

“Ripe for decision”: Tiering in environmental assessment

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ABSTRACT

Tiering of information and decisions from more strategic plans to more specific projects (and sometimes the other way) can streamline plan-making and assessments, and improve decisions at each planning tier. In particular, it can lead to more consistent and comprehensive impact mitigation at the lower tiers. In practice, however, tiering of assessments is carried out only sporadically. This paper reviews the international literature and case studies on Strategic Environmental Assessment (SEA) and Environmental Impact Assessment (EIA) tiering, and presents the findings of interviews with 14 SEA/EIA experts. It concludes that a conscious and explicit transfer of information from the SEA level, and an explicit receipt of this information at the EIA level are necessary prerequisites for effective tiering. SEAs must be carried out with local actions in mind, in order for mitigation measures to support environmental protection on the ground. Lower-tier decision-makers must also be willing to be bound by decisions by the higher-tier SEA, focusing on implementation of these decisions.

1. Introduction

Tiering in environmental assessment¹ is “*the deliberate, organized transfer of information and issues from one level of planning to another... supported by [environmental assessments]*” (Arts et al., 2011, p.417). Tiering typically takes place top-down, from an earlier, more strategic plan and its Strategic Environmental Assessment (SEA) to a later, more specific project and its Environmental Impact Assessment (EIA).

Tiering of environmental assessments can allow the right issues to be considered at the right time and appropriate mitigation to be put in place, supporting the right decision through cascades and feedback loops of information. It fosters streamlining of assessments and strengthening of plans. In the words of the United States (US) National Environmental Policy Act, it allows parties to “focus on the actual issues ripe for decision” at each level of environmental assessment (NEPA, 1970, 40 CFR 1501.11). However, while tiering can provide significant advantages, and environmental legislation promotes its application, there is limited literature on the subject and a dearth of knowledge of how it is implemented in practice.

This paper aims to explore the current status of environmental assessment tiering internationally, with a focus on tiering from SEA to EIA, and to identify opportunities for improving tiering. It presents

information collected as part of a research project funded by the Irish Environmental Protection Agency. It starts by reviewing the international literature and legislation on environmental assessment tiering; presents the results of 14 expert interviews about tiering; summarises some examples of effective tiering; and makes recommendations about how tiered environmental assessment practice could be improved internationally.

2. Methodology

The literature review used the search engines Google, Academic Search Complete, Science Direct and Zetoc, using the search terms ‘tiering’, ‘tier’, ‘hierarchy’, ‘strategic environmental assessment’ and ‘environmental impact assessment’. This search identified 66 articles, of which 53 were found to be relevant for this study. Based on this initial search and interviews, additional readings were identified. From the initial search, it also became clear that the US system of tiering was significantly better developed than that of other countries, so additional web-searches were carried out to identify literature and examples of US tiering. In total, about 100 articles and examples of tiered assessments were systematically reviewed. The review focused on identifying benefits of and constraint to tiering as well as tiering case studies.

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¹ This paper uses ‘environmental assessment’ to refer to both Strategic Environmental Assessment of plans and programmes, and Environmental Impact Assessment of projects.

Box 3

Main references to tiering in the US 'Final Rule Modernizing its NEPA Implementing Regulations' (CEQ, 2020).

§1508.1 Definitions: ... Tiering refers to the coverage of general matters in broader environmental impact statements or environmental assessments (such as national program or policy statements) with subsequent narrower statements or environmental analyses (such as regional or basin-wide program statements or ultimately site-specific statements) incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared.

§1500.4 Reducing paperwork: Agencies shall reduce excessive paperwork by: (...) Using programmatic, policy, or plan environmental impact statements and tiering from statements of broad scope to those of narrower scope, to eliminate repetitive discussions of the same issues.

§ 1501.11 Tiering:

- (a) Agencies should tier their environmental impact statements and environmental assessments when it would eliminate repetitive discussions of the same issues, focus on the actual issues ripe for decision, and exclude from consideration issues already decided or not yet ripe at each level of environmental review. Tiering may also be appropriate for different stages of actions.
- (b) When an agency has prepared an environmental impact statement or environmental assessment for a program or policy and then prepares a subsequent statement or assessment on an action included within the entire program or policy (such as a project- or site-specific action), the tiered document needs only to summarize and incorporate by reference the issues discussed in the broader document. The tiered document shall concentrate on the issues specific to the subsequent action. The tiered document shall state where the earlier document is available.
- (c) Tiering is appropriate when the sequence from an environmental impact statement or environmental assessment is:
 - (1) From a programmatic, plan, or policy environmental impact statement or environmental assessment to a program, plan, or policy statement or assessment of lesser or narrower scope or to a site-specific statement or assessment.
 - (2) From an environmental impact statement or environmental assessment on a specific action at an early stage (such as need and site selection) to a supplement (which is preferred) or a subsequent statement or assessment at a later stage (such as environmental mitigation). Tiering in such cases is appropriate when it helps the lead agency to focus on the issues that are ripe for decision and exclude from consideration issues already decided or not yet ripe.

The telephone interviews with international experts focused on current tiering practice, with the aim of identifying good practice and updating the findings of the literature review. We initially planned to interview eight international SEA-EIA experts about tiering. However, given the US's observed expertise in tiering practice, three additional interviews were carried out with US SEA-EIA experts. The initial round of interviews also identified three additional relevant interviewees. [Box 1](#) presents the professional profile and affiliation of the 14 experts ultimately interviewed. We anonymised the interviewees to help ensure confidentiality and honest responses; they are presented as numbers (I1, I2...) in the sections below.

[Box 2](#) lists the initial questions for the semi-structured interviews, although some of the interviews ranged far beyond these questions. The interviewees largely focused on discussing vertical flows of information and tiering from SEA to EIA. The interviewees were asked for examples of good tiering practice: these and other case studies identified through the literature review form the basis of [Section 5](#) on current tiering practice. The findings of the literature review, interviews and case studies were brought together into recommendations about how tiering could be improved.

