Title: Rethinking Environmental Impact Assessment for nature positive development

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Rethinking Environmental Impact Assessment for nature positive development

Abstract

Achieving nature positive development within existing regulatory frameworks will be challenging. Halting and reversing biodiversity loss requires restoration and enhancement of ecosystems alongside a fundamental shift in how we value biodiversity and assess quantifiable improvements. Environmental Impact Assessments (EIAs) focussed on mitigating negative impacts do not promote positive outcomes – a new approach is needed. We propose an additional EIA pathway that assesses potential for biodiversity gains at development sites, framing biodiversity as an asset to be enhanced, rather than a problem to avoid. By adding the identification of biodiversity opportunities to development planning, this approach encourages actions that support sustainable and resilient ecosystems, providing a clearer link to the social and economic benefits that can also be accumulated. Through two hypothetical case studies, we illustrate how this 'nature positive' pathway identifies biodiversity potential. We discuss how developers may be incentivised to align with the global nature positive agenda.

In a nutshell

- To reverse the biodiversity extinction crisis, we need developments that enhance nature rather than destroy it.
- Business-as-usual environmental impact assessments for potentially harmful developments do not deliver nature gain.
- Our 'nature positive' pathway is a complementary step that requires businesses to not only minimise negative impacts, but also deliver positive gains for nature
- We show how the 'nature positive' pathway could work for urban development and solar farms and explain why businesses should take this additional step to align with the global nature positive agenda

We can't achieve nature positive development within the current regulatory frameworks

In 2022, parties to the UN Convention on Biological Diversity committed to halt and reverse nature loss by 2030 through the Kunming-Montreal Global Biodiversity Framework (GBF, Convention on Biological Diversity, 2022). Meeting this commitment will mitigate the ongoing global extinction crisis and contribute towards many of the UN Sustainability and Human Wellbeing goals. The GBF increases the sense of urgency and level of ambition beyond previous biodiversity targets (e.g. Aichi Targets), introducing a specific timeline and pathway for the recovery of biodiversity. Importantly, it advocates a holistic approach, recognising the value of biodiversity to people's wellbeing and that people are intrinsically part of natural ecosystems. The new commitment also recognises that preventing biodiversity loss is not enough; solutions to the biodiversity crisis must also reverse nature loss, restoring and enhancing ecosystems. This is the ambition embedded within the vision of a 'nature positive' society.

To achieve 'nature positive', human activities must contribute positively to the health of ecosystems, enhancing species survival and persistence, rather than causing harm (Milner-Gulland, 2022; Locke et al, 2021). This demands the implementation of actions and policies that result in a measurable, positive increase in biodiversity. Approaches for delivering this commitment are emerging, including concepts like 'biodiversity net gain', where the environment is left in a quantifiably better state after human intervention (Jones et al, 2019). Critical for achieving this is the ability to assess the impact of human actions on biodiversity and identify specific actions that produce a measurable increase in biodiversity, from a predetermined baseline (Maron et al., 2021).

Through the conversion of natural habitat into other land uses, development has arguably had one of the greatest impacts on biodiversity globally (Diaz et al, 2019; Jaureguiberry et al. 2022; Ren et al, 2023). Whether this is the construction of housing on the urban fringe, conversion of forest to agriculture, or the creation of large infrastructure projects such as road or rail networks, all contribute towards habitat destruction on some level. The biodiversity impact of development also goes beyond initial on-ground impacts of habitat loss at a site, including the impact that material supply chains have elsewhere, both upstream and downstream (Lenzen et al, 2012; Crenna et al, 2020; Irwin & Geschke, 2023).

Recent global policy developments and recognition of the economy's dependence on biodiversity (World Economic Forum, 2024) have increased awareness of the role that

corporations and developers have in the biodiversity crisis. Developers have regulatory responsibilities driven by global, national or state-level legislation to minimise impacts on biodiversity and, in many jurisdictions, to mitigate residual impacts. In addition, many developers are seeking to implement sustainable approaches or corporate social responsibility practices that benefit the environment and biodiversity through their actions (Smith et al. 2020; Panwar et al, 2023). Nature positive requires that developers minimise and mitigate biodiversity losses, whilst simultaneously improving the state of nature to deliver genuine net gains for biodiversity.

