Taking an environmental ethics perspective to understand what we should expect from EIA in terms of biodiversity protection

Alan Bond* – School of Environmental Sciences, University of East Anglia; Research Unit for Environmental Sciences and Management, North-West University, South Africa

Jenny Pope – Integral Sustainability, Australia; Research Unit for Environmental Sciences and Management, North-West University, South Africa

Angus Morrison-Saunders –School of Science, Edith Cowan University, Western Australia; Research Unit for Environmental Sciences and Management, North-West University, South Africa

Francois Retief – Research Unit for Environmental Sciences and Management, North-West University, South Africa

*corresponding author

Taking an environmental ethics perspective to understand what we should expect from EIA in terms of biodiversity protection

Abstract

As a globally mandated decision-support tool, Environmental Impact Assessment (EIA) has the potential to contribute to the protection of biodiversity, which is increasingly under threat because of human activities. Concern over its ability to do this, however, has led to the addition of trade-off rules, Ecosystem Services Assessment (ESA), and biodiversity offsets. But given that EIA is set in a political decision-making context, what is reasonable to expect of EIA? In this paper we seek to explore what level of biodiversity protection we can expect EIA to support (and therefore whether these additions are worthwhile). Our point of departure is that EIA supports its political context and associated societal goals, and those goals typically (explicitly or implicitly) reflect some form of sustainable development. Given that the appropriate level of biodiversity protection is a moral consideration, we take an environmental ethics perspective to explain how different levels of protection are associated with different ethical positions on a spectrum from anthropocentrism (where only humans have intrinsic rights) through to ecocentrism (where all individuals of all species have intrinsic rights). We then investigate how different sustainable development discourses, one economic (on a spectrum from weak to strong sustainability) and one ecological (on a spectrum from shallow to deep ecology) map against the environmental ethics spectrum. We find that the economic discourse on sustainable development, which tends to prevail in political decision-making, is heavily anthropocentric, whereas an ecological discourse has some potential to deliver ecocentrism, but only where a deep ecology interpretation is adopted. We then show that the practise of EIA (with or without the addition of other approaches) maps against, and is bounded by, an economic discourse on sustainable development. The reality is, therefore, that EIA can do no more than contribute to delaying incremental biodiversity loss. If EIA were legislated to protect biodiversity using a deep ecology discourse, then only brownfield development would be possible.

Keywords

Environmental impact assessment; environmental ethics; anthropocentrism; biodiversity; trade-offs; ecosystem services assessment; biodiversity offsets; sustainable development

1. Introduction

Researchers are clear that global biodiversity loss is already severe, and that significant loss is forecast to continue into the future because of human development (Dirzo and Raven, 2003; Pereira *et al.*, 2010; Cardinale *et al.*, 2012; Hooper *et al.*, 2012; Sandbrook *et al.*, 2019). This makes biodiversity protection associated with new development proposals an imperative. To address the ongoing implications of development, Governments have committed to delivering sustainable development which, as a concept, assumes that biodiversity protection is compatible with development (United Nations Conference on Environment and Development, 1992).

Conservation is defined by the International Union for Conservation of Nature (IUCN) as "*the protection, care, management and maintenance of ecosystems, habitats, wildlife species and populations, within or outside of their natural environments, in order to safeguard the natural conditions for their long-term permanence*" (International Union for Conservation of Nature, undated, p.18). Given that biodiversity was defined in the Convention on Biological Diversity (United Nations, 1992) as incorporating genetic, species and ecosystem levels of ecological organisation (Pimm *et al.*, 2014), it is clear that references to conservation usually mean the conservation of biodiversity. Approaches exist for measuring biodiversity in line with these different metrics (for example, see Weitzman (1998) for a focus on genetic diversity, Wauchope *et al.* (2019) for a focus on each of taxa/species, regional protection, and protection by designation, and the European Union's Habitats Directive (Council of the European Communities, 1992) for an ecosystem protection approach). Thus it is possible to evaluate the success of conservation efforts, and this success will exist on a spectrum from extinction of species through to no further loss of genetic diversity, species, or ecosystem services. Whilst biodiversity increase is also possible (and does occur in certain cases), our focus is the extent to which EIA can be expected to stem the tide of global biodiversity loss, and therefore the focus is on the protection element of conservation (by which we mean no further development-created loss of biodiversity) rather than any enhancement.

Environmental Impact Assessment (EIA) is a decision-support tool that was first established in the USA in 1969, and is now legislated in every country in the world (Morgan, 2012; Yang, 2019). EIA was specifically associated with sustainable development in the Rio Earth Summit (United Nations Conference on Environment and Development, 1992) given that the conservation consequences of development decisions need to be understood by decision-makers before consent can be given.

Yet perceived weaknesses with EIA in protecting biodiversity has led to calls for greater inclusion of approaches within EIA to improve biodiversity outcomes; for example: application of trade-off rules within impact assessment (hereafter referred to as "Gibson's trade-off rules" after Gibson *et al.*, 2005; Gibson, 2006); embedding Ecosystem Services Assessment (ESA) within EIA (e.g., Baker *et al.*, 2013; Geneletti, 2013; Karjalainen *et al.*, 2013; Hansen *et al.*, 2018); and including biodiversity offsetting as a mechanism within EIA (Rundcrantz and Skärbäck, 2003; BBOP, 2009; de Witt *et al.*, 2019).

But EIA is not a decision-making tool, and its influence on decisions is known to be context dependent (Kolhoff *et al.*, 2009). Therefore the understanding, and political interpretation, of sustainable development in any jurisdiction (or the relationship between development and conservation where sustainable development is not an explicit policy goal) is an important determinant of the effectiveness of its practice (Lyhne *et al.*, 2017).

The extent to which biodiversity should be protected is a value-laden question that relies on moral views on the intrinsic value of biodiversity. As such it requires ethical reasoning to determine intrinsic value (Van Dyke and Lamb, 2020). Given that degrees of protection are ethical considerations, in this paper we map degrees of biodiversity protection against different ethical positions. This then provides a framework for considering the ethical boundaries which constrain the practice of EIA, and therefore explain the level of support provided to different biodiversity outcomes.