3. Literature review: reflection on key findings

The flow of information that occurs through environmental assessment tiering runs through the various planning hierarchies or tiers, which are often divided into (adapted from [Arts et al., 2011](#); [Therivel, 2010](#)):

- Policy: Inspiration and guidance for action; typically, at the national scale, not spatially specific, and without a time end-point (e.g. national policy on renewable energy or transport);
- Plan: Forward-looking strategy; typically, at a smaller scale and more spatially specific than a policy, often cyclical (e.g. 20-year regional development plan with 5-year reviews);
- Programme: Time-bound schedule of proposed commitments/projects in a particular sector or area (e.g. annual programme of transport projects); and

- Project: Specific development proposal (e.g. wind farm or railway line).

Policies, plans and programmes can be sectoral where they deal with a specific sector such as energy or transport; or they can be spatial where they deal with all the activities in a specific area (e.g. land-use plans). The policy, plan and programme levels can be informed by SEA, and large projects are informed by EIA. In theory, planning and environmental assessment tiers are hierarchical and sequential: higher tiers of planning and their SEAs precede, inform and set a structure for lower tiers of planning and their SEAs/EIAs.² However, horizontal flows of information (e.g. a plan influenced by another SEA at the same planning level) as well as diagonal ones (e.g. a plan influenced by an SEA of a higher-tier plan in a different sector) are not uncommon, and tiering up from project EIAs to policy/plan/programme SEAs can also occur. Nevertheless, in practice, as discussed below, almost all environmental assessment tiering seems to flow downward from policy to plan to programme SEA and, ultimately, to project EIA. This is also the main angle from which tiering is explored in this paper. In practice, tiering is most apparent between plan/programme SEA and project EIA, rather than policy SEA to plan SEA, plan SEA to programme SEA, and programme SEA to project EIA.³

Although tiering is typically discussed in terms of environmental assessment, of course, the related plan and project are integral to the tiering process. In the absence of tiering, the SEA informs its plan and the EIA inform its project about environmental impacts, but there is no interaction between them ([Fig. 1a](#)). With tiering, however, the plan and its SEA directly informs and constrains projects and their EIAs ([Fig. 1b](#)). In such cases, SEA data can be reused in EIAs; the preferred alternatives emerging from an SEA are integrated into the plan-making process, and set the basis for the type and location of subsequent projects; and

² For the purposes of this paper, a higher tier is any tier that precedes and is more strategic than a lower tier.

³ Policy/plan/programme is referred to as plan from here on to ease the narrative.

Box 1

Experts interviewed on SEA and EIA tiering practice.

Expert and affiliation	Country(ies) of expertise
Academic, University of Groningen	Netherlands, international
Consultant, ICF	United States
Government official, Scottish Government	Scotland
Government official, Northern Ireland Environment Agency	Northern Ireland
Academic, University of Liverpool	Germany, UK, international
Consultant, Bosch & Partner GmbH Environment Consulting	Germany
Government official, Western Cape Department: Environmental Affairs and Development Planning	South Africa
Consultant, DGE Group	Estonia, international
Consultant, WSP	United States
Government official, Department of Housing and Urban Development	United States
Academic, University of Saskatchewan	Canada
Consultant, World Bank	Developing countries, notably in South America
Consultant, ESG Consulting	Kazakhstan, Russia, Kenya
Consultant, AECOM	England

Box 2

Questions that formed the basis of the semi-structured interviews with international SEA and EIA experts.

1. In theory, how do you think that tiering could work, in terms of a) SEA informing EIA, and b) EIA informing SEA?
The next questions relate to SEA practice rather than theory. Of the SEAs/EIAs with which you are familiar:
 - a. Is baseline data used in SEAs also used for EIAs? Should it be?
 - b. How project-specific are the alternatives that are considered in SEA? Do EIAs check that the proposed project is compliant with the SEA preferred alternatives? Does SEA reduce the need to consider alternatives at the project level?
 - c. Are SEA mitigation measures formulated with lower-tier plans and projects and their related environmental assessments in mind? Do planners/EIA consultants check that the proposed project is compliant with SEA mitigation measures?
 - d. Do SEA-related monitoring measures relate to the strategic level of the plan/programme, or is data collection needed at project level?
 - e. If EIA consultants do not refer to the SEA, and integrate the SEA findings, why not?
4. How can/should planners ensure that large (EIA) projects are built as expected?
5. In conclusion, how do you think that tiering between SEA and EIA could be improved?

mitigation measures proposed in an SEA and incorporated in the plan set conditions for subsequent projects and associated EIAs. As such, any discussion of tiering must include plan-project links as well as SEA-EIA links.

3.1. Tiering legislation

References to tiering in environmental assessment legislation are rare, with the US [National Environmental Policy Act 1970](#) (NEPA) being the best developed. The main purpose of tiering in the US is efficiency: Tiering focuses on issues that are 'ripe for discussion' at each tier, eliminating the need for discussions of the same issues at lower tiers. In July 2020, for the first time in over 40 years, the US Council on Environmental Quality comprehensively changed the regulations implementing the NEPA. The sections on tiering were renumbered and slightly reworded. [Box 3](#) cites the key requirements of the new regulations regarding tiering. Similar requirements exist in some US states. The European SEA and EIA directives also refer to tiering, albeit more indirectly – see [Box 4](#)

3.2. Advantages of tiering

In theory, tiering has several advantages, including streamlining issues, data, alternatives and mitigation measures. Environmental assessments at different tiers allow different issues to be addressed at the most relevant planning scale, and to be scoped out for other planning scales ([Kirchhoff et al., 2011](#); [Therivel, 2010](#)). A regional development plan SEA could, for instance, conclude that impacts on flooding or soil quality do not need to be further assessed in an area where flood problems are unlikely, or where agricultural land quality is already poor ([Gallagher et al., 2015](#)). It may even be able to screen out some projects from EIA altogether, streamlining the project planning process and saving time and money. [Fig. 2](#) shows examples of potentially relevant environmental issues at different tiers of plan-making and environmental assessment.

