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Seeking convergence on the key concepts in 'no net loss' policy

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Summary

1. Biodiversity conservation policies incorporating a no net loss (NNL) principle are being implemented in many countries. However, there are linguistic and conceptual inconsistencies in the use of terms underlying these NNL policies.
2. We identify inconsistencies that emerge in the usage of eight key terms and phrases associated with NNL policies: *biodiversity*; *frames of reference (i.e. baselines, counterfactuals)*; *no net loss*; *mitigation hierarchy*; *biodiversity offset*; *in-kind/out-of-kind*; *direct/indirect*; and *multipliers*.
3. For each term, we make recommendations to support conceptual convergence, reduce ambiguity and improve clarity in communication and policy documentation. However, we also warn of the challenges in achieving convergence, especially given the linguistic inconsistencies in several of these key concepts among countries in which NNL policies are employed.
4. *Policy implications*. The recommendations made in this article, on improving clarity and supporting convergence on key no net loss (NNL) concepts, should help eliminate ambiguity in policy documentation. This is crucial if policymakers are to design robust policies that are: (i) transparent; (ii) translatable into practice in a consistent manner; and, (iii) sufficiently understood and supported by stakeholders to be effective in practice.

Keywords: biodiversity offset, compensation, conservation, counterfactual, frame of reference, mitigation hierarchy, multiplier, no net loss, policy terminology

Introduction

The principle of 'no net loss' (NNL) of biodiversity has been embraced by governments (Madsen et al., 2011), multinational corporations, and financial institutions such as the International Finance Corporation (IFC, 2012; Rainey et al., 2014). In most contexts, NNL requires that biodiversity losses associated with development are quantified and any unavoidable impacts fully compensated for by commensurate gains. NNL is generally associated with a 'mitigation hierarchy', under which project developers seek NNL by sequentially avoiding, minimizing, restoring, and offsetting any predicted impacts (Gardner et al., 2013). Associated mechanisms, e.g. biodiversity banking, have become prominent components of the conservation toolkit.

Despite the proliferating literature on NNL, particularly offsetting (Calvet et al., 2015), the lack of convergence on the usage of key terms is contributing to significant conceptual confusion. For instance, what is known as biodiversity offsetting in some regions (e.g. Australia, UK) is labelled compensatory mitigation elsewhere (e.g. US; Madsen et al., 2011; Box 1). Certain biodiversity offsets in Germany (*Ausgleichsmaβnahmen* or 'compensation offsets') could potentially be interpreted as restoration measures (i.e. a different stage in the mitigation hierarchy) (Tucker et al., 2014). NNL can also be evaluated in various ways resulting in different perceptions as to what 'no net loss' implies (see Bull et al., 2014a). For example, Pickett et al. (2013) discuss a fixed pre-development baseline for evaluating offsets at the Sydney Olympic Park development. But dynamic baselines are also sometimes employed – such as for the Oyu Tolgoi mine in Mongolia (TBC & FFI, 2012), where on-going background habitat deterioration rates were used in determining net outcomes. This potential for confusion is compounded by the fact that NNL-type policies are being developed and implemented across the world in a variety of different languages, which do not necessarily have terms that directly correlate (Table 1).

'No net loss' in different languages

Modern NNL policy, incorporating what is today called 'offsetting', grew out of national legislation in the 1970s in both the US (where offsetting is known as 'compensatory mitigation') and several other countries such as Germany (which distinguishes between 'compensation restoration' and 'substitution restoration', both of which could potentially be considered 'offsets') and France (Madsen et al., 2011; Tucker et al., 2014).

The use of the term 'offset' for biodiversity (lagging behind the emergence of carbon offsetting as a concept) seems to have originated more recently via the emergence of the Business and Biodiversity Offsets Programme in 2004 and Australian policies throughout the 2000s (Madsen et al., 2011; Maron et al., 2015).

