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What would environmental impact assessment look like if we started from scratch today? Designing better EIA for developed neoliberal nations

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ABSTRACT

After more than five decades of practice, environmental impact assessment (EIA) has failed to convince sceptics that it represents value for money. It increasingly overlaps with constantly emerging sustainability requirements. The completed assessments are extremely long, exceed the cognitive capacities of decision makers to assimilate information, cannot address motivated reasoning, and therefore inevitably lead to trade-offs that threaten the very environmental components EIA was designed to protect. In this paper, for the minority of nations with highly developed existing environmental legislation and management only, we propose three radical approaches that include: (1) the adoption of 'satisficing', to deliver a streamlined assessment that is good enough; underpinned by (2) better application of 'acceptable harm-rules' embedded in existing environmental legislation in many jurisdictions to prevent significant harm to environmental media; and (3) an 'externalities charge' on developers (irrespective of whether EIA is required) to force more aggressive scoping through market incentives and to fund a shift towards adaptive environmental assessment and management that manages environmental outcomes. Better environmental protections could be delivered using a far more streamlined EIA process, associated with the creation and maintenance of more accurate and comprehensive datasets that can provide better evidence for emerging artificial intelligence tools.

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1. Introduction

Environmental impact assessment (EIA) is under threat in many jurisdictions (albeit there is evidence for it being strengthened in others) (Fischer et al. 2023) – driven largely by neoliberalism (also known as free-market capitalism) (Mason 2014; Bond et al. 2020; Snow 2021). However, EIA was first developed and adopted under the United States National Environmental Policy Act (US Congress 1969) more than 50 years ago, before neoliberalism became the predominant political ideology. It is perhaps not a surprise, therefore, that a number of 'weaknesses' are currently recognised with EIA practice given its emergence during an era of environmentalism (Bond et al. 2020). It is therefore perhaps time to reflect on the cumulative consequences of these 'weaknesses' for the practice of EIA, which perhaps represent misalignment with the contemporary political ideology rather than any specific weakness of design. It is also time to determine if there is a better way of evaluating future proposals to support sustainable decision-making. Considering Neurath's analogy (as summarised in Norton 2015, p. 64, after the German

sociologist, Otto Neurath) helps to explain why there may be a need for some radical evaluation of EIA: Neurath suggested that society's body of knowledge could be related to a (wooden) ship travelling around the globe, stopping at ports, but never being able to spend time in a dry dock to be repaired. Instead, repairs would need to be made along the journey by the available (and highly skilled) seafarers on board. Over time, the entire ship would be replaced, plank by plank, necessarily maintaining the ship in its initial form, with no possibility of redesigning modules in line with any advances made to seafaring technology and design. Neurath argued that, in society, there are no intellectual dry docks to step into, and so current concepts and beliefs can continue to be communicated in the face of changes to our belief system. If this same analogy is applied to EIA, then the same process elements are continually maintained despite the possibility that, if we were starting from scratch, it may be designed entirely differently. In short – the planks continue to reflect a design based on environmentalism, whereas a new design would reflect

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neoliberalism (note that we are being pragmatic in this paper by arguing for the need to adapt to neoliberalism – this does not mean we promote neoliberalism).

We provide a list of compelling reasons why environmental assessment has protagonists for change. This list is not argued to be in any way comprehensive, rather it is sufficient to make the case that something needs to change to avoid the risk of EIA being unceremoniously abandoned by some policy makers. Whilst we recognise that the language used here is somewhat emotive, the first steps in this direction have been taken in the United Kingdom (UK) with the passage of the Levelling-up and Regeneration Act (2023) (HM Government 2023) which gives the Government Minister for Housing, Communities & Local Government the authority to abolish all EIA regulations in England (at a time of his/her choosing), and to replace them with a different (and as yet unclear) system of Environmental Outcomes Reporting (Department for Levelling Up, Housing and Communities 2023). Whilst the Government has since changed and it is unclear at the time of writing what the new Government's plans for EIA are, the fact remains that the power to abolish EIA without further democratic oversight has been approved through the political process. Following Neurath's analogy, it is unclear whether this represents placing EIA in dry dock for refitting, or whether it represents the scrapers/ship-wreckers yard.

However, the cumulative effect of the compelling arguments for change of environmental assessment should not be to simply give up on this decision-support tool. It is globally mandated, with considerable support which currently is sufficient to counter the sceptics in all jurisdictions. It fills an important need – and the question is not about whether it is needed, but how it should be designed and implemented. We argue that the legislative context within which EIA fits is different today than it was when EIA was first established as a decision-support tool. This means that there is often more control over impacts on environmental media (like water and air) meaning that there must be a compromise possible (representing a dry dock stage for EIA), that continues to deliver better-planned developments to the decision process, whilst at the same time increasing the efficiency and legitimacy of the EIA process. In this vein, we propose a shift toward a more streamlined EIA process that is better placed to benefit from the emerging technology of Artificial Intelligence (AI), and which is acceptable to neoliberals. Above all, the proposal is pragmatic – recognising how decisions involving EIA are actually made rather than how we might like them to be made. This means accepting decision-making is political, and often prioritises short-term economic goals; to ignore

this means continuing inefficiency through the production of voluminous EIA Reports that simply cannot perform their intended function to inform decisions.