Higher-tier environmental assessments can lead to better strategic planning decisions, since assessments are carried out at the 'right' time, and are strategic rather than reacting to project proposals. They can allow major projects – notably complex infrastructure projects that need to go through multiple planning stages – to progress in a phased manner

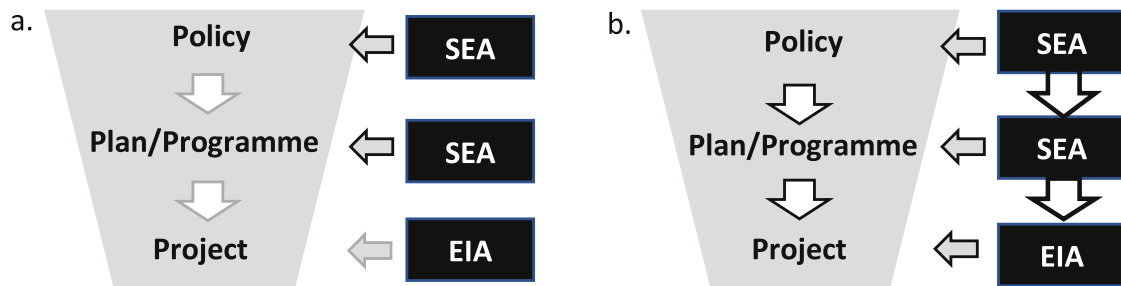


Fig. 1. The planning process without (a) and with (b) environmental assessment tiering (the darker arrows illustrate more meaningful information flow and stronger influence).

in the absence of detailed site-specific information, while funding and other approvals are sought (AASHTO, 2009; Fischer, 2003). This allows projects to progress in the certainty that the strategic ‘why’ and ‘what’ questions have been dealt with, and the projects are, at the strategic level at least, acceptable (Noble et al., 2013). It allows project developers to focus on the more spatially-specific ‘where’ and ‘how’ questions in their EIAs. This is the major benefit identified in the US literature on tiering.

Higher-tier environmental assessments can also provide data for lower-tier assessments, where data are of sufficient quality and resolution, reducing the need to collect data in lower-tier assessments. This is most effective when environmental/social conditions have not changed significantly between the time of the two assessments, as the shelf-life of an SEA is limited (Fischer, 2003; Nooteboom, 2000). Even with a time lag, however, the higher-tier assessment can still point to useful data sources and provide historic information to inform the trend analysis of the lower-level assessments. The higher-tier assessment can also identify data gaps at a time when they could still be easily filled for lower-tier assessments (Noble et al., 2013).

Higher-tier environmental assessments can consider cumulative impacts more effectively than can be done on a project-by-project basis. They can directly inform lower-tier assessments, although the analysis would need to be updated to reflect new projects, plans and other changes that have taken place between the two assessments (Gunn and Noble, 2011). Consideration of cumulative impacts at the higher tier allows mitigation measures to be set for all subsequent plans and projects. This avoids the last project being responsible for mitigating the cumulative impact of all previous projects (Nooteboom, 2000).

Similarly, higher-tier assessments can identify generic environmental mitigation measures that should apply to all projects emerging from the plan/programme, leading to more consistent, comprehensive and fairer implementation at the project level, and reducing the need to re-negotiate mitigation measures on a project-by-project basis. Lower-tier assessments then only need to fill in individual plan/programme/project information, saving time and money. This allows the focus and intent of the lower-tier assessments to be clearer, without having to address more strategic issues that are beyond the lower-tier assessment’s remit (Noble et al., 2013). That said, Gunn and Noble (2011) suggest that the higher-tier assessments must be explicitly designed to set a context for the lower-tier assessment, and in turn the lower-tier assessment must explicitly respond to the higher-tier assessment.

Tiered environmental assessment can also improve public participation and reduce opposition to lower-tier plans/programmes or projects (Arbter, 2019). Focusing on strategic issues at a higher tier of decision-making allows the public to provide local knowledge and ideas when these issues are still open. This is particularly important as planning systems become more communicative, aiming to involve all actors in designing and agreeing the strategic action (João and McLachlan, 2014). In the absence of higher-tier assessments, lower-tier environmental assessment or public concern may identify significant issues that are difficult to address at that stage of planning, leading to

public opposition and planning delays, or that can only be retrospectively resolved by using a strategic approach (Sánchez and Silva-Sánchez, 2008).

3.3. Constraints to tiering

Despite these advantages, tiering has not been the focus of significant recent contributions to the literature, in part because many of its advantages are not achieved in practice (Noble and Nwanekezie, 2017; Pope et al., 2013).

Planning is not always a linear, hierarchical process; projects/EIAs may emerge before plans/SEAs, and plans can emerge before policies (Arts et al., 2005; Kirchhoff et al., 2011; Nooteboom, 2000; Pope et al., 2013). Several planning tiers may operate at the same time, with different timeframes and different geographical and sectoral areas of focus (Hildén et al., 2004). Emerging projects can strongly influence higher-tier strategic actions: for instance, a new rail line proposed as part of a transport programme can lead to a re-evaluation of housing locations in a higher-tier regional housing plan. Furthermore, in Europe SEA is not required for the policies that would generally precede and set a context for lower-level strategic actions that require SEA, with all the possible inconsistencies and conflicts this raises (João and McLachlan, 2014; Therivel, 2010). An example of this would be a policy of economic incentives for the agricultural sector, with significant implications for subsequent plan/programme tiers when addressing water supply and quality, and greenhouse gas emissions.

In addition, there may be a substantial time lag between tiers, which can affect the usefulness of the higher-tier SEA. This may make the higher-tier plan and its SEA outdated for the purposes of the lower-tier plan/project and its SEA/EIA (Coutinho et al., 2019; Hildén et al., 2004).