Vagueness around terms can also arise in NNL policy development as a result of linguistic uncertainty, during translation of key concepts between different languages (ten Kate & Crowe, 2014). Here, we illustrate this using the example of the various terms used for “biodiversity offset”. Translation of that word can result in conflation of the terms compensation, mitigation, offset and so on (Table 1).

Terminological confusion can lead to misunderstandings about what NNL policy should, or is designed to, achieve (Gordon et al., 2015), in turn fuelling escalation of debates over the validity of the approach (e.g. Apostolopoulou & Adams, 2015). NNL is the focus of much environmental policy development, for example by the International Union for the Conservation of Nature (IUCN, 2016) and the EU (Tucker et al., 2014). It is thus imperative that key concepts underpinning NNL are clarified and understood in a consistent way, by all stakeholders involved in policy development and project implementation. If not, there is a risk that nascent NNL policies and influential guidance will incorporate vague or misguided concepts that are open to misinterpretation, potentially weakening conservation outcomes.

Informed by our involvement in reviews of the outstanding challenges for NNL (Bull et al., 2013; Maron et al., 2016), and by concepts which in our experience are most commonly misinterpreted in practice, we identified eight terms underpinning NNL policy that have been used inconsistently in the literature (including, admittedly, by the authors). For each, we briefly discuss the importance of the term, and potential implications of semantic and conceptual inconsistencies. Then, we attempt to provide clarity around the concepts to which the eight terms refer, in the context of NNL policy.

Key ‘no net loss’ concepts

1. *Biodiversity*

NNL is generally framed as managing and trading losses and gains of biodiversity, so it is important to define what NNL policies mean when referring to ‘biodiversity’. The Convention on Biological Diversity (CBD) recognizes biodiversity at genetic, species and ecosystem levels, and that diversity is driven through complex relationships between biotic and abiotic components and the variability within them (CBD, 2015). Yet the CBD definition of biodiversity – while accepted by many current NNL guidelines (e.g. BBOP, 2012; IFC, 2012) – is evidently not what is intended when NNL objectives refer to ‘biodiversity’. Achievement of NNL for biodiversity using the CBD definition is not only practically impossible to demonstrate, but impossible in principle – e.g. biota carry unique genetic combinations, so exact replacement is not possible.

Under NNL policies, it is standard either to try and use surrogates for total biodiversity, or a specific set of biological targets that are of interest (e.g. charismatic or threatened species) without claiming that all biota are represented. These measures are mostly species or habitat based, sometimes incorporating processes (e.g. US wetland banking) but rarely considering genes (Bull et al., 2014b). Whichever measures are used as targets in NNL policy, it is only for those targets that the policy is designed to achieve neutral outcomes. Even then, if the measure is a composite of multiple biological characteristics (e.g. condition and area), the potential for substitution means the degree to which neutral outcomes are achieved for each component of the composite measure is not certain (e.g. McCarthy et al., 2004). Yet continuing to use the all-encompassing term 'biodiversity', with its established meaning, implies otherwise.

We encourage greater efforts by those implementing NNL to clearly state which elements of biodiversity are actually incorporated – with no policy claiming NNL of 'biodiversity' more widely. For example, the stated aim of the "Net Positive Impact" biodiversity strategy for the Oyu Tolgoi project in Mongolia is to achieve "Net Positive Impact (NPI) or No Net Loss (NNL) on biodiversity" up to 2036 (TBC & FFI, 2012). However, the focus for Oyu Tolgoi is in reality the subset of biodiversity features for which NNL or a NPI would be required under PS6 (IFC, 2012): one plant, 15 vertebrates, and five habitat types. Thus, an accurate claim for the project would be that the strategy targets NPI for key biodiversity features identified (not biodiversity in general).

2. *Frames of reference, baselines and counterfactuals*

Fundamental to achieving NNL is the frame of reference against which it is evaluated. 'Frame of reference' can be considered an umbrella term for any reference state – including, but not limited to, baselines, scenarios and counterfactuals (Bull et al., 2014a). These terms are often conflated.