In the next section we set out some compelling reasons why EIA needs to change. These reasons are largely based on perceived weaknesses with EIA, but also included is the likelihood that AI will begin to play an increasing role in EIA practice. It is not the aim to be comprehensive in coming with up such a list of weaknesses, rather it provides justification for key concerns over the current or expected future practice of EIA that likely underpin some level of scepticism, and therefore drive arguments for change. In the subsequent section, we make radical proposals to deal with each of the key issues raised, reflecting a dry dock approach rather than continual maintenance. In Section 4, we conclude on our thinking, recognising that a radical upheaval of EIA systems is dependent on political will, and the reality is that this is currently absent (and that powerful developers would lobby hard to maintain this situation). In making the case for a different form of EIA, we recognise that the effectiveness of this decision-support tool is known to be context specific (Fischer 2005; Bina 2008; Kolhoff et al. 2009; Marara et al. 2011; Monteiro et al. 2018; Bond et al. 2022). The approach we recommend would only be appropriate for well developed economies, with a track record of legal enforcement and some levels of basic trust in agencies with environmental responsibilities (albeit tempered by a recognition that these agencies often have limited resources to conduct their duties). In many contexts where EIA systems are less mature and there is a continuing need for capacity development (which we consider to reflect the majority of contexts), or in cases where impacts are transboundary, our proposals offer more of a future road map than a realistic proposal for change. There is no structured method for any of the analysis in this paper – it represents a thought piece based on experience, perception and, probably, biases. It represents a suggestion that cannot necessarily emerge from traditional review-based approaches as we are connecting issues to untested potential solutions in this context. It is very much a conceptual suggestion, recognising that the specifics of implementation would be very different in any single jurisdiction – we would urge readers to view it in this way. Nevertheless, the credibility of all arguments made are supported by literature.

2. Compelling arguments that EIA needs to change

This section draws on the literature to highlight arguments which, in the view of the authors, are compelling arguments that might be used to influence political decision makers. It is not drawn on any

systematic literature review (as that would rely on a focus on specific keywords – which would themselves be dependent on pre-conceived notions of weaknesses), rather it reflects the cumulative knowledge of the authors gathered over decades of research and practice. Other researchers may have different ideas about which are the key issues with EIA practice and, as such, might have very different ideas about what EIA might look like if designed from scratch today. The remainder of this paper is therefore predicated on the assumption that these are the key issues.

2.1. Not value for money

Perhaps the greatest threat to the future practice of EIA comes from the inability of protagonists of the decision-support tool to ever demonstrate it is worth the time and expense (Sadler 1996; Morrison-Saunders et al. 2014; Retief et al. 2014; Glasson and Therivel 2019), with specific evidence that doubts over the value of EIA have started to emerge as primary concerns over the effectiveness of EIA (Commission of the European Communities 1997, 2003; Wood 2003; Retief and Chabalala 2009; Retief 2010). Evidence of specific concerns over the cost of undertaking EIA has been identified in, for example, South Africa (Alberts et al. 2023), the Netherlands (Arts and de Vries 2023), the UK (Jha-Thakur and Fischer 2016), Australia, India, Peru, Canada and Brazil (Fischer et al. 2023), and Denmark (Kørnøv and Lyhne 2023).

Given these doubts, the continued legal requirement for EIA seems surprising, and has been partially explained based on theoretical arguments that it suits the neoliberal agenda to have a decision-support tool that can legitimise development, irrespective of their actual impacts on the environment and society (Bond et al. 2020). This points to the need for some transparent means for demonstrating that EIA is contributing more to the economy and environment than it is taking out.

2.2. Reports are too dense/long

It has long been considered that environmental impact assessment reports (or environmental impact statements, EISs) are too long, making them hard to read and a poor basis for assimilation of information and/or evidence (Fairfax 1978; Miller 1981; Fernández et al. 2018). Even where regulations attempt to control the length of EISs, in practice those published are longer than specified limits, often by a considerable margin. For example, Lyles (2017) reports EISs in the United States being 700 pages in length on average, despite the Council on Environmental Quality (CEQ) regulations limiting this to 150 pages, or 300 pages for EISs of ‘unusual scope or complexity’ (Council on Environmental Quality 2022, s.1502.7). In the UK,

Glasson and Therivel (2019) report that EISs for offshore wind farms (which are complex projects) had reached a typical size of almost 10,000 pages in 2013. The result of this excessive length of EIS is that they are too long for people to read in their entirety (Cashmore et al. 2008; Ross 2018). Kørnøv and Thissen (2000, p. 193) explained the inability of readers of EISs to fully assimilate the information: ‘*attention is seen as a scarce resource. Decision-makers – like all other people – have a natural limited mental capacity and are therefore only able to cope within these limits and with a limited volume of information*’.

