# Scoping Review Protocol

## 1. Review title

A scoping review on determinants of financial institutions' engagement in biodiversity conservation

## Administrative Information

1. Identification: Scoping review/systematic map
2. Registration: Open Science Framework protocol pre-registration

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## 2. Background

Biodiversity underpins the foundation of people's wellbeing and livelihoods and is a core focus for the United Nations Sustainable Development Goals (SDGs) (Xu et al., 2021). However, due to human activities and accelerated climate change, global biodiversity is declining rapidly, threatening food security and human health, compromising our ability to achieve the SDGs (Díaz et al., 2019). Despite national and international efforts to halt global biodiversity loss, the global community failed to meet the majority of the 20 Aichi Biodiversity Targets on Biodiversity 2011-2020 of the Convention on Biological Diversity (CBD). One of the main reasons is the insufficient current financial flows on biodiversity conservation (Droste et al., 2019; Xu et al., 2021). The current financial gap between available financial resources and what is allegedly needed in EU is estimated to be EUR 18.69 billion a year on average between 2021 and 2030 to achieve the EU's biodiversity strategy for 2030 plan[1](Nesbit et al., 2022) and the global biodiversity finance gap is estimated to be USD 598–824 billion per year to achieve the 2050 Vision and goals (Deutz et al., 2020).

Private sectors have been increasingly viewed as a key catalyst to upscale financial resources to support biodiversity conservation and restoration, although private biodiversity investment is still niche (Löfqvist and Ghazoul, 2019; Tobin-de la Puente and Mitchell, 2021; Nedopil, 2022). Currently, the public sector domains the biodiversity conservation, accounting for around 85% of the biodiversity finance globally, but it is still insufficient and hard to fill in the above-mentioned estimated financial gaps (Deutz et al., 2020). Thus, governments and regulators are eager to mobilize private finance for biodiversity in ways that enhance the engagement of the private sectors and generate potential financial flows[2].

Meantime, there is a surge in private sectors' interests in conservation activities including: i) investing directly into biodiversity restoration projects, and/or ii) investing through intermediaries, e.g., philanthropic/public finance institutions and/or portfolio companies with bonds (Cooper and Trémolet, 2019; Thompson, 2023). This is because private sectors gain their awareness of the linkage between them and nature/climate change/biodiversity loss (Deutz et al., 2020). Private sectors might face market risks in equity holdings with material business exposed in nature-sensitive areas and the high cost in emission and reputation risks due to stricter environmental regulation and social (Fang et al., 2019). At the 15$^{th}$ Conference of the Parties (COP15) of the UN CBD in 2021, many private sectors made voluntary commitments to protect biodiversity. Private sectors also expressed a need for standard, guidance, instruments, and policies goals on biodiversity finance. In addition, during our talk with shareholders in Denmark, UK and Netherlands including CFOs from banks, mutual and pension funds, asset managers and sector directors from industry, these private

[1] The EU's biodiversity strategy for 2030 plan to protect 30 percent of European terrestrial and marine areas, including 10 % strictly protected areas. Based on the biodiversity expenditure tracking methodology used by the EU Commission, Nesbit et al. (2022) estimated the total expenditure needed was EUR 48 billion annually between 2021 and 2030.

[2] It is worthy to notice that mobilizing financial flows at scale for biodiversity is a complex problem and requires a systematic solution involving the public sector's center role and private sectors' engagement etc. In this manuscript, although we address the private sector's role, it does not mean that we ignore the role of the public sector and other important players.

sectors also showed significant interests to do investments related to biodiversity conservation activities if effective financing mechanisms/governance infrastructure could be developed to address the challenges and manage the risks they face.

The emerging field and institutional practitioners' demand for guidance on biodiversity finance suggests there is a need in a formal, comprehensive scoping/systematic/meta-analysis and peer-reviewed assessment to map the current state of research on private sectors' role in biodiversity (Karolyi and Tobin-de la Puente, 2022). However, to the best of our knowledge, there has not been a such review except that summaries have been attempted in the grey literature, e.g., Deutz et al. (2020), OECD (2020), Tobin-de la Puente and Mitchell (2021) etc.

Consequently, the goal of this paper is to gather multi-strand and robust evidence based on the state of the literature and give a formal, pre-registered scoping review to document the conditions under which context and to what extent private sectors engage in biodiversity conservation activities. In details, this scoping review will focus on financial institutions (FIs) because they are the key player on the private sector side (World Bank, 2020). Banks, insurance companies, pension and mutual funds are the focus of FIs referred in our study. Then we will explore the overall state of evidence about motivations, obstacles of FIs' engagement in conservation activities, financial tools/mechanisms they operate. This will lay an important knowledge base for researchers, policy makers and stakeholders by outlining the overall landscape of the role of FIs in restoration activities, as well as addressing the research gap in the field of biodiversity finance.

