and Dickey, M (2019) A Theory of Change for the Biodiversity and Land Use Project. South African National Biodiversity Institute, Pretoria.

Machalaba, C (2018) Biodiversity Mainstreaming for Health Security. EcoHealth Alliance to UN Environmental Management Group. https://unemg.org/images/emgdocs/Dialogues/ND5/conflict/Machalaba_%20UN%20EMG_Biodiversity%20and%20Human%20Security_%202%20May%202018.pdf.

Manuel, J, Maze, K, Driver, M, Stephens, A, Botts, E, Parker, A, Tau, M, Dini, J, Holness, S and Nel, J (2016), Key Ingredients, Challenges and Lessons from Biodiversity Mainstreaming in South Africa: People, Products, Process. *OECD Environment Working Papers* No. 107, OECD Publishing, Paris. http://dx.doi.org/10.1787/5jlzgj1s4h5h-en.

May, P, Platais, G, Di Gregorio, M, Gowdy, J, Pinto, LFG, Laurans, Y, Cervone, COFO, Rankovic, A and Santamaria, M (2018) The TEEBAgriFood theory of change: from information to action. In: TEEB for Agriculture & Food: Scientific and Economic Foundations. UN Environment, Geneva.

Maze, K, Barnett, M, Botts, EA, Stephens, A, Freedman, M and Guenther, L (2016) Making the case for biodiversity in South Africa: re-framing biodiversity communications. *Bothalia – African Biodiversity and Conservation* 46(1) a2039.

Mickwitz, P, Aix, F, Beck, S and Carss, DN (2009) Climate Policy Integration, Coherence and Governance. Partnership for European Environmental Research, Helsinki.

Mijatović, D, Sakalian, M and Hodgkin T (2018) Mainstreaming Biodiversity in Production Landscapes. United Nation Environment Programme, Nairobi.

Oberthür, S and Stokke, OS (eds) (2011) Managing Institutional Complexity: Regime Interplay and Global Environmental Change. MIT Press, Cambridge, MA.

OECD (2016) What does mainstreaming biodiversity mean? OECD Insights. http://oecdinsights.org/2016/05/22/what-does-mainstreaming-biodiversity-mean/.

OECD (2018), Mainstreaming Biodiversity for Sustainable Development. Éditions OCDE, Paris https://doi.org/10.1787/9789264303201-en.

OECD (2019) Greening Development Co-operation: Lessons from the OECD Development Assistance Committee. The Development Dimension. https://doi.org/10.1787/62cc4634-en.

Quatrini, S and Crossman, ND (2018) Most finance to halt desertification also benefits multiple ecosystem services: A key to unlock investments in Land Degradation Neutrality? *Ecosystem Services* 31(Part B) 265–277. https://doi.org/10.1016/j.ecoser.2018.04.003.

Redford, KH, Huntley, BJ, Roe, D, Hammond, T, Zimsky, M, Lovejoy, TE, da Fonseca, GAB, Rodriguez, CM and Cowling, RM (2015) Mainstreaming Biodiversity: Conservation for the Twenty-first Century. *Frontiers in Ecology and Evolution* 3, 137

Reid, H, Hou Jones, X, Porras, I, Hicks, C, Wicander, S, Seddon, N, Kapos, V, Rizvi, A and Roe, D (2019) Is ecosystem-based adaptation effective? Perceptions and lessons learned from 13 project sites. IIED Research Report. IIED, London.

Roe, D, Seddon, N and Elliot, J (2019) Biodiversity loss is a development issue: a rapid review of evidence. IIED, London. https://pubs.iied.org/pdfs/17636IIED.pdf.

Ruckleshaus, M, McKenzieb, E, Tallis. H, Guerry, A, Daily, G, Kareiva, P, Polasky, S, Ricketts, T, Bhagabati, N, Wood, S A and Bernhardt, J(2015) Notes from the field: Lessons learned from using ecosystem service approaches to inform real-world decisions. *Ecological Economics* 115 11–21.

Ruijs, A and Vardon, M (2018) Natural Capital Accounting for Mainstreaming Biodiversity in Public Policy. Background Report to the Natural Capital Policy Forum, 26–27 November 2018. PBL Netherlands Environmental Assessment Agency.

SANBI (2020) Mainstreaming Biodiversity. www.sanbi.org/biodiversity/science-into-policy-action/mainstreaming-biodiversity/.

Sangha, K, Russell-Smith, J and Costanza, R (2019) Mainstreaming indigenous and local communities' connections with nature for policy decision-making. *Global Ecology and Conservation* 19 e00668.