In terms of explaining how busy readers deal with all this information, scholars have begun to draw on learning from psychology (see, for example, Retief et al. 2023). A key distinction affecting decision-making related to EIA is between slow thinking and fast thinking (Retief et al. 2015). This draws on work in relation to psychology and decision-making that was undertaken by Nobel prize-winning Economist Daniel Kahneman who distinguished between system 1 and system 2 thinking (Kahneman 2012), whereby system 1 thinking operates quickly with little effort and is largely automatic. System 2 thinking requires attention, concentration and considerable mental effort. System 1 thinking therefore equates to fast thinking, and system 2 to slow thinking. The argument is that the realities of everyday life mean that system 1 thinking tends to predominate – yet the entire rationale behind EIA is premised on system 2 thinking taking place, so that evidence can properly be considered. Whilst system 2 thinking might be preferable, we argue that it is simply unrealistic to design an EIA system that relies on it and that doing so is highly inefficient considering the information will never be deliberated to the extent envisaged.

An EIA system that accommodates system 1 thinking is a radical departure from current expectations. For system 1 thinking, a decision maker is being asked to use their intuition as to whether a proposed development is acceptable or not, rather than trying to perform calculations related to predictions of competing impact probabilities (Kahneman and Klein 2009). The challenge is how to facilitate system 1 thinking related to EIA evidence and still ensure the environmental implications are fully considered and significant negative impacts avoided.

2.3. Exacerbate motivated reasoning

Motivated reasoning underpins a number of different theories in the social sciences. For example, Stern (2018) associates it with Haidt’s Social Intuitionist Model of Moral Judgement, Cultural Cognition, and Moral Foundations Theory. In these theories, ‘*people primarily use reasoning to justify their pre-conceived notions rather than to carefully*

weigh new information and make decisions based on that information' (Stern 2018, p. 76). This leads to 'confirmation bias', whereby the focus is only placed on evidence that reinforces pre-existing views. Whilst confirmation bias exists in theories rather than being proven, there is increasingly evidence that it exists in project decision-making subject to EIA (van der Zee 2023). As an example, Pimenova (2021) investigated a controversial resource project in Canada where the Crown's reasoning remained stable, although the use of motivated reasoning, she argues, was more nuanced in their controlling (through the exercise of power) the consultation process to ensure the predominance of arguments in favour of their own position.

Again drawing on learning from psychology, and specifically, the field of heuristics, helps to cast light on how decision making works. Gigerenzer and Gaissmaier (2011), p. 454) define a heuristic as 'a strategy that ignores part of the information, with the goal of making decisions more quickly, frugally, and/or accurately than more complex methods'. Retief et al. (2023) and Retief et al. (2015) draw on Slovic et al. (2002) and Kahneman (2012) in using the term 'affect heuristic' in referencing the application of motivated reasoning in EIA. The 'affect heuristic' reflects the tendency for human beings to draw on their emotions, rather than scientific evidence, when making decisions. Bessette (2022) calls motivated reasoning itself a heuristic! He further contends that many 'behavioural decision researchers' argue that heuristics, like motivated reasoning, 'lead to systematic, predictable and problematic errors' (Bessette 2022, p. 259). However, this view is contested by others (for example, Goldstein and Gigerenzer 2002; Kahneman and Klein 2009).

The issue with motivated reasoning is that it suggests that the production of an EIA is largely irrelevant in terms of influencing the views on a proposed project of a particular reader that already has a strong opinion – the evidence will be selectively used to strengthen the existing opinion, rather than used objectively to form an opinion. This can have dramatic implications for the environmental outcomes of projects subject to EIA where significant environmental impacts materialise that were predicted but did not support pre-eminent views in favour of giving decision consent. Furthermore, research suggests that confirmation bias is strengthened where individuals spend more time deliberating on a topic (Dickinson 2020). System 1 thinking is therefore more likely to moderate confirmation bias.

Whilst counterintuitive, it seems clear that systems 1 thinking moderates confirmation bias at the same time as speeding up decision-making; this seems like a win-win situation.

2.4. Lead to trade-offs that fail to protect the environment for current and/or future generations

Political decision cycles are notoriously short – four to five years typically. This reflects a timescale that does not accommodate intergenerational impacts. 'To the extent that existing theories have sought to explain intertemporal policy choices, they have tended to view the problem as one of electoral constraint: politicians seeking re-election avoid costly investment in the long run when they fear near-term punishment at the polls' (Jacobs 2008, p. 194). Political trade-offs at the point of decision-making subject to EIA is therefore inevitable (Weston 2000; Gibson 2013a; Morrison-Saunders and Pope 2013; Glasson and Therivel 2019), with few decision makers willing to take decisions that reap benefits in the longer term. Underdal (2010) explains that this is caused by the notion that the 'material self-interest of the present generation will therefore diverge significantly from those of future generations' (Underdal 2010, p. 388). He goes on to say that this 'extreme asymmetry with regard to both power and incentives generates a real risk that outcomes will fail to meet frequently invoked standards of intertemporal fairness and efficiency' (Underdal 2010, p. 388). However, Jacobs argued that it is more nuanced than simply prioritising current over future generations, as 'interest groups are in principle willing to accept short-run policy costs to avoid even larger long-run losses. They prefer, however, to address their long-term problems through redistributive, rather than intertemporal, means: to shift a problem's impact onto another segment of society rather than to invest in a solution.' (Jacobs 2008, p. 194). This argument lies at the heart of the 'jobs vs. the environment dilemma – and between groups who would win and lose from a project' (Glasson and Therivel 2019, p. 213).