Common practice across the globe is to undertake Environmental Impact Assessments (EIAs, or strategic environmental assessment SEA), to ensure that developments balance environmental, social and economic goals (Thomas & Murfitt, 2011). The approach usually involves a developer and their consulting team modelling the environmental and social impacts of a proposed development, a risk assessment of these impacts, and proposed mitigation actions (UNEP, 2002). There have been multiple critiques of EIA (Wood, 2003; Kolhoff et al, 2018), including its failure to prevent widespread environmental damage and the need to improve and refine this framework to ensure better outcomes for biodiversity (Macaulay & Richie, 2013; Simmonds et al., 2020; Maron et al, 2024).

One of the reasons the EIA and SEA processes fail to consistently achieve positive, or 'net-gain' outcomes lies at the heart of its focus. Whilst biodiversity offsets have been proposed as a mechanism to provide off-site biodiversity gains, these have mostly failed at their objective (zu Emgassen et al. 2019; Maron et al., 2016). The biodiversity impact of a project is often only measured by its potential effect on local threatened species or ecological communities (Gutierrez et al, 2024). While this remains vital, it can also lead to other biodiversity values being overlooked or dismissed (Weston, 2000; Ronish & Hilburn, 2022; Marshall et al, 2023). This is particularly the case for projects occurring in already altered or degraded landscapes, which may have lost threatened species, but still retain valuable biodiversity that merits protection or even enhancement.

Here we argue that EIA is unlikely to deliver nature positive outcomes because it frames biodiversity primarily as a hinderance to development (Rooney, 2024). EIA fails to consider the potential for improvement at a site, or the additional ecological, socioeconomic benefits that can accrue beyond the site itself. We present an approach to EIA that considers the potential

value of a site through a nature positive pathway, a mechanism for reframing biodiversity as a positive asset to be valued and enhanced. We apply this nature positive pathway to two hypothetical case studies and discuss regulatory frameworks and corporate motivations that are likely to support uptake.

A complementary EIA pathway to capture the potential of sites to deliver biodiversity gains

A key obstacle for achieving nature positive outcomes from EIA lies in the narrowness of the screening and scoping processes, which typically consider only existing environmental attributes and so-called 'significant impacts' (Weston, 2000). This limits EIAs to addressing negative impacts on existing biodiversity values at a site. However, nature positive requires the identification and assessment of potential biodiversity gains: opportunities to bring species back, increase or stabilise populations and restore lost ecosystem services. This can be achieved through the EIA process only with modifications to facilitate the identification of these biodiversity opportunities. We propose a complementary nature positive pathway alongside mitigating negative impacts (Figure 1). Proponents not required to undertake an EIA conduct a 'biodiversity gains assessment' to demonstrate to decision-makers how their development promotes positive outcomes (example Case Study 1, Panel 1). Proponents required to undertake an EIA also undertake the biodiversity gains assessment to illustrate how they will both mitigate loss and provide positive outcomes for biodiversity (example Case Study 2, Panel 2).

The traditional pathway (following best-practice EIA and implementation of the mitigation hierarchy with offsets) results in 'no net loss' at best, or even negative outcomes for biodiversity (Figure 1). This is especially the case when common species and ecological communities are destroyed by a development because their value has not been accounted for. While mitigation of impacts will always be important, the nature positive pathway provides an incentive for proponents (and regulators) to seek alternative approaches. It begins with the identification of possible gains at a site: what opportunities exist to enhance biodiversity (we describe how to identify the biodiversity potential of a site below). This is followed by an implementation plan to describe the opportunities identified and actions that will be taken. Finally, developers will follow a similar approvals process to traditional EIA, paired with monitoring of outcomes and linked to the growing nature positive market. This helps to 1) fully quantify the biodiversity and

other socio-economic gains that can be achieved, and 2) provide a benchmark for each development against which on-ground impact can be measured to evaluate success.