Sayer, J, Margules, C, Boedhihartono, AK et al. (2016) Measuring the effectiveness of landscape approaches to conservation and development. *Sustainability Science* 12: 465–476.

Schreckenberg, K, Mace, G and Poudyal, M (eds) (2018) Ecosystem Services and Poverty Alleviation. Routledge, London. https://doi.org/10.4324/9780429507090.

Seddon, N, Chausson, A, Berry, P, Girardin, CAJ, Smith, A and Turner, B (2020) Understanding the value and limits of nature-based solutions to climate change and other global challenges. *Philosophical Transactions of the Royal Society B* 375(1794). https://doi.org/10.1098/rstb.2019.0120.

Shackleton, CM, Ruwanza, S, Sinasson Sanni, GK, Bennett, S, De Lacy, P, Modipa, PR, Mtati, N, Sachikonye, M and Thondhlana, G (2016) Unpacking Pandora's Box: Understanding and Categorising Ecosystem Disservices for Environmental Management and Human Wellbeing. *Ecosystems* 19 587–600. https://doi.org/10.1007/s10021-015-9952-z.

Shih, WY and Mabon, L (2018) Land- use planning as a tool for balancing the scientific and the social in biodiversity and ecosystem services mainstreaming? The case of Durban, South Africa. *Journal of Environmental Planning and Management* 61(13) 2338–2357. https://doi.org/10.1080/09640568.2017.1394277.

Smith, J (2018) The GEF contribution to biodiversity mainstreaming in South Africa. Prepared for GEF IEO.

Sterner, T and Coria, J (2011) Policy Instruments for Environmental and Natural Resource Management. RFF Press, Washington, DC.

Suarez, DC (2017) Mainstreaming Natural Capital: The Rise of Ecosystem Services in Biodiversity Conservation. PhD thesis.

UNDP and UN Environment (2015) Mainstreaming Environment and Climate for Poverty Reduction and Sustainable Development: A Handbook to Strengthen Planning and Budgeting Processes. UNDP-UN Environment Poverty-Environment Initiative, Nairobi.

UNDP and UN Environment (2017) Accelerating Sustainable Development in Africa: Country lessons from applying integrated approaches. UNDP-UN Environment Poverty-Environment Initiative, Nairobi.

UNDP-UNEP (2009) Mainstreaming Poverty-Environment Linkages into Development Planning: A Handbook for Practitioners. UNDP-UNEP Poverty-Environment Facility.

USAID (2015a) Biodiversity and Development Handbook. https://rmportal.net/biodiversityconservation-gateway/gateway-resources/biodiversity-and-development-handbook-1.

USAID (2015b) Biodiversity and Development Research Agenda. https://pdf.usaid.gov/pdf_docs/PA00KB5X.pdf.

Van Winkle, C (2015) Mainstreaming Biodiversity at the Sector Level. www.slideshare.net/slideshow/embed_code/45745436.

Vogel, I (2012) ESPA guide to working with Theory of Change for research projects. Ecosystem Services for Poverty Alleviation (ESPA) programme. www.espa.ac.uk/files/espa/ESPA-Theory-of-Change-Manual-FINAL.pdf.

Watkin, LJ, Ruangpan, L, Vojinovic, Z, Weesakul, S and Sanchez Torres, A (2019) A Framework for Assessing Benefits of Implemented Nature-Based Solutions. *Sustainability* 11(23) 6788. https://doi.org/10.3390/su11236788.

WEF (2020) Nature Risk Rising: Why the Crisis Engulfing Nature Matters for Business and the Economy. New Nature Economy series. World Economic Forum in collaboration with PwC. www3.weforum.org/docs/WEF_New_Nature_Economy_Report_2020.pdf.

Whitehorn, PR, Navarro, LM, Schröter, M, Fernandez, M, Rotllan-Puig, X and Marques, A (2019) Mainstreaming biodiversity: A review of national strategies. *Biological Conservation* 235 157–163.

WWF (2017) Making Markets Work for People and Nature: 2017 Annual Report. http://awsassets.panda.org/downloads/Sida_Annual_Report_FY17.pdf.

Annex 1: Materials reviewed

This table lists the top 50 resources on mainstreaming from which data was extracted for this review. The review was further supplemented with individual research on specific topics to answer the questions for the scope of the review.