The key issue with trade-offs is explained by Gibson (2013b) who identifies trade-off practice in the context of EIA that presumes 'a world of environment-economy opposition and where this model prevails the core goal of environmental assessment is to facilitate a balancing of these competing ends' (Gibson 2013b, p. 124). However, Gibson (2013b) is clear that 'balancing is not the path to sustainability' (Gibson 2013b, p. 124), whilst recognising that some trade-offs are inevitable. As a result, he proposed a set of general trade-off rules:

- Maximum net gains should be delivered.
- Burden of argument on trade-off proponent.
- Avoidance of significant adverse effects.
- Prediction of the future – 'no displacement of a significant adverse effect from the present to the future can be justified unless the alternative is displacement of an even more significant

negative effect from the present to the future' (Gibson 2013b, p. 139).

- Explicit justification of all trade-offs.
- Open process to debate compromised and proposed trade-offs.

The issue needing to be resolved is how trade-offs can be properly managed such that political pressures do not prevent decision makers from delivering decisions that follow these trade-off rules.

2.5. Need to embrace AI whilst avoiding risks of doing so

Research on the implication of AI for EA practice is at an early stage. Already there are indications that AI will likely have implications for the practice of impact assessment in general (Koyampambath et al. 2022; Bond et al. 2024; Khan et al. 2024; Sandfort et al. 2024). Early thinking on the role AI could play in EIA is both very positive in terms of simplifying tasks (e.g. Sandfort et al. 2024), and potentially more negative through the identification of issues for impact assessment practice with the use of AI (e.g. Bond et al. 2024). Of the 12 potential issues with the use of AI in impact assessment (IA) identified by Bond et al. (2024), four are directly related to data availability and/or management. This recognises that AI relies on good data availability based on reliable datasets and AI models that have been trained on appropriate data sets, and these same concerns are espoused by Sandfort et al. (2024). Park et al. (2024) identify clear evidence of deception arising from AI, often stemming from asking particular questions of Large Language Models, and concerns over unintended consequences of the use of AI in general have already led several distinguished scientists to argue for a greater societal response to counter the potential for extreme risks from AI in the future (Bengio et al. 2024) (one signatory of this open letter was the Nobel prize-winning economist Daniel Kahneman, whose contribution to the understanding of the role of psychology in decision-making has already been alluded to in this paper (see Section 2.3)).

The key point for our consideration of changes needed in EIA practice due to the future use of AI in EIA is summed up Sandfort et al. (2024), p. 200 '*it is essential for us in EA research and practice to comprehensively grasp the implications of this transformation [to the application of AI] and proactively prepare for the imminent changes*'.

2.6. Stops at the point of decision

A significant weakness of EIA has long been argued to be the lack of follow-up activity (Arts 1998; Arts and Morrison-Saunders 2004; Marshall 2005; Morrison-

Saunders et al. 2021). That is, after the decision, the EIA process in most jurisdictions ends. This remains problematic because of the uncertainty underlying predictions, and also because the implementation phase of projects rarely follows the design originally assessed (Frost 1997; Wood et al. 2000).

Also, the need to radically change EIA is not a new argument. In the early days of EIA, limitations were already clear related to the extent to which prediction of environmental outcomes, subject to considerable uncertainty, were a reliable basis for decision-making. This led to a workshop convened in 1974 by the Scientific Committee on Problems of the Environment (SCOPE) which debated the early experiences with EIA (see Holling 1978; Munn 1979). Further extensive workshop deliberations by wide-ranging groups of practitioners took place as a direct response to this early initiative and developed proposals for Adaptive Environmental Assessment and Management; this was radical enough to argue that '*although the focus of this book is environmental assessment, its central message is that the process itself should be replaced*' (Holling 1978, p. 1). That the recommendations of such studies to deliver a more adaptive EIA process have not been implemented for the most part probably reflects political pushback driven by uncertain costs.

The underlying issue with EIA stopping at the point of decision in most jurisdictions is therefore that developers have one-off costs associated with gaining decision consent, and no responsibility for future, unintended or unforeseen impacts. Costs associated with these impacts are then inevitably borne by society, either in terms of experiencing impacts, or in terms of public money derived from taxes being spent to mitigate these impacts. This is at odds with the 'Polluter Pays Principle'.

2.7. Putting it all together

Drawing on the previous six subsections indicates the direction that EIA needs to take in order to be fit-purpose for the current age. Specifically, the following conditions need to be met:

- (1) It needs to be clearer how EIA contributes more to economy, society and the environment than it takes out (issue 1).
- (2) Pragmatically, EIA needs to facilitate system 1 thinking related to EIA evidence which delivers faster, informed decision-making, whilst moderating confirmation bias (issues 2 and 3).
- (3) Trade-offs need to be managed such that political pressures do not prevent decision makers from delivering decisions that follow trade-off rules (issue 4).