Therefore, the aims of this paper are:

1. to explore what biodiversity protection means from different environmental ethics perspectives;
2. to conceptualise sustainable development from an environmental ethics perspective; and
3. to identify the limits of biodiversity protection that EIA can be expected to underpin in a political context where sustainable development is the goal.

To meet these aims, the paper is structured as follows. The next section briefly introduces sustainable development discourses. Section 3 introduces environmental ethics and conceptualises the level of biodiversity protection afforded at points along that spectrum. Section 4 conceptualises the relationship between two discourses on sustainable development and environmental ethics, and shows where EIA (with and without associated approaches) fits into this picture. The final section discusses the implications of the findings, and concludes on the understanding that has been developed about the degree of biodiversity protection that EIA can support, and what the implication would be of changing EIA to better protect biodiversity.

2. Sustainable development discourses

Sustainable development means different things to different people depending on world-views held (Bell and Morse, 2008; Bond *et al.*, 2010; Bond and Morrison-Saunders, 2011), leading to different framings, which are termed discourses. Bond and Morrison-Saunders (2009) highlighted some of the sustainable development discourses (defined "*as an ensemble of ideas, concepts, and categories through which meaning is given to phenomena*" (Hajer, 1993, p.45)) that are relevant to a decision-making context where EIA might feature. Of these, we will focus on two as being directly relevant to our aim. The first is an economic discourse, and the second is an ecological discourse (ecology being the study of, *inter alia*, biodiversity). The former reflects decision-making practice in a neoliberal world (Bond *et al.*, 2020), whilst the latter is relevant because it focuses on the environmental component we are considering: biodiversity.

An economic discourse on sustainable development views biodiversity through a utilitarian lens, which fails to attribute intrinsic value to nature (Hugé *et al.*, 2017). Essentially, this means that non-human species do not possess individual rights. A moral framing of non-human species would be considered deontological (the opposite of utilitarian). An economic discourse on sustainability operates on a spectrum from weak to strong sustainability (Landrum and Ohsowski, 2017). Weak sustainability represents a situation where three capitals (economic, social and environmental) are considered as being tradable (Cabeza Gutés, 1996; Neumayer, 2010), with the expectation that total capital continues to increase. Taking strong sustainability as the other end of the spectrum of an economic discourse on sustainable development, we note there is some variation in how this is defined in the literature. Dietz and Neumayer (2007, p.619) refer to it as a "*more diffuse paradigm*" than weak sustainability. Landrum and Ohsowski (2017) go as far as arguing that strong sustainability represents a view that there should be no net loss in any of the three capitals and, indeed, go as far as saying that natural capital (which is synonymous with environmental capital and is therefore broader than just biodiversity) should be considered to be priceless. However, this view of strong sustainability is characterised by Wu (2013, p.1003) drawing on Daly (1995) as "*absurdly strong sustainability*" whereby no species should ever go extinct. In fact, Daly (1995) argues that "'*absurdly strong sustainability' is in fact absurd*". This suggests that 'strong sustainability' as more typically understood, is more limited in its protection aspirations, recognising the need to use some natural capital.

Indeed, the common understanding of strong sustainability (which we adopt in this paper) is very much based on the conservation of 'critical natural capital' (Ekins *et al.*, 2003), which tends to be defined somewhat pragmatically as the natural capital which is essential to maintain environmental functions (Ekins *et al.*, 2003). Morrison-Saunders and Pope (2013), conceptualised that each pillar of sustainable development has critical thresholds identifying non-negotiable capital that cannot be traded (either across the pillars of sustainability, or within individual pillars). This leaves some negotiable capital that can be traded within each pillar. If we then take the environment pillar only (in which biodiversity resides), this infers value judgements are taken about what should be protected and not traded, leaving further scope to trade what is not valued in this way. This leads to policies to protect natural areas from development, so that inevitable loss of biodiversity elsewhere does not threaten environmental function (i.e. species and ecosystems do not become extinct). Therefore, economists favouring a strong sustainability discourse are clear that only critical natural capital needs to be protected; this infers that not all natural capital is critical, therefore individuals of species have no intrinsic rights, and therefore not all natural capital needs to be protected.

An ecological discourse on sustainable development is based on an ecological framing of nature as a self-organising system, but one in which humans have imposed constraints to ensure the supply of needed goods (Mebratu, 1998). The ecological discourse operates on a spectrum, first described by Naess (1973), between shallow ecology, where the value of non-human species are considered only in terms of the value they contribute to humans, and deep ecology, where non-human species should be considered to have rights on a par with humans (Jacob, 1994; Mebratu, 1998). A deep ecology framing is favoured by ecologists as the best way of protecting biodiversity.

3. A spectrum of environmental ethics

We define ethics as standards or social norms that guide human conduct after Chirikure (2014) in decision-making associated with EIA. Verhoog (1992) explores environmental ethics by considering the intrinsic value humans place on different species. A key consideration here is the notion of sentience. A sentient species is one "*capable of experiencing positive and negative affective states*" (Duncan, 2006, p.11); which in more simple terms means they can experience, for example, hunger, fear, pain, frustration. The level of sentience of different species is contested, which has implications for how they are viewed by human beings (Dawkins, 2006; Brown, 2015). Therefore it is possible to conceptualise a spectrum distinguishing between:

- Anthropocentrism, in which only humans have intrinsic value;
- Zoocentrism, in which sentient (non-human) animals (usually equated to those capable of experiencing pain) also have intrinsic value (but the focus is generally on domestic animals). This ethical stance is consistent with 'compassionate conservation' which argues that sentient animals should have the same moral status as human beings (Wallach *et al.*, 2020);
- Biocentrism, in which all animals, including wild animals are considered to have a good of their own, and plants come into consideration as intrinsically valued. "*A biocentric view would approve the killing of other sentient individuals in order to preserve particular endangered organisms (for the action promotes the interest of the community of organisms or life)*" (Horsthemke, 2017); and
- Ecocentrism, in which all life (including individuals of non-animal species) has 'biotic rights'.

We can consider this as a spectrum from anthropocentrism through to ecocentrism with increasing value awarded to non-human species (simplistically represented in Figure 1). These two opposing ethical frames are argued to be at the root of differences between deep and shallow ecology. For example, Jacob (1994) argues that shallow ecology reflects anthropocentric world views, whilst deep ecology reflects biocentric worldviews, and Akamani (2020) emphasises that deep ecology emphasises the intrinsic right of all members of the biotic community. And, although not all observers agree that such perspectives can be so easily defined (see, for example, Grey, 1993), we find it a useful means of broadly distinguishing them.