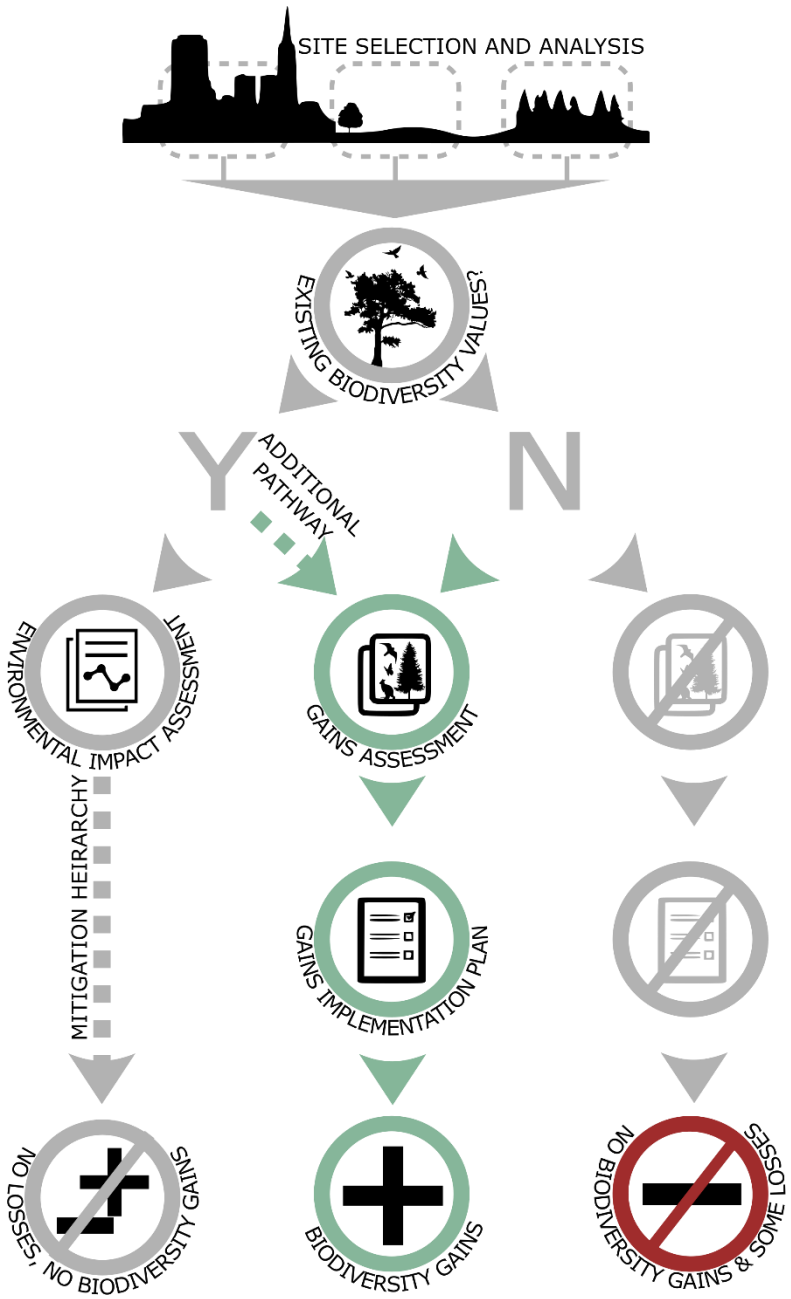


Figure 1. Logic flow for how proponents undertake development with the additional nature positive pathway. The nature positive pathway can be incorporated into existing legal processes: proponents elect to include a biodiversity gains assessment alongside a traditional EIA, or as part of their development proposal, depending on their needs. Those who do not elect the biodiversity gains assessment still proceed with the existing regulatory process. Whatever the outcome of the initial biodiversity gains assessment, the nature positive pathway can be followed. Different routes through this result in no net biodiversity loss (traditional EIA, left), biodiversity gains (nature positive, middle) or no gains (and potentially biodiversity loss depending on the development context, right).

We use two hypothetical case studies to outline how the nature positive pathway could be applied to different development types. We include examples of 'biodiversity potential' and how actions for biodiversity gain can be incentivised. Case Study 1 demonstrates how the pathway can be implemented in a typical urban brownfield development site (Panel 1). Urban development is a major cause of habitat destruction globally, especially when this takes place in unmodified landscapes (Ren et al, 2023). However, following protocols such as Biodiversity Sensitive Urban Design (BSUD) to develop land that has already been heavily modified can lead to measurable nature positive outcomes through on-site gains (Garrard et al., 2018; Kirk et al., 2021). The nature positive pathway will help ensure that the potential of a site to enhance biodiversity is not overlooked just because protected ecosystems or species have not been identified. Case Study 2 demonstrates how the nature positive pathway can be followed in addition to traditional EIA and mitigation (Panel 2). This case study looks at a solar farm development on post-agricultural land, where the presence of a threatened plant triggers use of offsets to achieve no net loss. However, the nature positive pathway also enables nature positive outcomes by introducing new habitat resources for local species once the potential of the site has been identified (Nordberg & Schwarzkopf, 2023).

Hypothetical Case Study One:
Brownfield high-rise development on an old urban carpark
Does not trigger EIA (no threatened species present) – but one developer bidding for the tender chooses to use the nature positive pathway.