Even where a higher-tier plan is assessed and adopted, this does not mean that all lower-tier actions that are consistent with the higher-tier plan will be given planning permission or implemented, or that lower-tier actions that are inconsistent with the higher-tier plan will be refused (AASHTO, 2009). Projects may be put forward that are not included in the relevant plan, perhaps as a result of new trends (e.g. mobile phone masts), new government policies (e.g. on land use zoning), or investment decisions by individuals (e.g. industrial plant) (Doelle, 2018). Equally, the environmental mitigation measures in a plan may not be fully implemented (e.g. as a result of budget restrictions or political shifts).

The higher tier alternative with the highest ‘national good’ could have very significant local-scale impacts: for example, a policy of reducing the air pollution impact of city centre traffic through park-and-rides could have significant air pollution impacts in the vicinity of the park-and-ride projects themselves. Similarly, environmental impacts that appear to be manageable at the higher tier of planning/assessment – for instance provision of environmental ‘net gain’ – may be found to be unmanageable at the lower tier (AASHTO, 2009; Wu and Ma, 2019). This could lead to lower-tier strategic actions and environmental assessments being seemingly inconsistent with those at the higher-tier. It

may also lead to the need to re-initiate formal consultation on strategic alternatives (AASHTO, 2009), losing many of the advantages of strategic-level assessment.

4. Interview findings

This section broadly groups the interviewee responses around the questionnaire questions (Box 2), and enables a review of whether tiering is occurring, how it is being applied, and what can be done to improve current practice.

4.1. Prevalence of tiering

Only the US interviewees (I7, I8, I12) were aware of tiering occurring regularly and effectively in practice. Many of the other interviewees expressed frustration at the lack of tiering altogether, the absence of effective tiering in ‘their’ countries, or the lack of reference to SEAs by EIA practitioners (I3, I5, I6, I9, I10, I13). The greater US practice seems to be due in part to a build-up of tiering practice over time, with NEPA already being operational for 50 years, and to its legal requirements for tiering being clear and well-elaborated. In many cases, the advantages of tiering in the US also accrue to the same organisation: one agency will develop both the higher-level plan/SEA and lower-level project/EIA, so directly benefitting from any cost- and time-savings resulting from the SEA’s baseline data collection, consideration of alternatives, generic mitigation measures, and the narrowing of the scope of subsequent EIAs.⁴

Instead, the European SEA and EIA Directives suggest that information from other tiers only ‘should’ be ‘taken into account’, and there is no specific guidance on tiering. In many other countries, notably developing countries, SEA is not carried out at all unless required (by e.g. multilateral banks), much less tiered with EIA. Several interviewees (I1, I2, I9, I14) noted that the best SEA tiering they were aware of was not from legally-required SEAs, but rather from voluntary SEAs carried out to help solve specific problems (e.g. collection of baseline data to inform offshore energy exploration and development, masterplans for large sites that included location and design specifics for projects).

Other reasons cited for lack of tiering included:

- fragmented governance, with the ‘world of planning’ involving very different disciplines than the ‘world of construction and permitting’ (I2, I3);
- EIA consultants working in project silos with little time or incentive to consider issues beyond the projects they are assessing (I3, I5, I6, I13);
- lack of training of planners and EIA consultants (I3, I5, I11); and
- the often long time period between SEAs and their follow-on EIAs, allowing project proponents to forget the SEA (I2, I3, I5, I9, I10).

4.2. Links between plans and projects

The interviewees differed in their views of whether plans do and should specify future development projects. For instance, many European water resource management plans are very project-specific, and some German plans were described as ‘a wish list of projects’ (I10). In contrast, one interviewee noted that:

“The whole point of a strategic plan is to say that ‘I have no firm grip on the future but through my plan I want to influence the future’. True

strategic planners don’t know what projects will emerge from their plans.” (I3)

From the bottom-up direction, for some projects it may be unclear what plan/SEA applies, especially if the project comes many years after the corresponding plan (I5). Many projects that emerge from plans are also not subject to EIA.

4.3. SEA data in EIA

Two interviewees (I11, I14) suggested that a key purpose of SEA is to ‘contextualise’ EIA: to set the EIA in the wider context of environmental constraints, and allow developers to make better decisions, knowing how their project fits into the ‘jigsaw’ of the bigger picture. The interviewees suggested that the data compiled in SEAs could, in theory, be used in lower-tier assessments. However, this is limited in practice by the ‘chronological disconnect’ between the SEA and subsequent EIAs (I9), allowing the SEA data to become outdated. In any case, SEA data often have a coarser grain that is inappropriate for the project scale (I3, I6):

“SEA is very high level, 30,000 feet above the earth, and EIA is detailed, 1,000 feet above the earth” (I11).

Several interviewees (I2, I5, I6, I13) cited Geographic Information Systems (GIS) as a good form of data provision at multiple tiers, with different levels of granularity. SEAs can use the GIS data at a strategic level and focus on strategic-level topics such as international and national level biodiversity designations. EIAs can zoom down to a project-specific level and focus on detailed data such as biotopes and species. That said, interviewees generally felt that existing large-scale datasets alone are inadequate for EIA, and field work would normally also be necessary (I9). One interviewee suggested that SEA is typically more qualitative and may require different data – not necessarily spatial – and a different mindset compared to EIA (I2). Nevertheless, three interviewees (I4, I12, I14) cited instances where baseline data collected at the SEA tier were used to reduce the need to collect baseline data at the project level, by scoping out geographical areas or environmental aspects. One case is of wind farm developments:

“The SEA can identify critical natural habitat like sources of water. Over this map of sensitivity, one can superimpose a map of wind speeds. Green areas where EIA could be approved very quickly would be areas with high wind speeds and few environmental impacts. Yellow areas have high wind speeds but the EIAs would have to include a lot of mitigation measures. Red areas would be the environmentally sensitive areas, and would have no guarantee that developers would get a license. This would help to promote investment outside the no-go areas. This is already happening in the US” (I4).

