Tiering biodiversity from SEA to EIA

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Abstract
Biodiversity protection has a pivotal role in the just transition of Impact Assessment (IA) to promote sustainability. Tiering biodiversity from Strategic Environmental Assessment (SEA) of sectoral and land use plans to Environmental Impact Assessment (EIA) of projects is a way to promote this. This paper presents some results of research that uses an existing analytical framework to help understand the extent of consideration of biodiversity in SEA and EIA, and the level of tiering of that knowledge. First, we benchmark the biodiversity coverage in both SEA and EIA literature to understand better the potential for transferring biodiversity knowledge from SEA to EIA. Second, the same analytical framework was used to benchmark the level of tiering of biodiversity evident in case studies from Brazil and the United Kingdom. The application of the framework demonstrates that IA tiering is still very limited despite all recommendations to improve it. Finally, some recommendations are presented to strengthen the tiering of biodiversity in IA practice.

1. Introduction

Since the Convention on Biological Diversity (CBD) was signed, through to the most recent Post-2020 Global Biodiversity Framework (GBF) published in 2021 and agreed as the Kunming-Montreal GBF at the 15th Conference of the Parties (COP 15 – held in December 2022) (Hughes et al., 2022; Chan et al., 2022), impact assessment (IA) instruments have taken a special place for protecting biodiversity (Treweek et al., 2005; Bond et al., 2021; Mandai and Souza, 2021; Milner-Gulland et al., 2021).

In terms of improving the efficiency of knowledge transfer across levels of decision making, Lee and Wood (1978) conceptualized tiering of actions through IA. Some suggestions to encourage tiering on biodiversity-related issues have recently been proposed. Coutinho et al. (2019) emphasized that tiering from SEA to EIA can help to identify critical areas for biodiversity and ecosystems and help to protect or conserve them. Gallardo et al. (2022a) discussed the use of the ecosystems concept as a thread to facilitate tiering in IA and Cumming and Tavares (2022) emphasized that a multi-tiered

approach can help to conserve ecological connectivity within and between the boundaries of national parks.

However, to ensure the efficacy of approaches designed to tier biodiversity knowledge from SEA to EIA, there is a need to have some means of measuring the levels of knowledge at the two tiers and the extent of its transfer. The main objective of this paper is to test an analytical framework previously developed for benchmarking global biodiversity objectives in SEA and EIA using both a representative sample of IA literature, and case studies from Brazil and the United Kingdom.

2. The analytical framework

An analytical framework comprising 18 biodiversity objectives that was previously developed from international policies by Gallardo and Bond (2023) (see Figure 1) was used as the means of determining the focus of biodiversity knowledge at the different tiers of IA.