The term 'baseline' has various meanings even within the NNL literature (Maron et al., 2015). For example, 'baseline' may refer to fixed conditions, such as the current state of a system, or a past reference state. A baseline can also refer to a dynamic scenario, reflecting on-going rates of background change, such as the estimated trends for a biodiversity surrogate in the absence of NNL policy (Bull et al. 2014a). Counterfactuals are scenarios capturing what would have occurred under different circumstances, but as they represent a version of reality that is never realized, they can only ever be estimated, and multiple counterfactuals may be plausible. Counterfactuals are necessary in order to attribute additionality, that is, the 'impact' or difference a set of actions made, relative to what was likely to have occurred otherwise (Ferraro & Pattanayak, 2006).

While reference frames are usually set by regulatory requirements, this information is sometimes not clearly articulated and only implicit. We have previously called for policymakers to be more explicit in specifying the frames of reference being assumed (Bull et al., 2014a; Gordon et al., 2015; Maron et al., 2015). In general, NNL policy remains weighted towards implicitly using current system states (e.g. German policy; Tucker et al., 2014), or counterfactuals of substantial decline (e.g. Australian policies; Maron et al., 2015). We suggest that the term baseline be appropriately modified whenever used, in order to specify the type of reference frame to which it refers. For example, a baseline representing the state of a system immediately prior to development is a 'fixed pre-development baseline'. Conversely, baselines against which gains and losses are to be evaluated could be referred to as 'crediting baselines' and 'debiting baselines' respectively, borrowing from the carbon literature (Maron et al., 2015). The relationship between baselines and counterfactuals requires care – by definition, a counterfactual is never actually observed or measured, whereas a baseline often is. However, observed baselines can form the basis for developing counterfactuals.

3. *No net loss*

Without specification of target ecosystem components and an appropriate frame of reference, NNL could mean different things depending upon interpretation. It is easy to see how a policy objective of 'no net loss of biodiversity or better' (BBOP, 2012) could be presumed by the non-specialist to: (a) apply to all biodiversity; and, (b) be measured against a fixed current baseline. NNL could be thus be interpreted to result in improvement over time for regional biodiversity, compared to the current situation. This perception is sometimes reinforced by policymakers, e.g. in the UK ("[biodiversity offsets offer] an exciting opportunity to look at how we can improve the environment as well as grow the economy"; see Gordon et al., 2015).

Yet these characteristics (a, b) are not usually intended, and in isolation, the NNL policy principle does not generally result in gains for conservation. Realising this might help lower stakeholder expectations to realistic levels, mitigate concerns that NNL is simply greenwashing, and avoid offsetting being mistakenly presented as an opportunity to 'improve the environment'. Where NNL policy contains an additional requirement for Net Gain, as is sometimes required (e.g. IFC, 2012), then this still does not necessarily mean an absolute decline in biodiversity is avoided – depending upon the frame of reference from which gains are measured. For example, if the counterfactual for a region involved a particularly steep on-going background decline, then Net Gain could technically be achieved by establishing a shallower rate of decline in the region, even if the development and associated offsets allowed a decline to continue in absolute terms (Gordon et al., 2011). Further, there are fundamental differences between NNL and NG as policy principles – they represent different underlying conservation philosophies, encourage different stakeholder expectations, and may involve different treatments of uncertainty and reference frames – which are not always widely recognised (Bull & Brownlie, 2015).

We propose that the phrase 'no net loss' is always extended to specify the frame of reference against which NNL is to be achieved. In addition, claiming that NNL policy supports overall environmental improvement should be avoided in most cases.

4. *Mitigation hierarchy*

The implementation of NNL policy ostensibly involves following some mitigation hierarchy. Here, we consider the common categorisation of the mitigation hierarchy: Avoid, Minimize, Restore, Offset (Gardner et al., 2013). That is, predicted biodiversity impacts on projects subject to a NNL requirement should first be avoided through design, then minimized in implementation, then remediated where possible, and finally, any residual impacts compensated for via offsets.