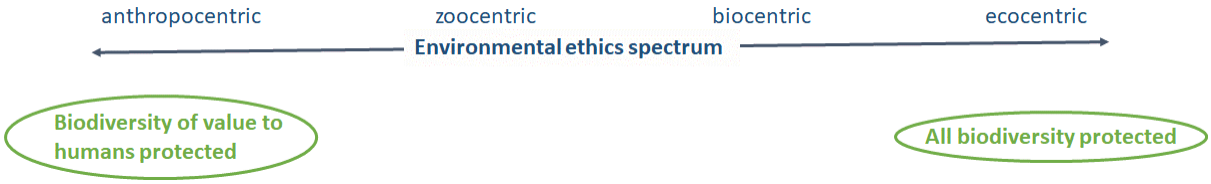

Figure 1 The relationship between ethical positions and biodiversity protection

In distinguishing between these ethical positions, we do not judge them. And the boundaries can be blurred because, for example, anthropocentrism could support conservation (and therefore provide a high level of biodiversity protection) because there is value in doing that for humans. The importance of this conceptualisation is that different ethical positions would have different implications for the level of biodiversity (however measured) that it is considered morally right to protect in any given context.

4. Conceptualisation: mapping sustainable development discourses and EIA onto environmental ethics

If we return to the economic and ecological discourses of sustainable development, it is clear that both shallow ecology and weak sustainability are anthropocentric concepts. Value attributed to species in either case is viewed in the context of the utilitarian value that is afforded to humans by the existence of that species (in that location). Arguably, in some cases, zoocentric ethics could come into play based on the greater affinity felt by human beings for sentient animals. Nevertheless, both weak ecology and weak sustainability accommodate trade-offs involving biodiversity, which has significant potential to incrementally erode that biodiversity.

it is insightful to draw on the conceptualisation of sustainability assessment trade-off model developed by Morrison-Saunders and Pope (2013), and introduced in section 2, whereby the environment pillar of sustainability has both critical natural capital (including biodiversity), and negotiable natural capital (including biodiversity). This has the advantage of potentially protecting, to a greater degree, some elements of biodiversity (e.g. as might happen in a protected area designated for tigers). However, these are still just degrees of anthropocentrism (or zoocentrism at best) given that the valuer is human. This makes it clear that anthropocentricism or zoocentrism can deliver very different conservation outcomes, depending what is, or is not, valued. Indeed, anthropocentric approaches can be very good at protecting some biodiversity, and protected areas are an example of this. Nevertheless, the caveats remaining for biodiversity conservation, in such a conceptualisation, are that trades can still occur based on an anthropocentric valuation system. As

soon as an economic framing is adopted, even where a strong sustainability framing is taken, the vast majority of species lose intrinsic rights.

Taking deep ecology as the other end of the spectrum of ecological discourse on sustainable development; here individuals of non-human (including non-sentient) species are deemed to have rights on par with those afforded to human beings. Where individuals of a species enjoys rights, then it is no longer possible to trade-off them off, even against other of their own species as might occur with biodiversity offsets, as it would infringe their rights. This is ecocentric and it is difficult to see how biodiversity would not be protected given this ethical position (recognising that biodiversity changes naturally – but here the context is the need for human development). It would seem, therefore, that deep ecology is similar to 'absurdly strong sustainability', which we have seen is dismissed by economists who see it as an unrealistic goal.

What this brief analysis makes clear is that strong sustainability and deep ecology are not the same when considered in the context of environmental ethics, and that the difference revolves around whether protection is afforded at the level of species of individuals of a species. This is important for the biodiversity outcomes where one discourse is favoured over another. Thus, whilst neoliberals maintain sustainable development as a key policy goal (Bond *et al.*, 2020), even the delivery of strong sustainability will likely continue the incremental loss of biodiversity outside protected areas. This is important because efforts to protect biodiversity in the context of environmental decision-making processes in place across the globe are made in the context of economic discourses and not ecological discourses, as these are the ones that speak to decision makers. However, taking an ecocentric ethics framing, it is clear that nowhere on the discourse spectrum of economic sustainable development (apart from 'absurdly strong sustainability') is biodiversity fully protected for future generations.

Figure 2 conceptualises the relationship between environmental ethics and economic and ecological discourses on sustainable development. In this figure, we place 'absurdly strong sustainability' outside the economic discourse given that it does not typically feature, as explained above.

This conceptualisation is useful because literature evaluating EIA, and the implications of undertaking EIA for biodiversity rarely mention ethics. But they often either explicitly or implicitly feature considerations of the sustainable development discourse. This means that we can map the discourse against the primary axis of environmental ethics. From there we can conclude on the extent to which biodiversity is protected based on the assumption that it is the underlying ethical position that determines the fate of biodiversity.