Themes	Main objectives distilled
Reducing threats to biodiversity	1. to reduce threats to biodiversity
Actively protecting biological diversity of threatened species	2. to guide actions to conserve biological diversity mainly related to threatened species
Wetland conservation	3. to conserve wetlands and their resources
Conservtion of wild flora, fauna, and natural habitats	4. to conserve wild flora and fauna and their natural habitats
Conservation of terrestrial, marine, and avian migratory species	5. to conserve terrestrial, marine, and avian migratory species throughout their range (habitat), to protect endangered migratory species
Conservation of ecosystem services	6. to protect ecosystem services
Protection of genetic diversity	7. to protect genetic diversity
Sustainable use of biological diversity	8. to promote the sustainable use of the components of biological diversity
Fair and equitable sharing of genetic diversity benefits	9. to promote the fair and equitable sharing of the benefits arising out of the utilization of genetic resources to meet people's needs
To promote afforestation and conservation	10. to reverse the loss of worldwide forest; to enhance forest-based sustainability benefits; to significantly increase the area of protected forests worldwide and other areas of sustainably managed forests
To combat desertification	11. to protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification
To halt and reverse land degradation	12. to halt and reverse land degradation
To increase biodiversity	13. to increase biodiversity by avoiding any new degradation of land, reduces existing degradation, and restores already degraded land
To manage risks of LMO	14. to protect biological diversity by managing the risks of Live Modified Organisms (LMOs)
to propose tools and solutions for achieving biodiversity objectives	15. to propose tools and solutions for implementation and mainstreaming (2050 goals to 2030 milestones)
To undertake ex ante assessment of actions affecting ecosystem services and biodiversity	16. to undertake an assessment should towards sustainable development and ecosystem health and biodiversity
To assessment implications of changes in ecosystem services for human well-being	17. to assess the consequences of ecosystem change for human well-being and to enhance the conservation and sustainable use of ecological systems and their contribution to human well-being
To maintain up-to-date knowledge of ecosystem services and biodiversity	18. to perform regular and timely assessments of knowledge on biodiversity and ecosystem services and their interlinkages at the global level in order to provide a summary of the status of biological diversity to ensure that biodiversity is conserved and used sustainably
International Biodiversity Milestones*: The IUCN Red List of Threatened Species (Red List); CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora; The Ramsar Convention; The Bern Convention; The Bonn Convention (the Convention on Migratory Species); Convention on Biological Diversity (CBD); United Nations Forest Instrument; Agenda 21; UN Convention to Combat Desertification; The Cartagena Protocol on Biosafety to the Convention on Biological Diversity; The Millennium Ecosystem Assessment; Aichi Biodiversity Targets (Strategic Plan 2011-2020); The Nagoya Protocol on ABS; IPBES: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services; Sustainable Development Goals; Post-2020 Global Biodiversity Framework – 2020: (2030 actions targets); Global Biodiversity Outlook (GBO) (there are 5 reports); BBNJ (biological diversity areas beyond national jurisdiction) agreement under the United Nations Convention of the Law of the Sea (UNCLOS)	

Figure 1 – Analytical Framework for evaluating extent of inclusion of biodiversity objectives in IA (modified from Gallardo and Bond, 2023).

3. Methods

The analytical framework was firstly applied to SEA and EIA literature to determine the extent to which the international biodiversity policies' objectives are currently addressed, firstly locating the relevant literature to evaluate; and then applying the analytical framework to this literature.

Based on a Scopus search, 503 papers on SEA (published between 1996 and April 2022) and 3383 papers on EIA (published between 1991 and April 2022) were found, which after being filtered resulted in 55 papers on SEA and 127 papers on EIA. Grey literature sources were also identified using the Google search engine (7 results for SEA and 16 results for EIA) to give a final sample of 62 documentary sources for SEA and 143 documentary sources for EIA. All the documentary sources were searched using terms developed from the themes and objectives presented in Figure 1 (see Gallardo and Bond, 2023). This analysis indicates which biodiversity objectives are considered at each level and so highlights possibilities for tiering, albeit there is no indication of whether tiering actually takes place.

The analytical framework was also applied to case studies of SEA followed by EIA, to identify evidence of IA tiering in practice. Two contrasting jurisdictions for SEA regulation and biodiversity were selected: Brazil (high biodiversity (Fearnside, 2016), limited SEA practice (Gallardo et al., 2021; Nadruz et al., 2018)); and England (extensive loss of biodiversity (Cunningham et al., 2021; RSPB, 2021), extensive SEA practice with some drivers for tiering (Bond and Fischer, 2022)). In both case studies, the plans and projects operate within a context of ecological conservation designations, which inform the IA processes.