Gains assessment: recognise biodiversity opportunities (green circles)

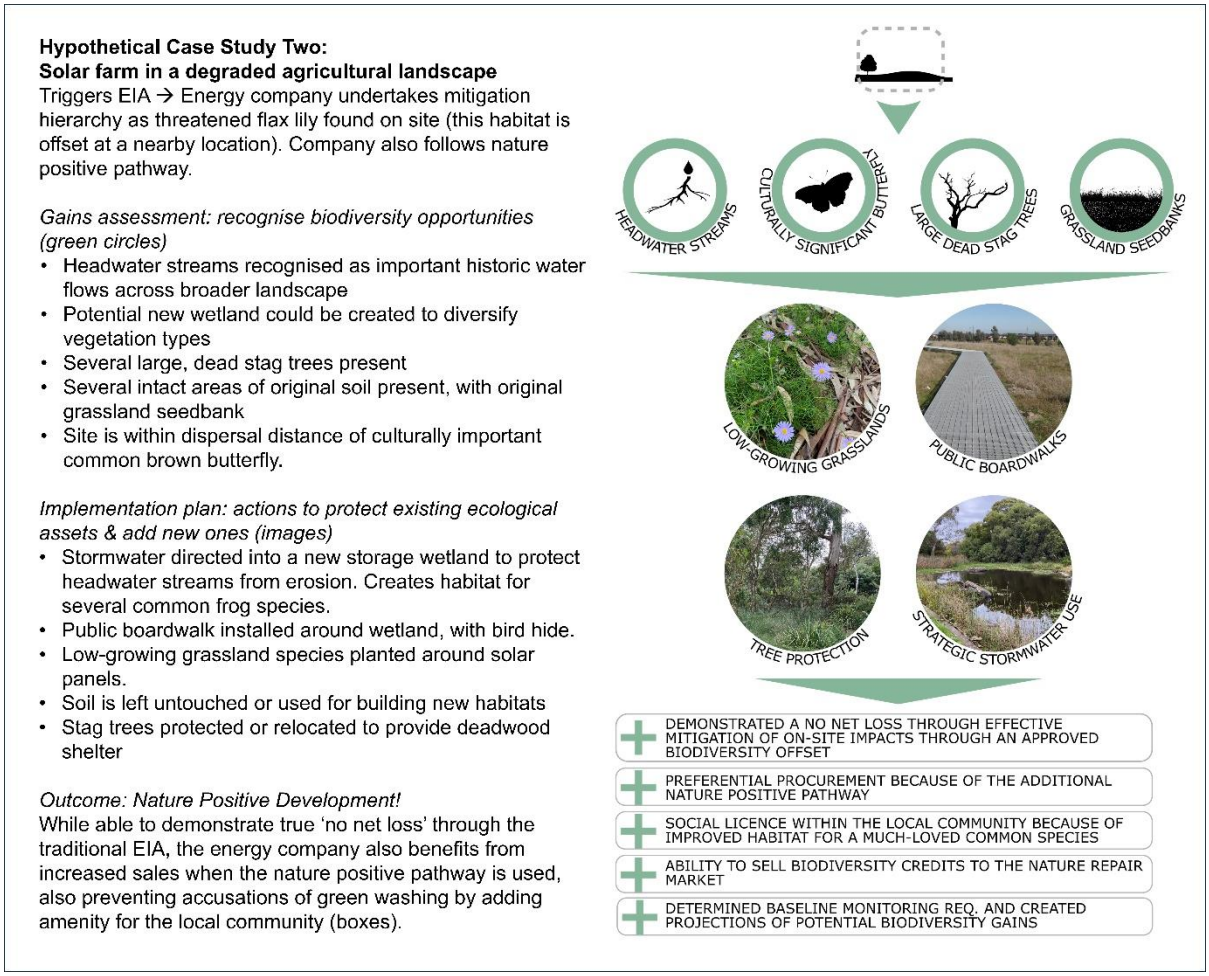
- Potential stepping stone habitat between local urban parks could enhance ecological connectivity
- Naturally low-lying land was once ephemeral wetland with threatened vegetation classes.
- Several native bird species identified occurring less than 1km from site.
- High foot-traffic means environmental education and nature connection opportunity for visitors.