Similarly, US SEAs for national-level funding of housing rehabilitation in deprived areas generally review all of the environmental laws relevant to the area, scope out environmental topics that are unlikely to be affected by the rehabilitation, and set criteria for testing, on a house-by-house basis, whether individual applications for rehabilitation (lower tier) could lead to significant environmental impacts requiring further lower-tier assessment. Typical lower-tier issues of concern include whether the house is in a floodplain, whether it has historical interest, and whether it affects a wetland. Only where there might be such impacts, or where the actual rehabilitation proposed is significantly different from the parameters assumed in the SEA, is further data collection and assessment required. This approach obviates the need for almost all data collection at the project level (I12).

In contrast, two interviewees (I4, I7) noted that some agencies – local authorities in one case and environmental ministries in the other – are reluctant to allow SEAs to scope issues out of their follow-on EIAs, because doing so would reduce the agencies’ ability to control subsequent projects.

⁴ There are also many exceptions to this, e.g. in California any lead agency can tier from the SEA so long as their proposed activity is consistent with the higher-level plan and its SEA, and for federal actions that cross state jurisdictions the SEA may be carried out by a federal agency and the lower-tier EIA may be carried out by a state agency (I7, I8).

Box 4

Main references to tiering in European Union Directives 2001/42/EC ('SEA Directive') and 2014/52/EU ('EIA Directive').

The preamble to the EIA Directive (EU, 2014) notes that:

- "With a view to avoiding duplication of assessments, the results of other assessments under Union legislation such as [the SEA Directive] should, where relevant and available, be taken into account."
- "Where the obligation to carry out assessments related to environmental issues arise simultaneously from this Directive and from other Union legislation such as [the SEA Directive], Member States should be able to provide for coordinated and joint procedures fulfilling the requirements of the relevant Union legislation."

The SEA Directive (EC, 2001) gives general guidance on how to reduce duplication through tiering:

- "4.3 Where plans and programmes form part of a hierarchy, Member States shall, with a view to avoiding duplication of the assessment, take into account the fact that the assessment will be carried out, in accordance with this Directive, at different levels of the hierarchy. For the purpose of, inter alia, avoiding duplication of assessment, Member States shall apply Article 5(2) and (3)."
- "5.2 The environmental report... shall include the information that may reasonably be required taking into account... the extent to which certain matters are more appropriately assessed at different levels in that process in order to avoid duplication of the assessment."
- "5.3 Relevant information available on environmental effects of the plans and programmes and obtained at other levels of decision-making or through other Community legislation may be used for providing the information [required for the SEA report]."

4.4. SEA alternatives in EIA

Tiering in environmental assessment involves asking the right questions at the right time. One interviewee (I10) suggested that the strategic level should ask 'why' questions (why are we doing this?), and then work down to 'what' (what do we need to do), 'where', 'how' and 'when'.

In theory, the alternatives considered in SEA would inform the choice of the preferred alternative(s) in the plan, which would then get implemented through projects and their EIAs; and through monitoring it would be possible to check whether this is actually happening. However, the interviewees' consensus seemed to be that most SEA-EIA links are weak at best:

"For most SEAs... alternatives are vague – often non-existent. I honestly can't think of a single example where the EIA checked for compliance with a 'preferred alternative'... So, I'd have to say no - SEA has not served its role in reducing the need to consider alternatives." (I1)

"My gut feeling is that there is no link between alternatives in SEA and EIA". (I6)

The exception to this is the US system of tiering, which focuses on issues that are 'ripe for decision' and excludes issues that are not ready to

be looked at. This leads to a clear link between plan and project alternatives. The example of housing rehabilitation cited above is one example. Another is:

"The tier 1 assessment might know the geography and routing options, but not be sure about when and where a project might go ahead. An example of that is a plan with a very long implementation schedule, for high speed rail between Washington DC and Boston. They did a tier 1 assessment which identified high-level alternatives, screening, and keyed up the next studies that had to be done. The next phase will be a tier 2 implementation assessment. The tier 2 assessment will not need to prove the purpose and need for high-speed, but instead will focus on looking at the location of track between different cities on the rail line." (I7)

Several interviewees (I10, I11) felt that SEA alternatives in their country are too detailed and project-specific, making it difficult to maintain a strategic mindset. Very detailed alternatives can also constrain the ability to respond to changes in circumstances:

"The plan and SEA need to leave flexibility for future development. Things can change over the lifetime of the plan: properties may not be sold, policy can take a different turn, a technological pioneer may come along who shouldn't be limited unreasonably." (I11)

Very detailed SEAs can also be difficult to change once more detailed

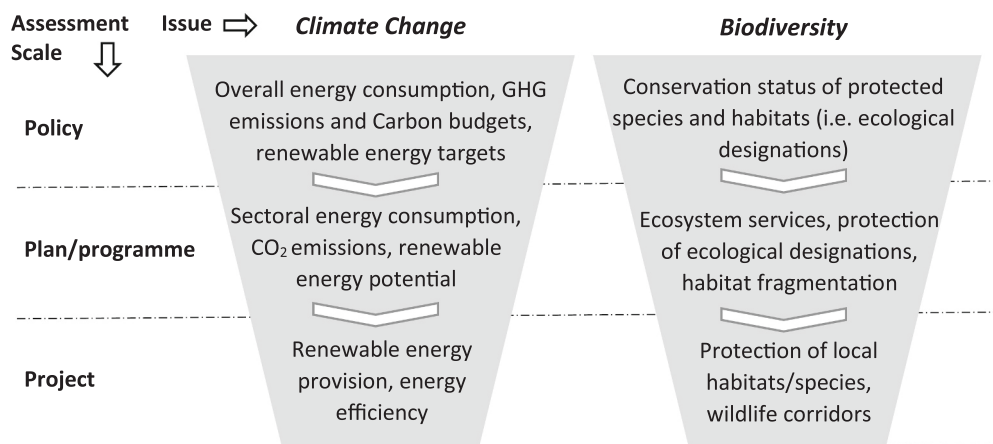


Fig. 2. Examples of environmental issues at different planning tiers (based on AASHTO 2009; Fischer, 2006; Rehhausen et al., 2018; Wesolowski, 2008).

data come to light. An interviewee gave the example of a plan/SEA that proposed a preferred transmission line corridor, but where a subsequent EIA showed that the route is problematic because of protected species. In such a case, the plan/SEA must allow for the option to go back and revisit other alternatives (I15).