Putting aside the practical challenges facing implementation of the mitigation hierarchy (Bull et al., 2013), a key conceptual challenge is the linguistic vagueness in the way the hierarchy is specified. This results in problems: (i) it is not always clear whether an action represents an avoidance or minimization measure (e.g. carrying out construction works outside of the breeding season for protected fauna); (ii) the third category of the hierarchy is subject to some variety in language, being alternatively labelled 'rehabilitation', 'remediation' (BBOP, 2012), and 'restoration' (IFC, 2012), and all three terms are conflated; (iii) it is unclear at what point restoration activities stop being part of the third stage of the hierarchy, and become biodiversity offsets; and, (iv) biodiversity offsets are sometimes labelled 'compensatory mitigation', causing confusion with the rest of the mitigation hierarchy.

Despite work having gone into clarifying such questions (e.g. Ekstrom et al., 2015), points (i – iv) above require additional exploration and clarification. We suggest that an avoidance measure is one which, once designed into the project, requires no further action to eliminate the corresponding impacts (e.g. choosing not to extract minerals on a site so as to leave important habitat untouched), whereas minimization measures require on-going action to eliminate corresponding impacts (e.g. carrying out extraction activities during certain times of year so as to avoid the nesting season of a bird species). Both are preventative actions, whereas restoration and offsetting are compensatory actions.

We argue that the third category of the mitigation hierarchy should be labelled 'remediation', because actions in this category specifically relate to reversing impacts caused by the development to which the hierarchy is being applied. Remediation, by definition, involves reversing damages that one has caused (e.g. replanting an area of vegetation that was cleared to allow construction access). Restoration and rehabilitation, conversely, refer to more general processes ("Rehabilitation emphasizes the reparation of ecosystem processes, productivity and services whereas the goals of restoration **also** include the re-establishment of the pre-existing biotic integrity in terms of species composition and community structure"; SER, 2004).

Whilst remediation may involve ecological restoration, it is different to biodiversity offsets. Offsets do not reverse damages, they compensate for damages in some other way (e.g. planting a new area of vegetation to compensate for project-related clearances). This distinction can be illustrated as a difference between *Ausgleichsmaßnahmen* (which might be interpreted as remediation) and *Ersatzmaßnahmen* (which might be interpreted as offsetting) measures under German NNL (Tucker et al., 2014).

Finally, despite the widespread use of the term, we discourage describing biodiversity offsets as 'compensatory mitigation'. Compensation is a term that applies to a broader class of measures than offsets (Bull et al., 2013), and 'compensatory mitigation' could equally be used to describe the third stage of the hierarchy ('remediation').

5.O*ffset*

The word 'offset' means to counteract something by having an equal and opposite force or effect (Oxford Dictionary of English). An offset exchange requires that the ecological targets – such as particular species or habitats – are not diminished in net terms compared to what would have occurred without the impact and offset (Maron et al., 2012).

The more general terms 'compensate' and 'mitigate' are often used interchangeably with 'offsets' (Madsen et al., 2011). This is problematic as it creates confusion about what constitutes an offset, and where the bar lies for achieving true NNL. For example in the US, banks of created or restored wetlands – effectively supplying true biodiversity offset credits – are labelled 'mitigation banks'. Conversely, many projects seek to offer financial compensation, education schemes, or research and monitoring funds as part of 'offset packages' (e.g. Oyu Tolgoi; TBC & FFI, 2012). We argue that such activities do not constitute true biodiversity offsets unless measurable and commensurate gains in the biota targeted are achieved through these mechanisms, but the distinction can be hard to make. Furthermore, to qualify as an offset, there must be demonstrably quantifiable equivalence between what is lost and gained, and the term offset should be quarantined for this use only. An offset can therefore be seen as a specific and rigorously quantified type of compensation measure. We recommend the broader term 'compensation' be reserved for other types of actions that do not meet our definition of an offset.