	Author(s)	Year	Title	Type	Publisher
1	Bass et al.	2017	Natural Capital Accounting for Policy—A Global View of Achievements, Challenges, and Prospects	Grey / corporate	IIED, WAVES, PBL
1	Daw et al.	2015	Evaluating taboo trade-offs in ecosystems services and human wellbeing.	Academic / peer reviewed	US National Academy of Sciences
1	Galafassi et al.	2017	Learning about social-ecological trade-offs	Academic / peer reviewed	ESPA
1	GEF IEO	2019	Evaluation of GEF's Support to Mainstreaming Biodiversity 2018	Grey / corporate	GEF IEO
1	Hunter et al.	2017	Biodiversity mainstreaming for healthy & sustainable food systems: A toolkit to support incorporating biodiversity into policies and programmes.	Process / project output	Bioversity International
1	IIED and UNEP-WCMC	2017	Mainstreaming Biodiversity and Development: African experience from 2012-17	Process / project output	IIED and UNEP-WCMC
1	IIED and UNEP-WCMC	2016	Mainstreaming biodiversity: A guide to selecting strategic development targets	Process/ project output	IIED and UNEP-WCMC
1	IIED and UNEP-WCMC	2015	Stories of change: mainstreaming biodiversity and development	Grey / corporate	IIED and UNEP-WCMC
1	IUCN and BirdLife International	2017	Mainstreaming Biodiversity: What does success look like?	Grey / corporate	IUCN and Birdlife International
1	IUCN and BirdLife International	2017	11 individual fact sheets with different countries, themes, etc.: Coffee Colombia, etc	Grey / corporate	IUCN and Birdlife International
1	Karlsson-Vinkhuyzen et al.	2017	Mainstreaming biodiversity in economic sectors: An analytical framework	Academic / peer reviewed	Biological Conservation

	Author(s)	Year	Title	Type	Publisher
1	Karlsson-Vinkhuyzen et al.	2018	Identifying barriers and levers of biodiversity mainstreaming in four cases of transnational governance of land and water	Academic / peer reviewed	Environmental Science & Policy
1	Karousakis	2018	Evaluating the effectiveness of policy instruments for biodiversity: Impact evaluation, cost-effectiveness analysis and other approaches	Grey / corporate	OECD
1	Manuel et al.	2016	Key Ingredients, Challenges and Lessons from Biodiversity Mainstreaming in South Africa	Grey / corporate	OECD
1	Mijatović et al.	2018	Mainstreaming Biodiversity in Production Landscapes	Grey / corporate	UNEP
1	OECD	2018	Mainstreaming Biodiversity for Sustainable Development	Grey / corporate	OECD
1	Redford et al.	2015	Mainstreaming Biodiversity: Conservation for the Twenty-First Century	Academic / peer reviewed	Frontiers in Ecology and Evolution
1	Ruijs and Vardon	2018	Natural Capital Accounting for Mainstreaming Biodiversity in Public Policy	Grey / corporate	PBL
1	Spurgeon et al.	2018	Combining Forces: Priority Areas for Collaboration	Grey / corporate	Natural Capital Coalition (WAVES, PBL,
1	UN PEI	2018	Looking back, Looking ahead: Lessons on Integrated Approaches to Sustainable Development from the Poverty-Environment Initiative 2005–2018	Process / project output	UNEP and UNEP
1	UN PEI	In development / unpublished	Poverty-Environment Initiative Africa: Achievements and Lessons Learned 2005-2018	Process / project output	UNEP and UNEP
1	UN PEI	2017	Mainstreaming Environment and Climate for Poverty Reduction and Sustainable Development: The Interactive Handbook to Strengthen Planning and Budgeting Processes.	Grey / corporate	UNEP and UNDP Poverty and Environment Initiative
1	UNEP-WCMC, IIED, ALG	unpublished	Measuring biodiversity mainstreaming success: A monitoring and evaluation tool based on African experience	Process / project output	IIED and UNEP-WCMC
2	Alova et al.	2018	Mainstreaming Biodiversity and Development in Peru	Grey / corporate	OECD
2	Duffell-Canham et al.	2017	Protected areas, biodiversity spatial planning and mainstreaming	Process / project output	Western Cape, South Africa