Implementation plan: Biodiversity Sensitive Urban Design actions to create gains (images)

- Green roofs and walls with native vegetation added to high-rise buildings, including a public roof-top garden.
- Stormwater drainage from impervious surfaces directed into a wetland in the small public park created as part of overall landscape design.
- Native garden created around wetland, with addition of several large tree species. Once mature these contribute to urban cooling and bird habitat.
- Added novel elevated 'bird waterers' to the parks and podium rooftop.

Outcome: Nature Positive Development!
Decision-makers preferentially weight the developers based on their nature positive proposal. In addition to successfully winning the tender, there are social and economic gains for the company (boxes).

Panel 1. Hypothetical Case Study One: Brownfield urban development on an old carpark in an urbanised area. This development does not trigger the traditional EIA process, as there are no threatened species on the site. However, the developers decide to go ahead with the nature positive pathway and identify the biodiversity potential of the site (green circles), actions to enhance biodiversity (round thumbnail images), which result in the company winning the tender for the site (boxes).



Panel 2. Hypothetical Case Study Two: Solar farm in a degraded agricultural landscape. In this example the development triggers the traditional EIA process, following the mitigation hierarchy to identify typical offsets. However, the energy company also choose to follow the additional nature positive pathway, identifying the biodiversity potential of the site (green circles), and actions (round thumbnail images) which result in nature positive outcomes and socio-economic benefits (boxes).

How to identify potential biodiversity gains at a site

The biodiversity or ecological potential of a site can be identified during the early stages of EIA. Although the focus on decision-making in development tends to be on the presence (or absence) of specific threatened species and ecological communities (Capmourteres & Anand 2016), much of the data collected during the initial site assessment phase can also be used to identify the site's potential biodiversity values. This includes desk-top exercises to summarise site hydrology or historic vegetation classes, and on-ground ecological surveys that look for threatened species but record other species incidentally. However, this type of assessment might need to be adapted to specifically encompass overlooked taxonomic groups or ecological assets. Identifying the potential of a site is an important process for demonstrating how

biodiversity can contribute to development goals (alignment) rather than being seen in conflict with those goals. Here we show some examples of biodiversity potential that are currently overlooked.

Common species have value in their own right

Conserving or enhancing resources for common species has huge potential to provide biodiversity gains in all types of development, not just through increasing baseline species diversity. Common species play fundamental roles in ecosystem functioning, contributing to pollination, nutrient cycling, and pest control (Ellison, 2019). They form the backbone of food webs, serving as both prey and predators, regulating populations of other species. While common species often exhibit resilience to environmental changes, across the world many such species are also exhibiting declines (Rosenberg et al, 2019). This means there is conservation value in reinforcing populations of common species. Furthermore, common species contribute to cultural heritage and recreational experiences, enriching human connections with nature (Ellison, 2019). Initial assessments should identify non-threatened species that could be returned to a site. Engaging local stakeholders, including First Nations Peoples and members of the public, can help to identify priority species or ecosystems that are of cultural significance (Mata et al. 2020). Aiming to enhance species that cover a range of taxonomic groups means delivering a diversity of habitat resources & mitigating a range of threats, increasing the biodiversity gains delivered.

Historical context of a site

Like with common species, the initial assessment process can also identify the 'ecological bones' of a site, especially where natural habitat might have been seriously degraded. Historical context identifies landscape elements that can contribute towards maximising biodiversity gains and development goals while also cutting costs. For example, retaining healthy topsoil at a development (rather than removing the whole layer) will improve the success of revegetation without the need for additional agrochemicals (Bach et al, 2020; Yin et al, 2022). Similarly, using a site's seed bank (where it exists) will reduce the need to purchase tube stock and result in growth of locally adapted plants. EIA typically identifies mature trees at a site, but identifying large dead trees and preserving these through protection or relocation on-site brings multiple biodiversity gains (Seibold et al, 2015). Adding water resources to a landscape, permanent or ephemeral, will immediately increase the number of species that can use a site. While water is often a focus of protection in the EIA process, in many degraded landscapes the presence of

historic headwater streams or drained ephemeral wetlands is easily overlooked (Bylak et al, 2022). Protection or restoration of these features or even conversion of naturally low-lying areas to new water bodies can help meet development goals (such as storm water control or filtration) while also creating biodiversity gains (City of Geelong, 2021).

Spatial potential because of landscape context

A biodiversity gains assessment should consider the ecological connectivity of the site with surrounding landscape features to evaluate its role in supporting regional biodiversity. Mapping techniques can help visualise and analyse broader spatial biodiversity patterns. For example, outside the development site there might be nearby remnant vegetation areas with source populations that can inform the target species and resources chosen to maximise on-site gains (Unnithan Kumar & Cushman, 2022). Similarly, a site's location might act as an important stepping stone or corridor between other areas – in this case, enhancing biodiversity on site should improve landscape level connectivity, enabling even small patches of habitat to contribute more than the sum of their parts (Lindenmayer, 2019; Wintle et al., 2019).