- (4) AI needs to be accommodated in a way that delivers the anticipated benefits at the same time as minimising the potential risks (issue 5).
- (5) EIA needs to deliver acceptable environmental changes for current and future generations rather than simply be a process (issues 1 and 6).

3. Strategies for achieving necessary change in EIA practice

To deliver on the five conditions set out in Section 2.7, we have drawn on our experience to propose three strategies: an approach to facilitate better scoping in EIA, adoption of a satisficing approach associated with acceptable harm rules, and the imposition of an externalities tax that can fund a data hub and the means for environmental agencies to manage data and adaptively manage environmental outcomes. To an extent, deciding on these three strategies is already adopting an approach of satisficing (see Section 3.2) because it is based on approaches that the authors determine will work sufficiently well, rather than attempting the impossible task of optimising countless strategies based on systematic literature review and evaluating all of them against all five conditions. Table 1 indicates how these strategies would help to deliver on each of the required conditions of change, with sections 3.1–3.3 elaborating on how each strategy could work in practice. The strategies build on, or modify, existing EIA stages of the EIA processes (that is – we are not proposing a change to the stages which comprise the EIA process itself – just the manner in which some are conducted and a clearer integration with existing environmental regulations) and, for the purposes of brevity, the following text will only identify necessary changes to EIA practice that are required.

The ideas are conceptual and therefore, we have deliberately avoided the temptation to illustrate the proposals for a fit-for-purpose EIA using a case study as this will inevitably lead to readers reflecting on the lack of validity in their own context. Implementing a more efficient EIA system involves a far-reaching integration of environmental legislation in general, to remove overlaps and therefore improve decision-making efficiency. This would take considerable effort and political will to achieve, and the political resistance is likely to be a formidable barrier given the need for collaboration across Ministries and sectors. That is – the ideas we propose might be theoretically possible, but politically

implausible (without a rather surprising alignment of circumstances and appropriate political will). Returning to Neurath's analogy, it is like asking the ship's carpenters to learn how to weld (a skill they don't know) a steel ship that they have no knowledge of – continuing to patch the wood is to remain in their comfort zone, however ineffective this is becoming. The time it would take to properly design and implement the suggested changes would likely require cross-party political agreement to ensure progress across different governments.

Whilst it is not our aim to explore how political will can be shaped in order to promote the radical change we are suggesting, research into policy change affecting environmental governance often points to 'windows of opportunity'. These represent discrete opportunities whereby understanding of the problem, the politics, and other relevant policy streams all converge to create opportunities for policy change (Knecht et al. 1988). For EIA, this change in political will would likely require all the following to happen simultaneously in a single jurisdiction: increasing recognition of negative environmental outcomes despite EIA practice (the problem), a move away from a position of extreme neoliberalism (the politics), and increasing calls for integration of environmental regulations to improve efficiencies (other relevant policy streams).

3.1. Better scoping

Issues with scoping have long been argued to plague the practice of EIA. In particular, the criticism that EIA Reports include unnecessary content on the impacts on environmental components which should have been scoped out. This was summarised in the 1996 International Effectiveness Study on EIA as '*It is in narrowing these concerns down again – "closing the scoping diamond" to delete inconsequential or peripheral matters – where the difficulty occurs*' (Sadler 1996, p. 113). Hansen and Wood (2016), p. 1) concur by arguing that the "*received view*" of scoping asserts that effectiveness is constrained by a failure to narrow the assessment focus', with Snell and Cowell (2006), p. 359) explaining that, as a country example, in the UK '*the tendency to scope issues in rather than exclude them reflects a pervasive concern for legal challenge, rather than environmental precaution*'. That is, despite the fact that scoping was introduced specifically to

Table 1. Meeting the conditions for fit-for-purpose EIA in the current age.

	Better scoping	Satisficing and acceptable harm rules	Externality tax
1. Demonstrate value	✓		
2. Facilitate system 1 thinking	✓	✓	
3. Apolitical trade-off management		✓	✓
4. Accommodate AI			✓
5. Deliver acceptable changes		✓	✓

shorten EISs (Jones 1999), it is failing to achieve that goal as the risk of legal challenge over a perceived inadequate scope of EIA is prioritised over the cost and time of conducting the assessment for environmental components which could otherwise be scoped out (the cost and time implications of legal challenge tend to far outweigh the cost and time implications of conducting assessments on environmental components that should have been scoped out).

Our suggestion for encouraging developers and their consultants, and the decision makers (that typically have the final say over the scope in many jurisdictions), to be more prepared to defend their scoping decisions is based around financial motivation (this is a specific recommendation that we make in section 3.3) and responsibility, that is, if a component is scoped in, then the developer should be mandated to pay an annual externality tax to an agency to enable them to manage the impact for the environmental component they have responsibility for (where such an agency exists – we would recommend one is established if not already in existence), or to the decision-maker where such an agency does not exist. Such a tax would be applied as long as the agency and/or decision maker deemed the impacts needed to be managed, so could extend into decommissioning periods and beyond. Over the decades in which EIA has been mandated in developed countries, considerable progress has been made in developing environmental legislation to control impacts to media such as air and water and, more recently, biodiversity through the application of Biodiversity No Net Loss, or Net Gain (BNG) rules (e.g. Bull and Brownlie 2017; Zu Ermgassen et al. 2021; Souza et al. 2023). Many countries are subject to water quality controls, for example, EU countries complying with the Water Framework Directive (European Parliament and the Council of the European Union 2000). This essentially means that a statutory agency will decide what level of discharge to controlled waters is allowed in order to protect or improve the status of those waters. If the impacts on water are effectively controlled in this way, there is no need to include a chapter in the EIA Report outlining the significance of impacts. A decision maker can be confident that the impacts will have to be acceptable or other environmental licenses needed will not be forthcoming. A similar situation exists to an extent for air quality and increasingly for biodiversity (as indicated above – the ideas are conceptual and so such situations can be created if they are not already in place).