	Author(s)	Year	Title	Type	Publisher
2	FAO	2018	Mainstreaming biodiversity in agriculture, fisheries and forestry for improved food security and better nutrition	Grey / corporate	FAO Global Forum on Food Security and Nutrition
2	Grima et al.	2017	Mainstreaming Biodiversity in Development Practice: Can the Concept of PES Deliver?	Academic / peer reviewed	Progress in Development Studies
2	Herity et al.	2018	Global business practices for mainstreaming biodiversity	Academic / peer reviewed	Biodiversity
2	Holness et al.	2018	Bridging the research-implementation gap: Mainstreaming biodiversity into the South African mining sector	Process / project output	Botalia - African Biodiversity & Conservation
2	Hugé et al.	2020	Mainstreaming biodiversity conservation into development cooperation—highlights from an ALTER-NET-EKLIPSE workshop	Academic / peer reviewed	Oryx
2	Karlsson-Vinkhuyzen	2016	Navigating Mainstreaming Biodiversity in Fields, Forests and Waters of Governance.	Conference paper	ECPR General Conference
2	Leroy et al.	2015	La gestion durable des forêts : un concept et des dispositifs de gestion qui limitent la prise en charge des enjeux de biodiversité	Process / project output	AFD
2	Roe and Tayleur	2016	Mining for Common Ground: Putting Biodiversity on South African Mining Companies' Agendas.	Process / project output	IIED and UNEP-WCMC
2	Tutwiler et al.	2017	Securing sustainable and nutritious food systems through mainstreaming agricultural biodiversity: an interdisciplinary study	Academic / peer reviewed	The Lancet
2	Whitehorn et al.	2019	Mainstreaming biodiversity: A review of national strategies	Academic / peer reviewed	Biological Conservation
3	Diz	2016	ESPA Contributions to Ecosystem Approach to Fisheries and Sustainable Development		ESPA / University of Strathclyde
3	Friedman et al.	In press	Mainstreaming biodiversity in fisheries	Academic / peer reviewed	Marine Policy
3	Hugé et al.	2020	EIA-driven biodiversity mainstreaming in development cooperation: Confronting expectations and practice in the DR Congo	Academic / peer reviewed	Environmental Science & Policy
3	Kettunen et al.	2017	Integration approach to EU biodiversity financing - Evaluation of results and analysis of options for the future	Grey / corporate	IIEP

	Author(s)	Year	Title	Type	Publisher
3	Lovera	2016	Perspectives on Proposed Work on Biodiversity Mainstreaming, Community Conservation and the Role of Incentive	Academic / peer reviewed	Environmental policy and law
3	Rivera	2017	Mainstreaming Biodiversity	Academic / peer reviewed	Aquatic Commons
3	Smith et al.	2018	Mainstreaming international biodiversity goals for the private sector	Grey / corporate	JNCC
3	Smith et al.	2018	Mainstreaming biodiversity targets for the private sector: Technical Appendix (to JNCC Report No. 613)	Grey / corporate	JNCC
3	Trondheim Conference	2019	Biodiversity mainstreaming for healthy & sustainable food systems: A toolkit to support incorporating biodiversity into policies and programmes.	Conference paper	Trondheim Conference
3	True Price (Govt of Netherlands, IUCN et al.)	2017	It pays to be to pays to be transparent. Lessons learned in the Green Deal Cooperation towards Transparency in Natural and Social Capital 2014-2016	Grey / corporate	Govt of Netherlands, IUCN, etc
3	UNSG	2018	Policy coherence for SDGs		
4	Funabashi	2017	Synecological Farming for Mainstreaming Biodiversity in Smallholding Farms and Foods: Implication for Agriculture in India	Academic / peer reviewed	Indian J. Plant Genet. Resour.
4	Shih and Mabon	2018	Land-use planning as a tool for balancing the scientific and the social in biodiversity and ecosystem services mainstreaming? The case of Durban, South Africa	Academic / peer reviewed	Journal of environmental planning and management
4	Simoncini et al.	2019	Constraints and opportunities for mainstreaming biodiversity and ecosystem services in the EU's Common Agricultural Policy: Insights from the IPBES assessment for Europe and Central Asia	Academic / peer reviewed	Land Use Policy
4	Suarez	2017	Mainstreaming Natural Capital	Academic / peer reviewed	UC Berkeley

This report seeks to explore the current status of mainstreaming biodiversity into production sectors — in theory and in practice. It first explores a number of key concepts of biodiversity mainstreaming. Then a review of the literature reveals that while the literature on mainstreaming continues to evolve and improve, its development is hampered by an inconsistent use of terminology and approaches. The report concludes that an empirical framework is needed, as well as more and better 'stories' that will allow the narrative will change.

Project
Materials

Biodiversity

Keywords:
biodiversity mainstreaming, theory of change, co-benefit, trade-offs, Global Environmental Facility (GEF)

iied

International Institute for Environment and Development
80-86 Gray's Inn Road, London WC1X 8NH, UK
Tel: +44 (0)20 3463 7399
Fax: +44 (0)20 3514 9055
www.iied.org

This report was commissioned and funded by the Scientific and Technical Advisory Panel to the Global Environment Facility.