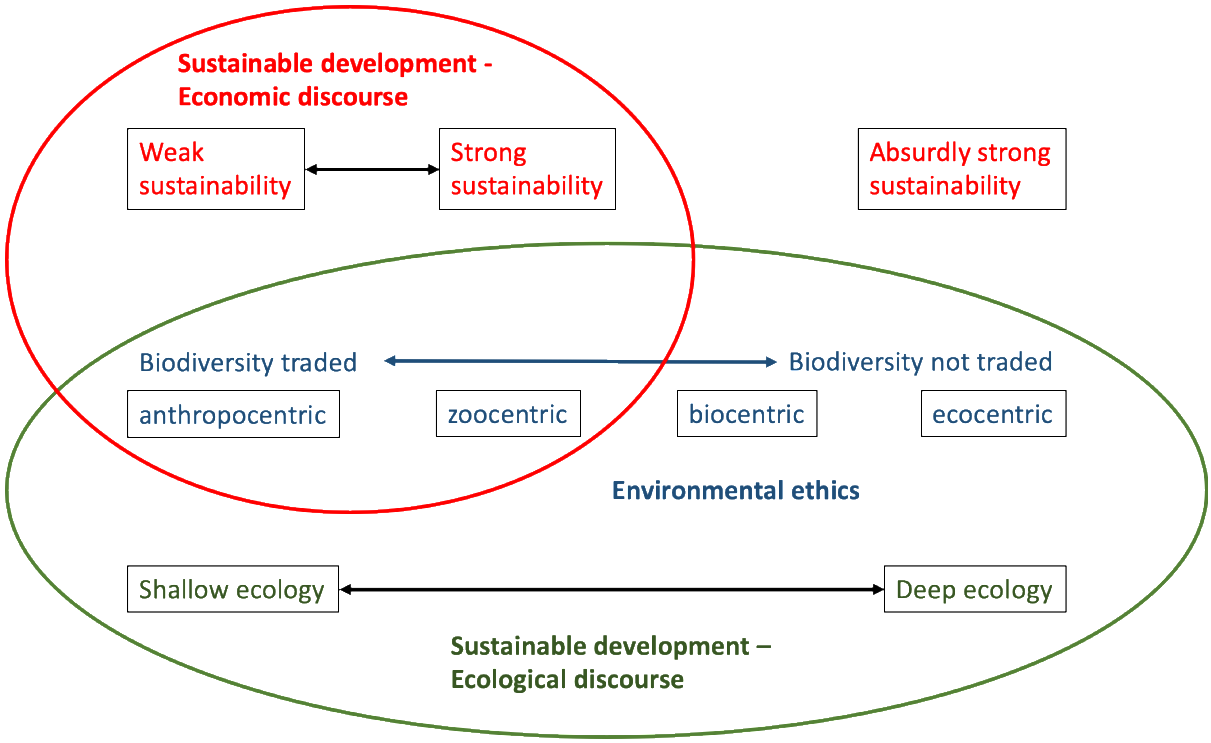

Figure 2 Sustainable development discourses mapped against the spectrum of environmental ethics

EIAs are documented in Environmental Impact Statements (or Reports), typically comprising separate chapters covering each of the aspects listed in legislation. Ecological impact assessment is the name often given to the chapter in the EIA focussing on the ecological implications of the proposed development (e.g., Treweek, 1996; Geneletti, 2006; Briggs and Hudson, 2013; Drayson and Thompson, 2013) and thus where biodiversity protection will mainly be addressed. In any one chapter, the environmental consultants undertaking the assessment will evaluate the significance of the impacts on that environmental aspect, with and without suggested mitigation measures. Ultimately, an EIA will present a number of impacts on different environmental aspects, each with varying levels of significance. Duinker and Beanlands (1986, p.7) set out how significance should be assessed in EIA: "*Any exercise in judging the significance of an environmental impact should thoroughly consider (a) the importance of the environmental attribute in question to project decision makers, (b) the distribution of change in time and space, (c) the magnitude of change, and (d) the reliability with which change has been predicted or measured*". Evidence would suggest this approach has continued over time (e.g., Wood, 2008), and it is clearly focussed on the values humans place on aspects of biodiversity, without recognising intrinsic rights of other species. Depending on the system, the findings of significance, and their acceptability are moderated through public and other stakeholder engagement approaches. In this way, there are opportunities to embed some existing societal values in the EIAs, which help decision-makers to understand the political consequences of their decisions (O'Faircheallaigh, 2010).

As Retief *et al.* (2013, p.13) put it: "*dealing with trade-offs lies at the heart of environmental impact assessment (EIA)*". In this paper we have argued that the trade-offs inherent in EIA underpin a utilitarian model for decision making that can facilitate environmental losses subject to socio-economic gains. For this reason, Gibson *et al.* (2005) and Gibson (2006), in the context of

sustainability assessment, set out trade-off rules that include the delivery of net sustainability gains, and avoidance of significant adverse effects (including those on biodiversity). However, avoiding 'significant adverse effects' is a trade-off loaded within an anthropocentric framing for decision-making, and one which is open to interpretation from different ethical perspectives. Retief *et al.* (2013) draw on Caldwell (1989) in arguing that trade-off decisions need to incorporate values and morality. As it stands, the Gibson trade-off rules have been designed to deliver strong sustainability by forbidding trade-offs which result in the loss of critical natural capital. This is a significant advance over weak sustainability that might otherwise ensue, but falls short of avoiding incremental biodiversity loss given that even strong sustainability is based on ethical positions that do not fully protect biodiversity.

Whilst ESA was established as a concept many years ago, it was first popularised by the Millennium Ecosystem Assessment (MA), which revealed the wide-ranging impact that human activities have had on ecological systems (Millennium Ecosystem Assessment, 2005). An approach for estimating wealth based on the services that ecosystems provide to humans was developed based on the argument that unless the issue of ecosystem degradation is addressed, human activity "*will substantially diminish the benefits that future generations obtain from ecosystems*" (MA, 2005, p.1).

The underlying rationale for ESA was the continuing degradation of biodiversity, with an argument that fully reflecting the value of all the services that ecosystems provides will allow ecosystem services to enjoy a stronger position in trade-off decision making. There have, therefore, been calls to embed ESA into EIA where it can better inform those trade-offs (Fothergill *et al.*, 2012; Baker *et al.*, 2013; Geneletti, 2013; Karjalainen *et al.*, 2013; Landsberg *et al.*, 2013; Geneletti *et al.*, 2015; Hansen *et al.*, 2018).

ESA is by definition anthropocentric (Brauman *et al.*, 2014; De Vreese *et al.*, 2019), given that ecosystems are valued in the context of services for humans. Whilst different interpretations exist, the most common understanding stems from the Millennium Ecosystem Assessment (2003), that differentiated between four types of ecosystem services:

- supporting services needed to produce all other ecosystem services (e.g. soil formation, primary production);
- regulating services delivering benefits (e.g. water purification, regulation of flood risk);
- provisioning services delivering goods that people use (e.g. food, fuel); and
- cultural services reflecting the value that people attribute to rivers, parks, wild spaces, etc.

There has been much interest in embedding ESA within EIA (e.g., Baker *et al.*, 2013; Geneletti, 2013; Karjalainen *et al.*, 2013; Hansen *et al.*, 2018), and guidance has also been developed in some instances (e.g., Landsberg *et al.*, 2011; Fothergill *et al.*, 2012). However, the sparse investigations of practice reveal that ecosystems services do not currently form a significant part of EIAs (Russel *et al.*, 2014; Geneletti *et al.*, 2015).