We will apply the five-stage methodological framework proposed by Arksey and O'Malley (2005), Levac et al. (2010) to conduct this scoping review. This protocol is based on the Systematic Reviews and Meta Analyses (PRISMA) Statement extensions for systematic review protocols and scoping reviews, and materials developed by The Campbell Collaboration.

## 3. Review Question

What motivates and hinders financial institutions' engagement in direct biodiversity conservation activities, and/ or fund corporate companies in biodiversity conservation?

## 4. Methods

### a. Setting

This review will investigate global context and is not limited by specific area or country status.

### b. Population

FIs in high- and low-income countries. The main focus are banks, asset manager, insurance companies, pension funds, mutual funds and other financing institutions (e.g. multilateral FIs).

### c. Outcomes of interest

In general, we expect to identify how FIs differ in motivations and barriers in engagement of biodiversity conservation activities by categorizing FIs into different typology groups. For example, banks, asset manager, pension funds, mutual funds, insurance company and other institutions may have different risk-return profiles and concerns, thus differ in different investment activities, time frame, restriction etc. We could categorize FIs by geographic location, financial flows etc. as well. We will explore the following questions but not restricted to them:

Primary interests:

- What kind of activities various FIs engage in?
- To which extent each of FIs engage in biodiversity conservation activities?
- Where the financial funding flows go to?

Secondary interests:

FIs' leverage effectiveness in influencing corporate management and boards towards biodiversity restoration.[3]

**d. Study design/publication type**

We will include original research (qualitative and quantitative studies) and/or peer reviewed articles, reviews articles, and grey literature from reputed institutions (e.g., white paper and reports from World Bank, IFPRI and UN environment Program etc.). We will only include articles written in English.

**e. Definitions**

**Biodiversity**. According to the UN Environment Programme, "biodiversity" is the contraction of the terms biological diversity, and it describes the diversity of life on Earth. It includes all genes, species, and populations; the genetic variation among these; and their complex assemblages of communities and ecosystems (CBD, 1992).

**Biodiversity finance** in this study refers to the expenditure from all sources including both the public sector and private sector that support the conservation and sustainable management of biodiversity.

**Financing institutions** refer to institutions engaged in the business of providing financial services to customers who maintain a credit, deposit, trust, or other financial account or relationship with the institution (15U.S. Code 6826). It includes banks, insurance companies, and other nonbank financial institutions (institutional investors and other nonbank financial intermediaries(such as leasing companies and investment banks) (World Bank, 2015).

**Institutional investors** are specialized financial institutions and play an increasing role in financial sector. Institution investors collect savings collectives, invest in securities and other financial assets, cross-border investment, and ownership of companies on behalf of small investors toward a specific objective at acceptable risk, return maximization and maturity of claims. Institutional investors include public and private insurance companies, pension funds, and forms of mutual funds (Davis and Steil, 2004).

**Public biodiversity finance** refers to finance flows on biodiversity that come from public sectors including national and local governments, regional bodies and institutions and public financial institutions.

[3] Since it is difficult to investigate the outcome of FIs' direct activities on biodiversity, we will try to explore whether we can find evidence on outcome by using their leverage impact on portfolio companies as a proxy. We have noticed that FIs' shareholders could also have impact on the FIs' investment strategies, but in our study, we only focus on how FIs affect their portfolio companies, e.g., using their voting influence supporting portfolios to do green investments, systematically supporting resolutions in shareholders' meetings on biodiversity conservation (Dyck et al., 2019; Krueger et al., 2020).

**Private finance** refers to finance flows on biodiversity from private sectors include philanthropic foundations, institutional investors, corporations, private enterprises and households.

## 5. Search Strategy

Databases:

- CAB Abstracts(Clarivate Analytics)
- Web of Science Core Collection (Clarivate Analytics)
- Scopus (Elsevier)
- EconLit (EBSCO)

We will search the following databases and websites for additional peer-reviewed research and grey literature:

- Collaboration for Environmental Evidence (http://www.environmentalevidence.org)
- AgEcon Search (https://ageconsearch.umn.edu/collections/)
- AGRIS (http://agris.fao.org/agris-search)
- International Institute for Environment and Development (http://pubs.iied.org)
- OECD repositories(https://www.oecd.org/environment/resources/publications-biodiversity.htm)
- World Bank (https://openknowledge.worldbank.org)
- UN environment Document Repository (https://wedocs.unep.org/)
- International Fund for Agricultural Development (https://www.ifad.org/en/)
- French Agricultural Research Centre for International Development (https://www.cirad.fr/en)

A comprehensive strategy will be developed to identify all available studies on the role of FIs on biodiversity restoration. Search terms include variations of the key concepts in the research question: finance, biodiversity, conversation, ecosystem services, financial institutions, risks, portfolio management. We will document complete search terms used for the database CAB Abstracts (Clarivate Analytics). We will also check the bibliographies of included articles to identify other related studies, especially in the grey literature which are not detected in the initial search. Any adjustments to this proposed search strategy will likewise be documented.