4.5. SEA mitigation measures in EIA

Except for those from the US, the interviewees generally felt that many SEAs do not clearly set out the mitigation measures they would expect in projects, SEA mitigation measures are not incorporated well in EIAs, and there are few checks on whether SEA mitigation measures are implemented through EIA (I1, I2, I5, I6, I13). Not all of the mitigation measures suggested in SEAs are integrated into their plans, and plan mitigation measures are not necessarily implemented in subsequent projects: in other words, Fig. 1b does not hold in practice. Some EIAs are not clearly linked to an SEA (I5), so the strategic mitigation measures required may not be clear.

The non-US interviewees mentioned very few examples of mitigation measures, notably identification of robust locations where development can take place, (non-specific) mitigation measures required for individual sites put forward in a local development plan, and minimisation of stream crossings (bridges, culverts) to protect water quality in a sensitive riparian area (I1, I4, I9). Two interviewees working in developing countries suggested that mitigation measures could set high-level standards or guidelines to be met – for instance International Finance Corporation performance standards, Equator principles, or World Health Organisations standards – and the project level would focus on how to meet these standards (I11, I14).

In contrast, tiered mitigation in the US is well developed:

“Tier 1 could state that, any time in tier 2, if there is a certain type of impact, then this is the type of mitigation you should apply. For instance, ‘if this type of species or habitat would be affected, this is what the mitigation should be’. It could say, for instance, in visual terms that all of the stations on a rail line should look a particular way, be made of a certain material, else that station will be subject to [a more detailed EIA]. Tier 1 mitigation is often about process, for instance ‘Every time the project is within half a mile of a wetland, you need to consult with the applicable wildlife agency and jointly discuss what mitigation measures will be needed’. Or ‘First try to avoid historic buildings, but if you can’t avoid them, then you should do the following predetermined process for evaluating such resources’” (I8)

This involves doing more work at the strategic scale to avoid needing to do more work at the project scale: “front-loading the NEPA process”. It also means that, at the project scale, the focus does not need to be on what mitigation is needed, but rather on how the mitigation can be implemented.

4.6. Monitoring of SEA and EIA

None of the interviewees gave examples of effective monitoring of either SEA or EIA. SEA monitoring, where carried out, seems to be of the environmental baseline – bringing together data that already exists elsewhere – rather than monitoring of SEA mitigation; or of plan implementation such as number of houses built, rather than of the impact of these houses or the effectiveness of SEA mitigation (I9, I10). In Europe at least, this lacuna seems to be due to the fact that there is no legal requirement for anyone to check the results of SEA or EIA monitoring (I5, I6).

Several interviewees noted that, in SEA, follow-up of mitigation measures is vital, both to ensure that the measures are implemented at the project level and to test whether the mitigation measures are effective, as input into the next round of plan-making and SEA (I2, I3, I6). One interviewee termed this “monitoring the links between ladders”

(i.e. between planning tiers and SEA-EIA tiers) (I3). Another noted that, in their country, thousands of people undertake project-level monitoring every year, but there is no single point where this information is collected: the lack of a central repository of monitoring information, compounded by developers’ concern about confidentiality, hinders what could otherwise be a very useful and cost-efficient feedback mechanism (I13).

5. Examples of good tiering

This section presents brief examples of successful tiering identified through the interviews, the literature review and the authors’ knowledge. ‘Successful’ in this case means consideration of issues that are ‘ripe for decision’ at the appropriate time; a clear transfer of information from the SEA to the EIA level; and efficiency gains from the tiering process. Most of the examples are, unsurprisingly, from the US.

A 2005 SEA⁵ of the proposed California high speed rail project between San Francisco and Los Angeles (with subsequent phases planned to reach Sacramento and San Diego) discussed the need for the project, and compared the impacts of no action, modal alternatives, and general corridors for the rail line. It identified significant strategic-scale impacts, and proposed mitigation for incorporation in subsequent more detailed EIAs, e.g. avoidance of high-quality farmland by sharing existing rail rights-of-way where possible, avoidance of wildlife refuges. EIAs are currently being prepared for each of a dozen sections of route. The EIAs do not need to revisit the need and overall choice of corridor, but instead focus on implementing the mitigation measures (I8, CHSRA, 2020). A similar process is being carried out for a rail line between Boston and Washington DC (I7, USDOT, 2016).

The 2004 Hudson Yards SEA assessed the impact of redeveloping 11 ha of prime waterfront real estate in Manhattan, New York into mixed-use development. The SEA assessed the need for the development and the impacts of the development as a whole, and considered mitigation measures which included defining building heights and density, as well as providing green roofs and open spaces, and increasing school capacity. The developers of subsequent projects in that area will only have to carry out more detailed EIAs if their proposed development is not in keeping with the height or density of development anticipated in the SEA (Empire State Development, 2004).

A 2018 SEA prepared by the North Carolina (US) Department of Commerce analysed the environmental impact of financially assisting homeowners whose homes were damaged by Hurricane Matthews. It determined that site-specific assessment would not be needed for issues related to coastal barriers, air quality, coastal zone management, sole source aquifers and environmental justice. More detailed assessments would be needed for issues that were unresolved in the SEA, including airport hazards, contamination, endangered species and wetlands protection (NCDOC, 2018).