If a component is scoped out, then no annual externality tax is paid. To avoid developer's simply scoping items out to avoid the externality tax, existing legal consequences would continue – such decisions would have to be defensible, and decision authorities should decide the final scope based on consultation

with the responsible agencies. For the decision authorities – where a component is scoped out, they have no further responsibility for monitoring in the future which is likely to be a significant incentive to scope appropriately. Thus, the developers will have a financial motivation to scope components out that will at least balance the financial risk of legal challenge against that decision, making them more likely to scope based on evidence rather than financial risk, thereby leading to shorter EIA Reports. Decision makers responsible for scoping would gain some tax income where they scope in an environmental component, but will divest themselves of responsibility for post-approval monitoring where they scope out, which is likely to be a significant incentive to also scope on evidence rather than risk.

A potential additional benefit of introducing an annual externality tax for each environmental item scoped in is likely to be increased motivation to consider a wider range of alternatives for project design. Such a shift in emphasis to scoping being the stage at which the alternatives are decided is not new thinking (see, for example, van Eck et al. 1994).

Better scoping in EIA reduces the volume of evidence that decision makers have to consider, which already helps to move towards system 1 thinking. However, our next proposal (satisficing and acceptable harm rules) aims to move even further in this direction as, for some of the environmental components scoped in there will be no need to produce a chapter in the EIA as the decision maker will be able to rely on the statutory agency to ensure unsustainable impacts are not licensed. The task for decision makers becomes much more manageable and more likely to accommodate system 1 thinking. At the same time, far shorter EIA Reports that facilitate decision-making but with a focus on fewer environmental components should be seen as providing better value for money.

3.2. Satisficing and acceptable harm rules

Decision making subject to EIA is frequently argued to operate within the realm of bounded rationality (see Hellström and Jacob 1996; Kørnøv and Thissen 2000; Lawrence 2000; Nilsson and Dalkmann 2001; Fischer 2003; Nooteboom and Teisman 2003; Morgan 2012; Retief et al. 2013; Bond et al. 2016; Williams and Dupuy 2017). Cashmore and Kornov (2013) explain that, by the mid-1950s the theory of bounded rationality was proposed by Simon, who proposed an alternative model – the administrative model – of decision-making. The administrative model differed from the classic model in a number of key respects: it replaced 'the goal of maximizing with the goal of satisficing ...' (Simon 1957). That is, satisficing is argued to be a better way (than optimisation) of making decisions in situations where rationality is bounded, including

EIA. Merkhofer and Maxwell (1999) distinguish between satisficing whereby *'the first course of action found to have a satisfactory evaluation is selected'* (Merkhofer and Maxwell 1999, p. 249), and optimisation *'all options are considered to ensure that the most favorable one is identified'* (Merkhofer and Maxwell 1999, p. 249). Whilst this may suggest that optimisation is preferable, Simon (1972) uses the game of chess as an analogy to explain why satisficing is better in situations of bounded rationality. Simon (1972) calculates an individual player has around 30 legal moves they can typically make at any one time, and a game typically last 40 moves, that leaves 10^{120} different games of chess that could be played. Good chess players cannot use optimisation as a strategy as it is simply impossible; they cannot even optimise just two moves ahead as that includes over one million different terminal positions for the chess pieces; instead they use satisficing (Simon 1972).

In EIA specifically, given the volumes of data and levels of complexity in trying to understand what it all means, satisficing has been suggested to be an appropriate strategy to deal with the implications of decision-making subject to bounded rationality (van der Zee 2022). van der Zee (2022) cites the promotion of the use of satisficing as a strategy in Bartlett and Kurian (1999), Morgan (2012) and Wood and Becker (2005), albeit the word is not used in those articles and is inferred through its association with individuals choosing *'alternatives that are "good enough" when confronted with decision-making under uncertainty because these alternatives exceed aspirations levels on all goals'* (van der Zee 2022, p. 401). Satisficing has also been promoted in EIA by Weston (2000), Bailey (1997) and Grima (1989), and identified by (Retief et al. 2013) as appearing in the literature as a suitable strategy for Strategic Environmental Assessment (SEA). Specifically, Kørnøv and Thissen (2000) argue that cognitive limitations for decision makers means that satisficing rather than optimising behaviour is warranted, with a better approach being a restriction of the *'set of key issues to be brought to the attention of decision-makers'* (Kørnøv and Thissen 2000, p. 198). Nilsson and Dalkmann (2001) further argue that SEA processes need to adapt to the complexity of the decision process, and that satisficing is appropriate where bounded rationality exists or mixed scanning is appropriate decision theory.