Nevertheless, the ESA approaches used attribute value to human beings of an ecosystem service. As Batavia and Nelson (2017) argue, this favours value to humans and not an existence value. This is potentially zoocentric at best.

Biodiversity offsets, defined as "*measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimised and / or rehabilitated or restored, in order to achieve no net loss or a net gain of biodiversity*" (BBOP, 2012, p1), have emerged over recent decades as a

potential means to reconcile biodiversity and development (McKenney and Kiesecker, 2010). Incorporated into EIA, biodiversity offsets are positioned as the final step in the mitigation hierarchy, aiming to compensate for residual significant impacts after options to avoid, minimise or rehabilitate these impacts have been exhausted (von Hase and ten Kate, 2016). Biodiversity offsets should result in no net loss of the impacted biodiversity values, and sometimes the goal is net overall gain (Brownlie *et al.*, 2013).

EIA is often the process through which biodiversity offsets are planned and communicated (de Witt *et al.*, 2019). Cuckston (2019) argues that biodiversity offsetting is inherently ecocentric given that ecological values are provided rather than monetary values (as in ESA). Yet this argument fails to recognise that value judgements are being made as to the ecological value which is worthy of protection, and that which is not. This occurs through the process of determining what residual impacts are considered significant – where is the line between significant and insignificant drawn, and at what level is significance of biodiversity considered (genetic, species, or ecosystem)? It is clear that offsets decisions are not based on the assumption of the intrinsic rights of all species, which means that offsetting cannot be ecocentric.

In addition, there is also abundant evidence that offsetting policies are challenging to implement and validate in practice, and have been subject to abuse, meaning that they do not achieve the intended outcome of biodiversity net gain (e.g., Ives and Bekessy, 2015; Spash, 2015; Maron *et al.*, 2016; Primmer *et al.*, 2019). For example, Calvet *et al.* (2015) are clear that biodiversity offsetting has an ecological rationale, but that this is undermined by taking an economic framing for sustainable development, particularly when compensation payments to offset biodiversity loss are allowed. Even without compensation payments, there is an underlying assumption that different habitats are exchangeable, and this assumption treats biodiversity as a commodity to be traded (Walker *et al.*, 2009). Thus despite being well-founded in seeking to address exactly the issue of concern in this article – incremental biodiversity loss – biodiversity offsetting aligns with other decision contexts, including EIA itself, that are utilitarian by design. As such, it does not assign intrinsic value to any nature – but rather values some nature above others. In figure 2, this allocated rights to some species but not others, and so is largely anthropocentric or, as Vaissière *et al.* (2017) argue the approach represents a move towards strong sustainability, possibly zoocentric at best.

Figure 3 summarises the conceptualisation of EIA (with and without embedded approaches) against the environmental ethics positions set out above.

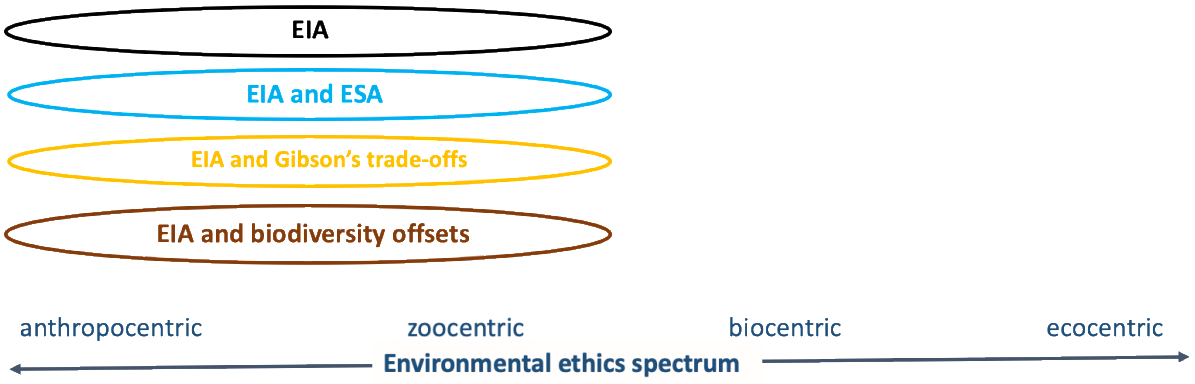

Figure 3 Environmental ethics and EIA (with and without embedded approaches)

5. Discussion and conclusions: what does environmental ethics tell us about the ability of EIA to assist in the protection of biodiversity?

Our stated aims were:

1. to explore what biodiversity protection means from different environmental ethics perspectives;
2. to conceptualise sustainable development from an environmental ethics perspective; and
3. to identify the limits of biodiversity protection that EIA can be expected to underpin in a political context where sustainable development is the goal.

The level of biodiversity protection has been shown to increase along the environmental ethics spectrum from anthropocentrism through to ecocentrism, with ecocentrism being the only ethical position where intrinsic rights are enjoyed by all individuals of all species, and there biodiversity would be actively protected by human actions.

The conceptualisation of sustainable development from an environmental ethics perspective has made it clear that the currently prevailing economic discourse on sustainable development has limited ability to prevent incremental biodiversity loss outside protected areas, even where strong sustainability is delivered.

The analysis has also shown that an ecological discourse on sustainable development can protect biodiversity at the deep ecology end of the spectrum. However, most economists would regard such a position as absurd. A move to an ecological discourse at any point on the spectrum in decision making would require a very dramatic shift in in political interpretations of sustainable development.

What does this mean for EIA and the extent to which this decision tool can protect biodiversity from development? Figure 3 shows us that EIA practice, including where associated with any other biodiversity protection approaches, is in line with an economic discourse on sustainable development, or with shallow ecology. This suggests that, despite concerns over the outcomes for biodiversity that have led to the formation of these additional approaches, the prevailing sustainability context is determining the decision. EIA is performing its function within the constraints of the political context in which it operates. It cannot realistically be expected to do more.

We are not arguing that values and ethics have no role in EIA, or in decision making, as it is well-recognised that they do (Richardson, 2005). The argument is rather that the prevailing ethical positions are limited by the economic discourse on sustainability, which act to constrain the extent to which it is considered appropriate to afford intrinsic value to all individuals of all species. Therefore the addition of Gibson's trade off rules, ecosystems services assessment, and biodiversity offsets do not change the extent to which EIA can protect biodiversity (albeit they may increase the attention given to the significance of the impacts).