A 2015 SEA of the US Federal Emergency Management Agency’s grant programme found that seven types of projects – planning, management and administration, training, exercises, purchase of mobile and portable equipment, modifications of existing structures and facilities, and new construction – would have no significant environmental impacts if they met specific conditions and mitigation measures. One of the conditions was that the project should not be located in the floodplain. Subsequently a boat launch ramp in the floodplain was proposed. Because this raised an environmental issue that was not consistent with the conditions assumed in the higher-tier SEA, it required a lower-tier

⁵ Different US jurisdictions use different terms for ‘strategic’ – e.g. programmatic, generic, Tier 1 – and different terms for environmental assessment, e.g. environmental impact report, environmental impact statement, environmental assessment. This paper uses ‘SEA’ for the programmatic/generic/Tier 1 environmental assessment and ‘EIA’ for the project/Tier 2 environmental assessment.

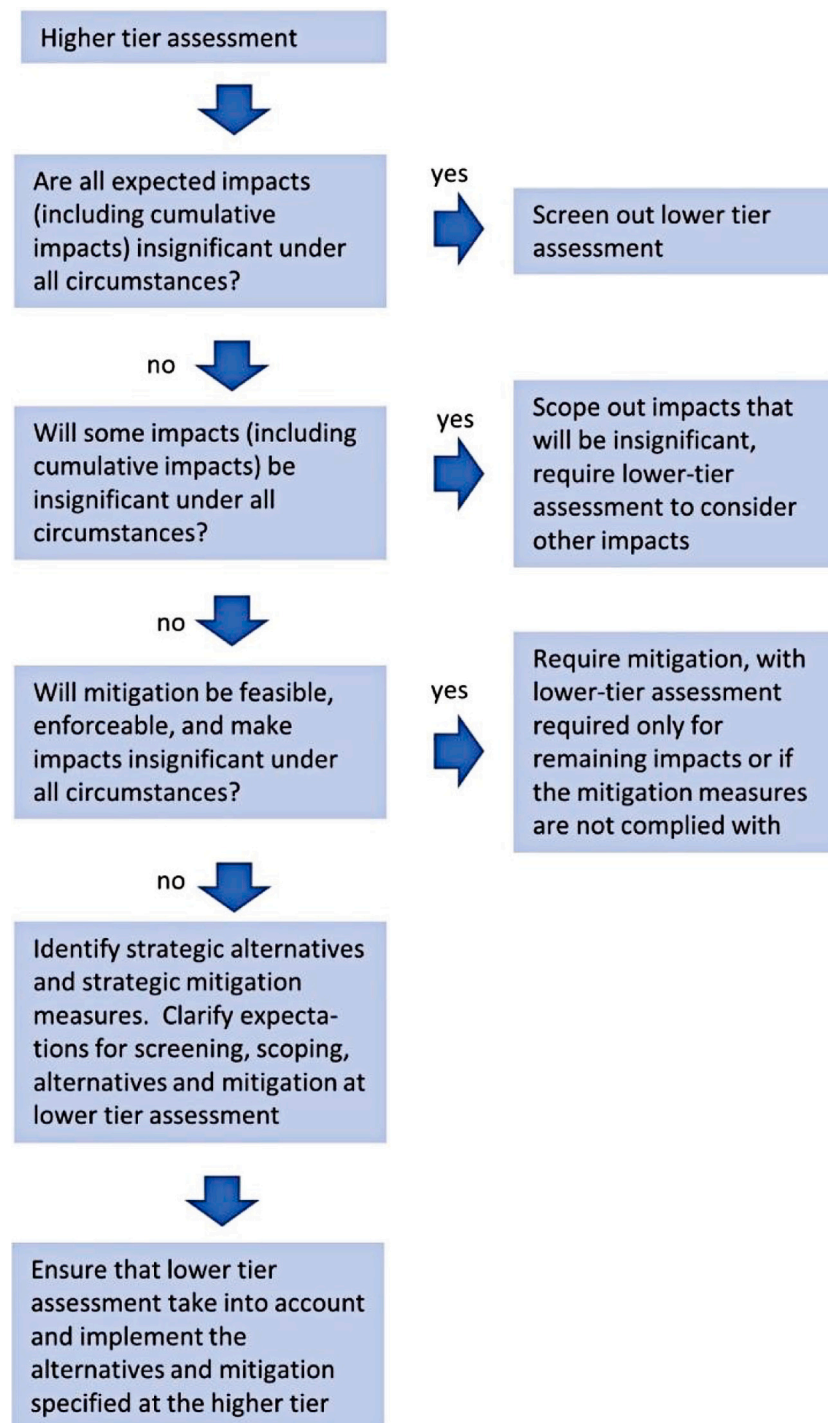


Fig. 3. Explicit tiering: possible links between higher and lower tiers of environmental assessment.

EIA (FEMA, 2015).

In the UK, some local plans propose specific environmental mitigation measures for large proposed development sites. For instance, the Wyre Forest Local Plan requires, as part of a 1400 home development, retention of existing boundary hedges and sensitive lighting to protect habitats and species, and provision of a landscape buffer to minimise visual impacts (Wyre Forest DC, 2018). The Oxford Local Plan requires, for each of the 66 sites it proposes for development, different combinations of mitigation such as buffers around sensitive wildlife areas, proof that the development will not increase surface water runoff, and careful design to ensure that the development has no negative impacts

on nearby sensitive heritage assets (Oxford City Council, 2020). Because the Local Plan is the key consideration when projects are given planning permission in the UK, it is very likely that these measures will be implemented in practice.

Arbter (2019) describes four cycles of 'round table' SEAs and subsequent EIA for Viennese waste management. The first SEA was voluntary, carried out in response to concerns about a possible third waste incinerator in the city. It concluded that an incinerator should be built, but complemented with a waste avoidance initiative and a new biogas plant; and it set as technical conditions for the incinerator that the best available filter techniques should be used. The subsequent EIA for the

incinerator received little public criticism, and the incinerator was approved quickly. Similarly, the third round of SEA analysed the extension of landfills in Vienna, and concluded that raising the height of one of the landfill sites was the preferred alternative. Again, the EIA process for that project went very smoothly because the SEA process dealt with many areas of public concern.