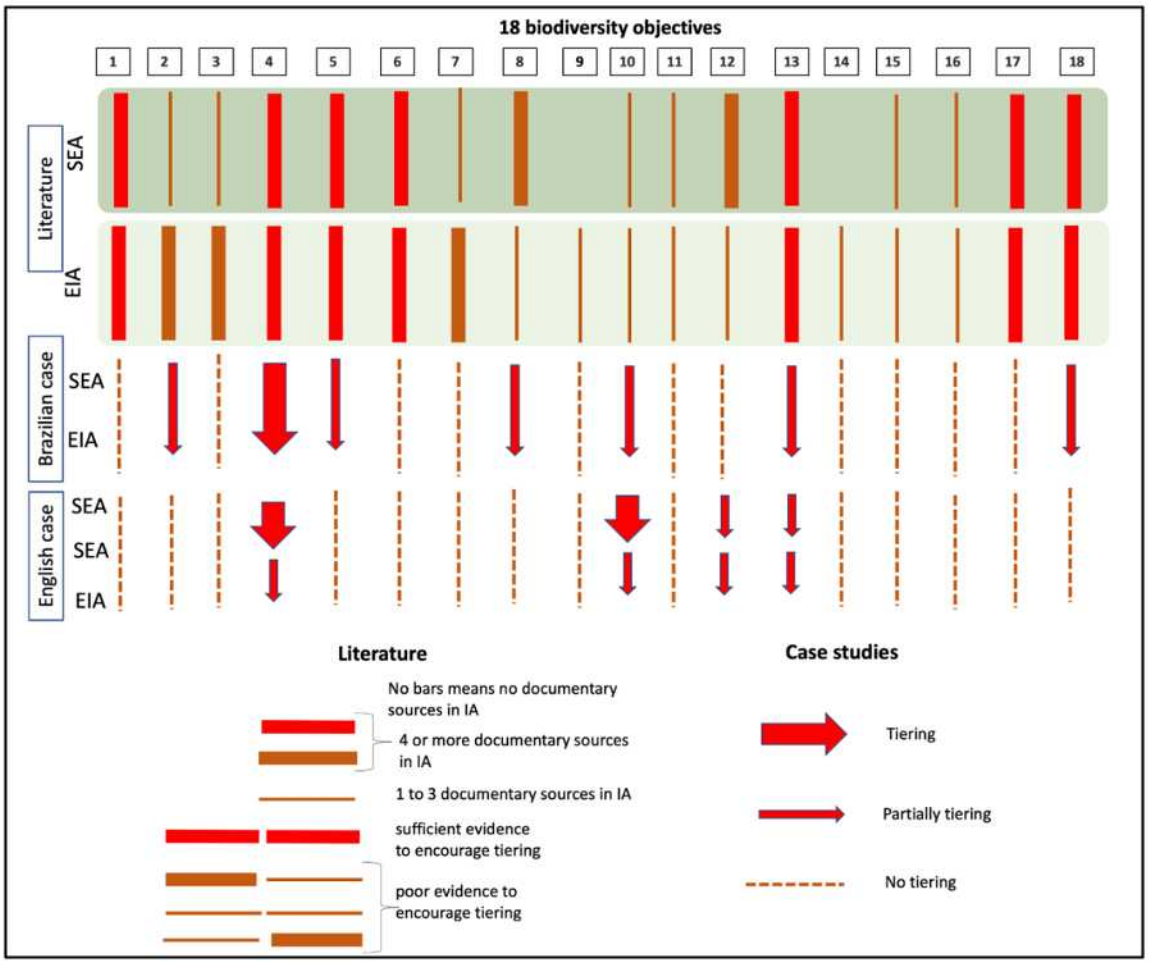
The analytical framework was used in both case studies to investigate a) the extent to which global biodiversity objectives are addressed at the SEA and EIA levels; b) the extent to which there is explicit reference in the lower tier (EIA or SEA) to the biodiversity objectives mentioned in the higher tier (SEA).

Regarding the Brazilian case, the SEA of the Multimodal Transport and Mineral-Industrial Development Program of the Cacao Region (Bahia state) (http://www.lima.coppe.ufrj.br/images/documentos/projetos/aae_sumario_executivo-porto-sul.pdf) was selected because the decree law (11.235/2008) that approves the environmental and biodiversity protection policy in the state of Bahia, has an article that allows the State to request an SEA to evaluate planning. The Environmental Impact Statement (EIS) Porto Sul Complex (http://licenciamento.ibama.gov.br/Porto/Porto%20Sul%20-%20Bahia/EIA/) is an EIA project derived from the development program analysed in this SEA. The English case study includes two tiers of SEA and a project EIA. This case study will consider one example of the SEA for the Greater Norwich Local Plan, GNLP: https://gnlp.oc2.uk/docfiles/46/GNLP_SA_Reg18(C)_Final.pdf) which is a collaboration between the local authorities of Norwich City Council, Broadland District Council, and South Norfolk District Council. There is a neighbourhood plan adopted within the GNLP for a proposed new town (Rackheath Neighbourhood Plan: https://www.southnorfolkandbroadland.gov.uk/downloads/file/67/rackheath-neighbourhood-plan) which is consistent with the GNLP. Then, planning applications to deliver the housing expected are separately submitted to the local authority (which in

this neighbourhood is Broadland District Council), for example, the North Rackheath housing application (https://secure.broadland.gov.uk/MVM/Online/dms/DocumentViewer.aspx?PK=771254&SearchType=Planning%20Application), which has to be consistent with the neighbourhood plan and was subject to EIA.