EIA is a decision-support tool and not a decision-making tool. This is an important distinction that underpins the role of EIA as a means of delivering evidence to decision makers to facilitate good decision-making. This approach can underpin one of the key reasons that EIA needs to change – namely that it often leads to jobs versus environment trade-offs that place politicians in unenviable positions. Nevertheless, in the decades since EIA was first legislated in many

jurisdictions, there have been considerable developments in the understanding and management of some environmental media; in particular, water, air and biodiversity. The role of EIA for these media has largely been relegated to reaffirming standards that exist and proposing means of reducing any impacts. For these media, however, other environmental laws already place limits on what can be done, usually requiring consents from regulatory bodies. For a decision maker, it seems likely that a license granted to pollute air, water, or affect biodiversity means that regulatory bodies with responsibility for these media are formally indicating that these media can accommodate the environmental changes proposed. Fundamentally, following a satisficing approach, these components can be removed from the trade-off considerations. The agencies involved should be best placed to ensure environmental thresholds are not exceeded, and to manage consents over geographical areas adaptively to accommodate changes. However, the reality often is that those same agencies are under-funded, and therefore fail to manage the environmental components they are tasked to manage as well as they would like (see section 3.3 for the solution to this problem). The proposal is that EIA simply need not report on the impacts for environmental components which are already protected through other legislation, even when scoped into the EIA. This should dramatically reduce the size of EISs and be more likely to facilitate system 1 thinking when making decisions.

3.3. Externality tax funding a data hub and ensuring adaptive management

To ensure that AI can work effectively, and to properly ensure environmental media are protected to a sustainable level, there is a need to ensure a credible, up-to-date dataset. This is far from a trivial undertaking as it requires acquisition of compatible data for each environmental component included in EIA regulations. These vary by country but, as an example, in the European Union (EU), the list of environmental components for which environmental impacts have to be predicted include: water; air; biodiversity; landscape, human health; population; soil; land; cultural heritage; climate; material assets (European Parliament and the Council of the European Union 2014).

The vision here is for all research on environmental components to be uploaded to centralised databases that are validated and managed by central agencies. This would require an obligation to provide data, and rely on those agencies having the resources to manage the datasets over the long-term. There are precedents, however, with the Crown Estate in England being a notable example as the licensing authority for

much offshore development on the UK continental shelf around England. As a license-granting authority, they can set conditions on the developer to deliver their newly gathered data, and ensure it is hosted in a suitable format on a publicly available data centre to help develop a community of practice to assist with the sustainable development of the offshore environment, this is called the Offshore Wind Evidence and Knowledge Hub (OWEKH)(see <https://owekh.com/home>).

Having reliable, publicly available data is a first step towards having confidence in AI applications that can potentially add value to EIA in the future. It would help to prevent concerns over the proliferation of data self-generated by AI becoming part of the evidence then considered when assessing environmental impacts – leading to ‘model collapse’ where AI increasingly analyses data that has been generated only by AI (Shumailov et al. 2024). However, a pervasive criticism in relation to EIA practice is related to the substantive effectiveness of the process. That is, the focus has always been on procedural effectiveness, whereby the enforcement ensures the legal process has been followed and does not ensure that the environmental outcomes promised are actually delivered. Holling’s proposal for Adaptive Environmental Assessment and Management (AEAM)(Holling 1978) was an attempt

to manage the uncertainty inherent in EIA practice, and to manage environmental impacts in the longer term. Essentially, it requires continual monitoring of impacts and remedial measures to be undertaken to deal with unexpected impacts. This does mean that consent conditions associated with permits to pollute, or with biodiversity gain claims, can change throughout the lifetime of individual projects as the regulatory authorities respond to the cumulative impacts of multiple developments on the carrying capacities of the environmental components they oversee. Whilst this is likely to be vigorously resisted by developers – it is the only means of ensuring the polluter, rather than society, ultimately pays. In many jurisdictions, some form of EIA follow up is now required through the development and application of Environmental Management Plans (EMPs) (World Bank 1999; Goodwin and Wright 2008; Lees et al. 2016), however, these largely focus on ensuring the EIA learning is implemented in practice rather than reacting to unforeseen consequences.