This begs the question of what EIA reflecting an ecocentric ethic would look like? Given that it would award intrinsic rights to individuals of species, the only possible areas upon which development could be allowed would be locations with no biodiversity at all. It is difficult to see that such locations exist, but perhaps it could be argued that created land (for example new islands) or sites already cleared prior to such a policy being introduced might be examples. While this might be a

useful thought experiment, it is clear that it is entirely inconsistent with government policy anywhere in the world, and indeed would not enable essential development to occur.

The bottom line is that, outside protected areas, and assuming their boundaries do not change, EIA will continue to consider the implications for biodiversity of human development, but that incremental loss of biodiversity is inevitable where current understandings of sustainable development prevail. This is not a new finding, but might help to clarify the limitations that apply to EIA in terms of the outcomes that it can realistically deliver. It provides a valuable function in operating to minimise the rate of biodiversity loss in unprotected areas, but cannot prevent it.

6. References

Akamani, K (2020), "Integrating Deep Ecology and Adaptive Governance for Sustainable Development: Implications for Protected Areas Management", *Sustainability*, **12(14)**, pages 5757.

Baker, J, W R Sheate, P Phillips and R Eales (2013), "Ecosystem services in environmental assessment — Help or hindrance?", *Environmental Impact Assessment Review*, **40(0)**, pages 3-13.

Batavia, C and M P Nelson (2017), "For goodness sake! What is intrinsic value and why should we care?", *Biological Conservation*, **209**, pages 366-376.

BBOP (2009), *The relationship between biodiversity offsets and impact assessment: A BBOP resource paper* (Business and Biodiversity Offsets Programme, Washington, D.C.).

BBOP (2012), *Biodiversity Offset Design Handbook-Updated. A BBOP Resource Paper.* (Business and Biodiversity Offsets Programme, Washington DC).

Bell, S and S Morse (2008), *Sustainability Indicators: Measuring the immeasurable?* (Earthscan, London, Sterling, VA).

Bond, A, J Pope, M Fundingsland, A Morrison-Saunders, F Retief and M Hauptfleisch (2020), "Explaining the political nature of environmental impact assessment (EIA): A neo-Gramscian perspective", *Journal of Cleaner Production*, **244**, pages 118694.

Bond, A J and A Morrison-Saunders (2009), "Sustainability Appraisal: jack of all trades, master of none?", *Impact Assessment and Project Appraisal*, **27(4)**, pages 321-329.

Bond, A J and A Morrison-Saunders (2011), "Re-evaluating Sustainability Assessment: aligning the vision and the practice", *Environmental Impact Assessment Review*, **31(1)**, pages 1-7.

Bond, A J, C V Viegas, C Coelho de Souza Reinisch Coelho and P M Selig (2010), "Informal knowledge processes: the underpinning for sustainability outcomes in EIA?", *Journal of Cleaner Production*, **18(1)**, pages 6-13.

Brauman, K A, S Van Der Meulen and J Brils (2014). "Ecosystem Services and River Basin Management". "Handbook of Environmental Chemistry"). 29, 265-294.

Briggs, S and M D Hudson (2013), "Determination of significance in Ecological Impact Assessment: Past change, current practice and future improvements", *Environmental Impact Assessment Review*, **38**, pages 16-25.

Brown, C (2015), "Fish intelligence, sentience and ethics", *Animal Cognition*, **18(1)**, pages 1-17.

Brownlie, S, N King and J Treweek (2013), "Biodiversity tradeoffs and offsets in impact assessment and decision making: can we stop the loss?", *Impact Assessment and Project Appraisal*, **31(1)**, pages 24-33.

Cabeza Gutés, M (1996), "The concept of weak sustainability", *Ecological Economics*, **17(3)**, pages 147-156.

Caldwell, L K (1989), "Understanding impact analysis: technical process, administrative reform, policy principle", in Bartlett, R V (editor) *Policy through impact assessment: Institutionalized analysis as a policy strategy* (Greenwood Press, New York), pages 7-16.

Calvet, C, C Napoléone and J M Salles (2015), "The biodiversity offsetting dilemma: Between economic rationales and ecological dynamics", *Sustainability (Switzerland)*, **7(6)**, pages 7357-7378.

Cardinale, B J, J E Duffy, A Gonzalez, D U Hooper, C Perrings, P Venail, A Narwani, G M MacE, D Tilman, D A Wardle, A P Kinzig, G C Daily, M Loreau, J B Grace, A Larigauderie, D S Srivastava and S Naeem (2012), "Biodiversity loss and its impact on humanity", *Nature*, **486(7401)**, pages 59-67.

Chirikure, S (2014), "Where angels fear to tread: Ethics, commercial archaeology, and extractive industries in southern Africa", *Azania*, **49(2)**, pages 218-231.

Council of the European Communities (1992), "Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora", *Official Journal of the European Communities*, **L206(22/07/1992)**, pages 7-50.

Cuckston, T (2019), "Seeking an ecologically defensible calculation of net loss/gain of biodiversity", *Accounting, Auditing and Accountability Journal*, **32(5)**, pages 1358-1383.

Daly, H E (1995), "On Wilfred Beckerman's critique of sustainable development", *Environmental Values*, **4(1)**, pages 49-55.

Dawkins, M S (2006), "Through animal eyes: What behaviour tells us", *Applied Animal Behaviour Science*, **100(1-2)**, pages 4-10.

De Vreese, R, A Van Herzele, N Dendoncker, C M Fontaine and M Leys (2019), "Are stakeholders' social representations of nature and landscape compatible with the ecosystem service concept?", *Ecosystem Services*, **37**.

de Witt, M, J Pope, F Retief, A Bond, A Morrison-Saunders and C Steenkamp (2019), "Biodiversity offsets in EIA: Getting the timing right", *Environmental Impact Assessment Review*, **75**, pages 1-12.

Dietz, S and E Neumayer (2007), "Weak and strong sustainability in the SEEA: Concepts and measurement", *Ecological Economics*, **61(4)**, pages 617-626.

Dirzo, R and P H Raven (2003), "Global state of biodiversity and loss", *Annual review of Environment and Resources*, **28**.