4. Results and Discussion

Figure 2 presents the results from the application of the analytical framework firstly in relation to the objectives identified in the documentary sources for SEA and EIA, and secondly for the Brazilian and English case studies of SEA followed by EIA.



Sources: modified from Gallardo and Bond (2023) and Gallardo and Bond (submitted).

Figure 2 – Evidence of biodiversity focus within SEA and EIA from literature and the evidence for biodiversity tiering taking place from SEA to EIA in the two case studies (Brazilian and English).

Figure 2 reveals those objectives that are referenced more at EIA level than SEA level (objectives 2, 3 and 7). Objectives 9 and 14 have little reference at the EIA level, but no reference at the SEA level. For objectives 1, 4, 5, 6, 13, 17 and 18, there is some

evidence that there is relatively frequent consideration in both EIA and SEA. From the literature, prompts can be identified which help to explain how tiering can be facilitated. For example, to encourage tiering to reducing threats to biodiversity (objective 1), conservation actions considering red list species can be guided at the SEA level using Citizen Science as a tool (Barnard et al., 2017) whose data can be confirmed and detailed at the EIA level project, for example, through indicators for a listing of threatened ecosystems by individual projects (Botts et al., 2020).

Thérivel and González (2021) highlight biodiversity as a relevant environmental issue to be addressed at different tiers of plan-making and EA practice. Figure 2 shows that evidence of explicit tiering of biodiversity knowledge from the SEA to the EIA in the Brazilian case is limited, albeit some tiering practice is evident for seven out of the 18 biodiversity objectives. For the English case, the scope of biodiversity is understandably smaller (only four out of the 18 biodiversity objectives) than in the Brazilian case and with limited tiering results, albeit the proportion of objectives considered that were tiered (fully or partially) is much higher than in the Brazilian case. Except for objective 4 for the Brazilian case, the transfer from the planning level to the project level (EIA) was always partial, restricting the potential benefits of EA tiering. The analysis of the Brazilian and English case studies demonstrates that tiering of biodiversity objectives does exist, but is limited, in line with previous findings (Sánchez and Silva-Sánchez, 2008; Coutinho et al., 2019; Gutierrez et al., 2021; Gallardo et al., 2022a).

4. Conclusions

Considering that all 18 objectives have some analysis mirrored in the sets of papers analyzed from the literature, the practice of IA, in accordance with Craik (2017), is helping to shed light on biodiversity goals. Consideration of some biodiversity objectives is widespread showing that certain biodiversity issues are widely covered in the IA literature and a variety of methods may already be available to capture these elements of biodiversity in current IA practice as demonstrated by the methods developed by Brownlie and Treweek (2018); Mandai and Souza (2021); Gutierrez et al. (2021); Gallardo et al. (2022b).

The importance of biodiversity objectives being considered in the SEA planning cycle for the subsequent EIA is that the strategic aspects of biodiversity are not only present but detailed at the level of local actions in individual projects or initiatives. The extensive literature on the consideration of biodiversity in SEA and EIA practice demonstrates the connection between these themes subject to the analytical framework being valid. Further development of this analytical framework can help to improve its ability to fully reflect biodiversity tiering, and may lead to the development of metrics and, ultimately, suggested methods to enhance tiering of biodiversity knowledge.

Our study finds limited evidence of biodiversity tiering considering two contrasting Brazilian and English planning cases. The Brazilian case shows that even though a wide range of biodiversity objectives are considered in planning guided by the SEA and that some may even be present in the EIA, an explicit connection between them is not guaranteed. Likewise, the English case, which shows limited consideration of

biodiversity issues even with mature planning in the EA process, also reveals an incomplete connection between tiers.

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