However, there remains a concern that the agencies mandated with implementing the requirements to protect water, air, biodiversity, and so on, are often publicly funded and subject to political decision-making associated with the allocation of finite budgets. Instead, the externality tax should be ring-fenced to ensure that monies would continually help

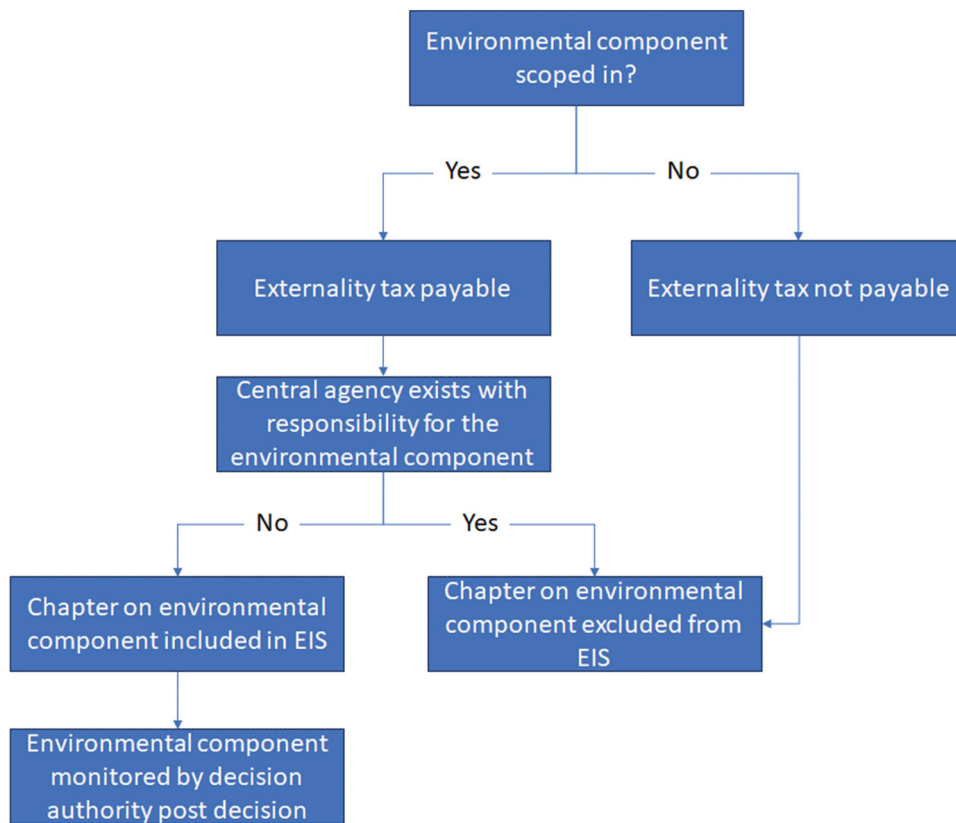


Figure 1. Decision tree for scoping EIS chapter contents.

to resource the necessary oversight of the legislation associated with these environmental media (such an approach helps to preserve the 'polluter pays principle') and be used to fund the development and maintenance of a data hub with reliable, publicly available data, which could also improve the validity of AI-generated information.

In the initial years of a future EIA system as proposed, there would not be centralised agencies for each of the environmental components that need to be considered in EIA. The aspiration would be to develop them, with decision authorities picking up monitoring obligations (funded by the externality tax) in the meantime.

Figure 1 sets out a decision tree that sets out how scoping and the externality tax should work together.

4. Conclusions

This paper has been written based on the premise that, if EIA were to be invented today, it would look different to the process that has been undeniably valuable and which has spread around the world. Taking concerns with the existing process that at times threaten its very existence, some key approaches have been suggested which lead to a streamlined process that will be easier for decision makers to engage with, but that will provide the additional benefits of delivering adaptive environmental management through better funded agencies, and will prevent incremental environmental losses which are inevitably the result of political trade-offs in the face of bewildering levels of often conflicting environmental data. Recognising that democratically-elected decision makers may be uncomfortable with what may be seen as relinquishing decision authority (for example, where a statutory agency refuses to grant a license to discharge emissions to air or water, or to allow biodiversity loss in a specific location), such a system would need to ensure that call-in powers existed, such that Governments could override the satisficing approaches where national interest was felt to be jeopardised. This is no different than call-in processes that exist in many jurisdictions already to elevate decision-making from local to central Government.

We recognise that suggestions in this paper will be uncomfortable for many EIA practitioners. However, the intention is not to undermine the excellent evaluation work that has, for many years, contributed to environmental decision-making. Rather the intent is to recognise the realities of political decision-making, which is to accept the cognitive limitations of decision makers as well as the time and resource constraints under which they operate – and also the political lobbying they experience. The proposals remove some environmental

components from trade-off consideration, potentially requiring a far stronger case to be made to justify socio-economic gains against environmental losses for the fewer environmental components that would be considered in an Environmental Impact Statement.

Under the proposals, the expectation is that the media of air and water, and potentially biodiversity, would be the most like environmental components to be removed initially from the content of EISs. But there is theoretically no limit to how many components can be devolved to expert agencies to adaptively manage in response to authorised development. Removal from the EIS does not mean no assessment; rather it means developers still work with their consultants to gain the necessary licenses, but these are contingent on the carrying capacity of the environment now and in the future rather than on a one-off assessment of how significant the impacts might be at a single point in time.

These proposals remain conceptual. The level of externality tax to be set would need to be calculated based on the specific context within which such a system would operate. The suggested EIA process would be streamlined, but far more rigorous in terms of protecting environmental media. The costs for developers would inevitably increase through payment of the tax – which would not be popular. However, failure to move to more adaptive forms of environmental assessment continues to subsidise those unscrupulous developers who profit at the expense of the taxpayer – those who bear the burden of environmental losses.

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