We focus on papers published in English and since the year 2000 to map this emerging topic. Our search is restricted to English, because English is the most common language, and we assume most novel findings, scientific research articles are published in this format. Further, studies of the medicine area have shown that exclusion of other language other than English do not necessarily cause a bias (Morrison et al., 2012). The timescale of included studies is between 2000 and 2022 because this could provide a most current landscape, while looking into the time trend for relevant literature.

## 6. Eligibility criteria

**Studies will be included if they meet the following inclusion criteria:**

- Studies published after 2000

- Original research (qualitative and quantitative) and/or a review of existing research, and grey literature
- Studies focused on (or explicitly mentioning) motives of FIs to invest in biodiversity as defined above
- Studies focused on (or explicitly mentioning) obstacles of FIs to invest in biodiversity as defined above
- Studies focused on (or explicitly mentioning) FIs' direct investment activities in biodiversity as defined above
- Studies focused on (or explicitly mentioning) FIs' portfolio management activities on biodiversity conservation as defined above
- Studies focused on (or explicitly mentioning) the impact of FIs' portfolio management on shareholders' engagement in biodiversity

**Studies will be excluded if they meet one of the following exclusion criteria:**

- Studies published before 2000 or after the start of search [TBD]
- Studies that are not original research (qualitative and quantitative) and/or a review of existing research, and grey literature. For example, program proposals, descriptions
- Studies with no explicit focus on motives of FIs to invest in biodiversity as defined above
- Studies that do not explicitly focus on obstacles of FIs to invest in biodiversity as defined above
- Studies with no explicit focus on FIs' direct investment activities in biodiversity as defined above
- Studies with no explicit focus on FIs' portfolio management activities on biodiversity as defined above.
- Studies with no explicit focus on the impact of FIs' portfolio management on shareholders' engagement in biodiversity

## 7. Study records

### a. Data management

Searches will be conducted from all sources listed in Section 5 of this protocol. We will remove duplicated citations based on search results across the sources. Machine learning methods will be used to speed up the screening process. For example, we will distinguish potential studies at the title /abstract screening stage by adding machine-derived metadata for individual citations, and tag populations, countries/regions, types of FIs, and outcome of interest.

### b. Selection process

We plan to use the systematic review software Covidence to do article screening, study selection and data extraction. This includes two stages: i) title, abstract screening and ii) full-text screening. In both stages, two independent reviewers (any two of authors) will review the citations due to the eligibility criteria listed in section 6. Conflicts will be resolved by a third reviewer in Covidence.

### c. Data collection process

We will build a data extract template to document our related results based on core research question, outcome of interests. A flow diagram will be documented following a preferred Reporting Items for PRISMA. All the citations that satisfy the inclusion criteria or do not meet the exclusion criteria will be reviewed in full. If not, we will record reasons to exclude full-text reviews.

**8. Critical appraisal of individual sources of evidence**

The proposed review is a scoping review, so critical appraisal is not mandatorily applicable (for systematic review, it is mandatory to conduct assessment of bias). In order to reduce bias, we follow the best practices from the literature for doing scoping review (Arksey and O'Malley, 2005; Levac et al., 2010), pre-registering our protocol in OSF, making our study transparent. Due to the anticipated heterogeneity of included studies, we may evaluate the studies' critical appraisal taking the reference by Joanna Briggs Institute (JBI) selectively, but we will not perform a formal assessment of bias of all included studies.

**9. Data synthesis/charting**

To illustrate the core research questions and the linked outcome interests, we will tag and map the searching results based on criteria including:

**Scoping**

- Overview of existing studies (publication patterns, countries, study types) to summarize the settings, contexts, and scales of conducted studies
- Motives of FIs on the investment on biodiversity restoration
- Conditions that facilitate or undermine FIs' activities on biodiversity restoration
- Activities of FIs on the investment on biodiversity restoration (i.e. direct investments and/or portfolio leverage)
- Impacts of FIs' portfolio management on shareholders' engagement towards biodiversity
- Differentiation criteria:
  - Type of FIs (e.g., banks, asset managers, insurance companies, mutual funds)
  - Financial instruments/mechanisms
  - FIs' geographical money flow, e.g., funding generated region/country and deployed/beneficiary region/country
  - Portfolio companies' characteristics (geographical and economic characteristics; ESG rating)
  - Funding type themes (e.g., forest biodiversity, agricultural biodiversity, marine and coastal biodiversity, inland water biodiversity etc.)
  - Project characteristics (funding scale, time frame, (expected) risk-return ratios)

**Data**: What are the data sources on studying FIs' role in biodiversity and how is the data's quality, replicability, and availability?
**Method**: What are the existing methodologies relevant to the research questions? How about their replicability?

**Research Agenda**: What are the key knowledge gaps between academic and practitioner communities (e.g., FIs, firms)? What are the key gaps for research, policy, and practice?

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