6. Discussion

The literature review, interviews, and examples of effective tiering suggest that tiering can significantly streamline both the project development and EIA processes. The case studies give examples of lower-tier assessments not needing to revisit alternatives or assess specific issues, and indeed not being needed at all in some cases, saving time and money. By starting with the 'why' question at the strategic level, and working down to 'what', 'where', 'how' and 'when', assessments can be focused, issues can be resolved at the right time, resources can be optimised, and decisions can be logically structured and informed. The case studies and interviews also suggest that higher-tier assessments prepared with lower-tier assessments specifically in mind can help to ensure that mitigation measures are consistent and implementable. This gives developers certainty and an incentive to develop their projects within the 'envelope' permitted by the higher-tier assessment. Tiering SEA and EIA presents opportunities to anticipate and tackle issues at the right time (i.e. those 'ripe for decision'), avoid duplication, and resolve data and knowledge gaps.

Even where higher-tier assessments are broad and non-spatially specific, the issues identified and data collected at that tier can set terms of reference for lower-tier assessments. Conversely, monitoring the implementation of mitigation measures and impacts at local plan or project level can provide data for future higher-tier assessments. Such information flows and feedback loops enhance the knowledge base, and improve both the assessments and the sustainability of plans and projects.

The good practice case studies discussed in this paper validate the reported benefits of tiering. Yet, our research findings suggest that tiering is rarely occurring in practice. Interviewees highlight issues around fragmented governance, lack of training, time lags between SEA and EIA, and practitioners working in silos within each assessment process. This is often augmented by the fact that SEAs are linked to public initiatives (e.g. land use plans, renewable energy strategies) and EIAs to private project (e.g. housing development, wind farm). Large consultancy teams often have dedicated but separate SEA and EIA teams, which contributes to the 'silo-isation' of impact assessment processes and hinders linkages between the processes. The US's more active tiering practice may be due in part to its more limited requirements for EIAs for private projects, leaving those SEAs and EIAs that are carried out more likely to be carried out by the same agency, with associated resource benefits.

Some of these issues can be tackled by implementing preconditions that ensure SEA and EIA 'talk' to each other. SEA practitioners must write their reports with EIA practitioners – someone who will read and use their information – in mind, and EIA practitioners must read and use the information from the SEA. Governance issues and silo approaches can be overcome by establishing clear communication mechanisms between SEAs and their follow-on EIAs. For this pre-requisite to be effectively implemented, improved guidance, training and possibly stronger legislative requirements for tiering would be needed.

Generally, the following preconditions for effective SEA-EIA tiering should be promoted:

- Lower-tier assessors are aware of what upper-tier plans/programmes and their SEAs affect their project and its EIA.
- The lower-tier assessment 'receives' the higher-tier assessment findings via its screening, scoping and mitigation measures processes. This could be via a legal requirement that EIA authors must

explain how their project responds to the SEA, for instance in an early context-setting chapter.

- The higher-tier assessment is clear about the preferred alternatives and recommended mitigation measures. The mitigation measures could include specific conditions (e.g. no housing within x metres of designated wildlife sites); or how project-level mitigation measures are to be identified (e.g. 'must be discussed and agreed with Environmental Authority X'); or what environmental limits/thresholds the project must achieve.⁶ Fig. 3 suggests possible links of decision-making between higher and lower tiers of assessment, based on the US examples. This would involve carrying out more work at the SEA stage in order to reduce time and costs at the EIA stage, "front-loading the SEA".
- The higher-tier assessment carries down to the lower-tier assessment those issues that the EIA might not otherwise consider (e.g. cumulative impacts, carbon emissions, habitat fragmentation).
- Lower-tier decision-makers are willing to be bound by decisions made not only at the higher planning level but also by the higher-tier SEA. Notably, they must be willing to allow issues to be scoped out at the EIA stage, in order to gain the efficiency advantages of tiering. This may mean giving up some subsequent power to rule out projects on EIA grounds, but should help to ensure that projects are built as planners want them to, and make the EIA process cheaper and faster.
- The implementation of SEA mitigation measures is followed up through monitoring, including at the project/EIA level.
- Stakeholders and the affected public are engaged at the right assessment tier to ensure that relevant concerns are identified and appropriately addressed.

While time lags between SEA and EIA are inevitable, the breaking down of silo approaches and a better legal mandate and guidance on tiering can help to ensure that processes remain linked. GIS can help to manage the upward and down flows of data between processes. Centralising SEA and EIA data in a single interface or portal – ideally one that is available online such as the Irish EIA Portal⁷ – can support tiering by making environmental information accessible at various scales, supporting the flow of information between assessment tiers, and enabling trend analysis over time for the various planning hierarchies.

7. Conclusions

Tiering can ensure that potentially significant impacts are considered at all stages of planning; ensure that mitigation measures are comprehensive, fair and appropriate to each planning stage; save time and money; and avoid public opposition, by front-loading the assessment process. However, except possibly in the US, tiering is a particularly weak aspect of environmental assessment processes. An obvious follow-on research project would be to determine why tiering works so well in the US, for instance whether a higher proportion of EIA projects are carried out by government bodies than in other countries, those bodies are more likely to carry out both the higher and the lower tier assessments, and so whether the 'institutional memory' of the higher-tier assessment remains stronger and there is a stronger incentive for screening issues out of the lower-tier assessments.

Regardless of the jurisdiction, clearer 'downward' communication of information, alternatives and mitigation measures, and a required 'upward' review of SEA findings using EIA data and findings would go a

⁶ The European Habitats Directive assessment process provides a good example. It requires plans and projects to show that they will not affect the integrity of any sites of international nature conservation importance, else the plan/project cannot be approved.

⁷ <https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal>

long way towards improving the efficiency of environmental assessment.

Credit author statement

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Declaration of Competing Interest

None.

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