Contribution towards future climate resilience

Many elements of a development site might contribute towards future climate resilience. Carbon sequestration and storage provided by existing vegetation, soils and wetlands is particularly valuable (Were et al, 2019). A site may also have the potential to contribute towards water purification, mitigating damaging storm run-off and cooling the surrounding landscape through shade and slowing evaporation from the soil (Hobbie & Grimm, 2020). Many of the elements already mentioned (adding water resources, supporting common species) will boost the adaptive capacity of a landscape, either by providing key resources, services or promoting species and genetic diversity to enhance adaptation.

Human value, including ecosystem services and cultural value

Engaging local communities and First Nations People in the initial assessment process (as is meant to happen in EIA) will ensure the incorporation of local and traditional ecological knowledge. Stakeholder workshops are an easy and quick way to both communicate development aims and distil knowledge from a range of different sources in an open and transparent way (Ignatieva et al., 2023). Local stakeholders can help uncover overlooked biodiversity potential; for example, historic wetlands or culturally important species (Glucker et al, 2013). This process can also identify the human value that nature positive actions provide

onsite, from the abiotic ecosystem services through to the return or preservation of beloved or culturally significant common species.

Why will this work?

The nature positive pathway requires developers to demonstrate biodiversity threat mitigation where legally required (through the traditional mitigation hierarchy approach), while also showing how they will enhance biodiversity value. This should increase likelihood of successfully achieving no net loss and meeting the nature positive goals identified by businesses and governments globally. Without regulation to require nature positive development, this nature positive pathway will remain optional. Even so, it can be used by decision makers when selecting amongst project options, which will encourage adoption by developers if nature positive approaches are treated preferentially. Focusing on achieving nature positive approaches at the scale of individual developments allows the application of clear methods and metrics without some of the uncertainty and complexity of nature positive thinking at larger scales (White et al, 2024).

The nature positive pathway can be integrated into regional planning, changing how land is valued by making the biodiversity potential and linked socioeconomic benefits of a site clearer. By increasing the potential social and economic value of land through conservation and restoration, zoning practices that prioritize biodiversity and ecosystem services should follow. This conceptual shift will encourage planners and developers to revalue land: no longer merely be seen as a location for infrastructure, but a place where cumulative positive impacts can be achieved for biodiversity, the physical environment, the economy and society.

At face value, the nature positive pathway may seem like extra work, but there are numerous compelling motivations for proponents. Early adopters may already be following this pathway but without the reward or recognition that it can offer; for example, inner city developments that commit to provision of parks or vertical greening are already winning tenders by demonstrating this commitment to biodiversity. Extrinsic motivations for proponents to use the nature positive pathway may include (1) incentives such as the potential for tax breaks, (2) sustainability certification (e.g. additional positive ratings in building construction) or preferential procurement; (3) credits for offsetting biodiversity impacts within a supply chain (e.g. embedded biodiversity impacts of a construction project); (4) competitive advantage (winning bids); (5) meeting regulatory obligations (e.g. the European Union's Corporate Sustainability

Reporting Directive (CSRD)), and (6) organisational reputation (external and internal) including employee satisfaction and wellbeing. Businesses targeting sustainability outcomes are also driven by intrinsic motivations, including ethical considerations, staff satisfaction and concerns for inter-generational equity (Sajjad et al, 2024). The biodiversity-gains pathway provides an additional route for fulfilling these intrinsic motivations.

Conclusion

Achieving nature positive will require transformative changes to development and regulation, success might come through new knowledge and pathways, or simply better implementation of existing processes (Maron et al, 2024). Our proposed nature positive pathway provides a way for developers to have direct impact, empowering companies by enabling greater control over the outcome of different actions. Following this complementary pathway may well become the defining feature of nature positive businesses, differentiating them in a market-place that is increasingly seeking transparent and rigorous measurement and disclosure of nature-related impacts (Strange et al, 2024). However, it is imperative that we also address the well documented failings of existing EIA and mitigation legislation (e.g. Maron et al, 2016; Simmonds et al. 2020; Gutierrez et al. 2024); achieving biodiversity gains alone cannot compensate for ongoing losses of threatened species and ecosystems.

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