Drayson, K and S Thompson (2013), "Ecological mitigation measures in English Environmental Impact Assessment", *Journal of Environmental Management*, **119**, pages 103-110.

Duinker, P N and G E Beanlands (1986), "The significance of environmental impacts: an exploration of the concept", *Environmental Management*, **10(1)**, pages 1-10.

Duncan, I J H (2006), "The changing concept of animal sentience", *Applied Animal Behaviour Science*, **100(1-2)**, pages 11-19.

Ekins, P, S Simon, L Deutsch, C Folke and R De Groot (2003), "A framework for the practical application of the concepts of critical natural capital and strong sustainability", *Ecological Economics*, **44(2-3)**, pages 165-185.

Fothergill, J, J King, J Murphy, J Owen, S P Smith, J Spurgeon, J Treweek, O Venn and A White (2012), "Considering Ecosystem Services in EIA", available at <http://www.envirotrain.co.uk/wp-content/uploads/2010/09/PN6-01.23-Ecosystem-Services-in-EIA.pdf >, last accessed 17 January 2013.

Geneletti, D (2006), "Some common shortcomings in the treatment of impacts of linear infrastructures on natural habitat", *Environmental Impact Assessment Review*, **26(3)**, pages 257-267.

Geneletti, D (2013), "Ecosystem services in environmental impact assessment and strategic environmental assessment", *Environmental Impact Assessment Review*, **40**, pages 1-2.

Geneletti, D, A Bond, D Russel, J Turnpenny, W Sheate and A Jordan (2015), "Chapter 10: Ecosystem services and sustainability assessment: theory and practice", in A Morrison-Saunders, J Pope and A Bond (editors), *Handbook of Sustainability Assessment* (Edward Elgar, Cheltenham, UK and Northampton, USA) pages 215-234.

Gibson, R B (2006), "Sustainability assessment: basic components of a practical approach", *Impact Assessment and Project Appraisal*, **24(3)**, pages 170-182.
Gibson, R B, S Hassan, S Holtz, J Tansey and G Whitelaw (2005), *Sustainability Assessment: Criteria, Processes and Applications* (Earthscan, London).
Grey, W (1993), "Anthropocentrism and deep ecology", *Australasian Journal of Philosophy*, **71(4)**, pages 463 - 475.
Hajer, M A (1993), "Discourse Coalitions and the Institutionalization of Practice: The Case of Acid Rain in Great Britain", in F Fischer and J Forester (editors), *The Argumentative Turn in Policy Analysis and Planning* (Duke University Press, Durham) pages 43-76.
Hansen, K, M Malmaeus, L Hasselström, E Lindblom, K Norén, M Olshammar, T Söderqvist and Å Soutukorva (2018), "Integrating ecosystem services in Swedish environmental assessments: an empirical analysis", *Impact Assessment and Project Appraisal*, **36(3)**, pages 253-264.
Hooper, D U, E C Adair, B J Cardinale, J E Byrnes, B A Hungate, K L Matulich, A Gonzalez, J E Duffy, L Gamfeldt and M I O'Connor (2012), "A global synthesis reveals biodiversity loss as a major driver of ecosystem change", *Nature*, **486(7401)**, pages 105.
Horsthemke, K (2017), "Biocentrism, ecocentrism, and African modal relationalism: Etieyibo, Metz, and Galgut on animals and African ethics", *Journal of Animal Ethics*, **7(2)**, pages 183-189.
Hugé, J, A J Rochette, L Janssens de Bisthoven, F Dahdouh-Guebas, N Koedam and M P M Vanhove (2017), "Utilitarian framings of biodiversity shape environmental impact assessment in development cooperation", *Environmental Science and Policy*, **75**, pages 91-102.
International Union for Conservation of Nature (undated), "IUCN Definitions - English", available at <https://www.iucn.org/sites/dev/files/iucn-glossary-of-definitions_en.pdf>, last accessed 26 August 2020.
Ives, C D and S A Bekessy (2015), "The ethics of offsetting nature", *Frontiers in Ecology and the Environment*, **13(10)**, pages 568-573.
Jacob, M (1994), "Sustainable development and deep ecology: An analysis of competing traditions", *Environmental Management*, **18(4)**, pages 477-488.
Karjalainen, T P, M Marttunen, S Sarkki and A-M Rytkönen (2013), "Integrating ecosystem services into environmental impact assessment: An analytic–deliberative approach", *Environmental Impact Assessment Review*, **40**, pages 54-64.
Kolhoff, A J, H A C Runhaar and P P J Driessen (2009), "The contribution of capacities and context to EIA system performance and effectiveness in developing countries: towards a better understanding", *Impact Assessment and Project Appraisal*, **27(4)**, pages 271-282.
Landrum, N E and B Ohsowski (2017), "Content trends in sustainable business education: an analysis of introductory courses in the USA", *International Journal of Sustainability in Higher Education*, **18(3)**, pages 385-414.
Landsberg, F, S Ozment, M Stickler, N Henninger, J Treweek, O Venn and G Mock (2011), "Ecosystem Services Review for Impact Assessment: Introduction and Guide to Scoping", available at <http://www.wri.org/publication/ecosystemservices-review-for-impact-assessment>, last accessed 4th June 2013.
Landsberg, F, M Stickler, N Henninger, J Treweek and O Venn (2013), "Weaving Ecosystem Services into Impact Assessment: A Step-by-Step Method", available at <http://www.wri.org/publication/weaving-ecosystem-services-into-impact-assessment>, last accessed 18th January 2018.
Lyhne, I, F van Laerhoven, M Cashmore and H Runhaar (2017), "Theorising EIA effectiveness: A contribution based on the Danish system", *Environmental Impact Assessment Review*, **62**, pages 240-249.
Maron, M, C D Ives, H Kujala, J W Bull, F J F Maseyk, S Bekessy, A Gordon, J E M Watson, P E Lentini, P Gibbons, H P Possingham, R J Hobbs, D A Keith, B A Wintle and M C Evans (2016), "Taming a Wicked Problem: Resolving Controversies in Biodiversity Offsetting", *BioScience*, **66(6)**, pages 489-498.

McKenney, B A and J M Kiesecker (2010), "Policy development for biodiversity offsets: a review of offset frameworks", *Environmental management*, **45(1)**, pages 165-176.
Mebratu, D (1998), "Sustainability and sustainable development: Historical and conceptual review", *Environmental Impact Assessment Review*, **18(6)**, pages 493-520.
Millennium Ecosystem Assessment (2003), "Ecosystems and human well-being: a framework for assessment", available at <https://www.millenniumassessment.org/en/Framework.html>, last accessed 18 January 2018.
Millennium Ecosystem Assessment (2005), "Ecosystems and Human Well-being: Synthesis", available at <http://www.maweb.org/documents/document.356.aspx.pdf>, last accessed 20th December 2010.
Morgan, R K (2012), "Environmental impact assessment: the state of the art", *Impact Assessment and Project Appraisal*, **30(1)**, pages 5-14.
Morrison-Saunders, A and J Pope (2013), "Conceptualising and managing trade-offs in sustainability assessment", *Environmental Impact Assessment Review*, **38**, pages 54-63.
Naess, A (1973), "The shallow and the deep, long-range ecology movement. A summary", *Inquiry*, **16(1-4)**, pages 95-100.
Neumayer, E (2010), *Weak versus strong sustainability: exploring the limits of two opposing paradigms* (Edward Elgar, Cheltenham).
O'Faircheallaigh, C (2010), "Public participation and environmental impact assessment: purposes, implications, and lessons for public policy making", *Environmental Impact Assessment Review*, **30(1)**, pages 19-27.
Pereira, H M, P W Leadley, V Proença, R Alkemade, J P Scharlemann, J F Fernandez-Manjarrés, M B Araújo, P Balvanera, R Biggs and W W Cheung (2010), "Scenarios for global biodiversity in the 21st century", *Science*, **330(6010)**, pages 1496-1501.
Pimm, S L, C N Jenkins, R Abell, T M Brooks, J L Gittleman, L N Joppa, P H Raven, C M Roberts and J O Sexton (2014), "The biodiversity of species and their rates of extinction, distribution, and protection", *Science*, **344(6187)**, pages 1246752.
Primmer, E, L Varumo, J M Kotilainen, E Raitanen, M Kattainen, M Pekkonen, S Kuusela, P Kullberg, J A Kangas and M Ollikainen (2019), "Institutions for governing biodiversity offsetting: An analysis of rights and responsibilities", *Land Use Policy*, **81**, pages 776-784.
Retief, F, A Morrison-Saunders, D Geneletti and J Pope (2013), "Exploring the psychology of trade-off decision-making in environmental impact assessment", *Impact Assessment and Project Appraisal*, **31(1)**, pages 13-23.
Richardson, T (2005), "Environmental and planning theory: Four short stories about power, multiple rationality, and ethics", *Environmental Impact Assessment Review*, **25(4)**, pages 341-365.
Rundcrantz, K and E Skärbäck (2003), "Environmental compensation in planning: a review of five different countries with major emphasis on the German system", *Environmental Policy and Governance*, **13(4)**, pages 204-226.
Russel, D, J Turnpenny, A Jordan, A Bond, W Sheate and C Adelle (2014), *UK National Ecosystem Assessment Follow-on. Work Package Report 9: Embedding an Ecosystem Services Framework in appraisal: Key barriers and enablers.* (UNEP-WCMC, LWEC, UK).
Sandbrook, C, J A Fisher, G Holmes, R Luque-Lora and A Keane (2019), "The global conservation movement is diverse but not divided", *Nature Sustainability*, **2(4)**, pages 316-323.
Spash, C L (2015), "Bulldozing biodiversity: The economics of offsets and trading-in Nature", *Biological Conservation*, **192**, pages 541-551.
Treweek, J R (1996), "Ecology and Environmental Impact Assessment", *Journal of Applied Ecology*, **33**, pages 191-199.
United Nations (1992), "Convention on Biological Diversity", available at <https://www.cbd.int/doc/legal/cbd-en.pdf>, last accessed 24 April 2020.
United Nations Conference on Environment and Development (1992), *Earth Summit '92* (Regency Press, London).

Vaissière, A-C, H Levrel and P Scemama (2017), "Biodiversity offsetting: Clearing up misunderstandings between conservation and economics to take further action", *Biological Conservation*, **206**, pages 258-262.
Van Dyke, F and R L Lamb (2020), "Values and ethics in conservation", in *Conservation Biology* (Springer) pages 411-447.
Verhoog, H (1992), "The concept of intrinsic value and transgenic animals", *Journal of Agricultural and Environmental Ethics*, **5(2)**, pages 147-160.
von Hase, A and K ten Kate (2016), "Correct framing of biodiversity offsets and conservation: a response to Apostolopoulou & Adams", *Oryx*, **51(1)**, pages 32-34.
Walker, S, A L Brower, R T T Stephens and W G Lee (2009), "Why bartering biodiversity fails", *Conservation Letters*, **2(4)**, pages 149-157.
Wallach, A D, C Batavia, M Bekoff, S Alexander, L Baker, D Ben-Ami, L Boronyak, A P A Cardilin, Y Carmel, D Celermajer, S Coghlan, Y Dahdal, J J Gomez, G Kaplan, O Keynan, A Khalilieh, H Kopnina, W S Lynn, Y Narayanan, S Riley, F J Santiago-Ávila, E Yanco, M A Zemanova and D Ramp (2020), "Recognizing animal personhood in compassionate conservation", *Conservation Biology*, **34(5)**, pages 1097-1106.
Wauchope, H S, J D Shaw and A Terauds (2019), "A snapshot of biodiversity protection in Antarctica", *Nature Communications*, **10(1)**.
Weitzman, M L (1998), "The Noah's ark problem", *Econometrica*, pages 1279-1298.
Wood, G (2008), "Thresholds and criteria for evaluating and communicating impact significance in environmental statements: 'see no evil, hear no evil, speak no evil'?", *Environmental Impact Assessment Review*, **28(1)**, pages 22-38.
Wu, J (2013), "Landscape sustainability science: Ecosystem services and human well-being in changing landscapes", *Landscape Ecology*, **28(6)**, pages 999-1023.
Yang, T (2019), "The Emergence of the Environmental Impact Assessment Duty as a Global Legal Norm and General Principle of Law", *Hastings Law Journal*, **70(2)**, pages 525–572.