6. *In-kind versus out-of-kind*

Biodiversity offsets are often categorised as 'in-kind' or 'out-of-kind'. These terms refer to the biodiversity attributes being impacted and offset, and whether they are similar or different, respectively. Note, in-kind is not the same as 'on-site' (on-site offsets can be either in-kind or out-of-kind, as can off-site offsets), even though the terms are sometimes used interchangeably. Under the CBD definition of biodiversity, all offsets are out-of-kind, as biodiversity in any two places can never be truly identical. However, since specific surrogates of biodiversity are the targets under NNL policy, in-kind offsets are possible with respect to these surrogates. An important question is whether out-of-kind trades with respect to the surrogates can ever qualify as true offsets.

One widely accepted type of out-of-kind offsetting is referred to "trading up" (BBOP, 2012), where offsets seek gains in components of biodiversity of higher conservation value than those impacted. For example, impacts on a common and unthreatened ecological community (e.g. fallow agricultural land) being offset by gains for a more threatened community (e.g. wetland). More generally, so-called 'strategic offsetting' has been advocated as an effective approach (Sochi & Kiesecker 2016), integrating offsetting with conservation planning. This makes use of well-developed techniques for prioritising locations for conservation activities based upon factors such as complementarity, irreplaceability, species rarity, cost, and threat. Out-of-kind offsets might sometimes, under such an approach, achieve benefits more valued from a conservation perspective compared to strict like-for-like offsetting (Habib et al., 2013; Bull et al., 2015). The downside of this approach is that it either removes the clear connection between losses and gains, or obscures the targets of the exchange.

We argue that out-of-kind exchanges of biodiversity (including trading up) should not be referred to as 'offsets' in the strict sense unless the biodiversity surrogates upon which the policy operates are specifically designed to be fungible. For instance, where Habib et al. (2013) propose the use of caribou conservation as a flexible offset for vegetation clearances in western Canada, this would be labelled strategic compensation – whilst measures that compensated like-for-like with habitat restoration would be true offsets. In proposing this position, we again emphasize that true fungibility does not exist for trades in actual components of biodiversity e.g. individual organisms (Salzman & Ruhl, 2000), so in practice 'in-kind' means 'fungible in relation to the specified biodiversity metric'. Equally, we acknowledge a practicality – developers may be less likely to attempt strategic compensation measures, involving gains of very high conservation value, if they are strictly required by policy to demonstrate that they have implemented some kind of 'offset', meaning potentially foregone opportunities for substantial conservation gains. However without making a distinction of this sort between in-kind and out-of-kind trades, we risk the outcomes from offset activities becoming so varied and ambiguous that the fundamental NNL principle becomes meaningless.

7. *Direct versus indirect offsets*

The terms 'direct' and 'indirect' reflect multiple conceptual dichotomies, variously being used to distinguish between offsets on the basis of: (a) biodiversity outcomes; (b) type of action undertaken (e.g. restoration, protection); and, (c) mechanisms through which the offset is delivered (Miller et al. 2015). For an example of (a), the terms are commonly used to distinguish between actions with direct, measurable benefits for target biota (e.g. protection or enhancement of habitat) from those without (e.g. public education). But the dichotomy has also been made on the basis of (b) whether offset actions involved purchasing land, or addressing threats to species in an alternative way. Alternatively, the distinction is based not on offset outcomes, but on (c) the pathway for delivery – i.e. direct offsets are provided or purchased by the proponent of the impact, while indirect offsets involve payment to a third party (such as a government) who assumes liability for finding an offset to compensate for losses. To further confuse matters, the impacts giving rise to offsets can be either direct or indirect (Curran et al., 2015), with a comparably inconsistent use of the terms – although in this article we focus on the application of the terms to offsetting.

We recommend the direct/indirect dichotomy be reserved for category (c) above, i.e. the pathway through which offsets generate measurable benefits for target biota. Activities that do not achieve such an outcome should not be defined as offsets (see point 5). Often, funding for research and increasing community awareness would fall into the ‘indirect’ category by this definition, but not necessarily in all cases – for instance, Weston et al. (2011) describe measurable benefits to shorebird nesting success being directly attributed to increased signage and community education. Similarly, indirect pathways of funding for an offset can still, in theory, generate a direct benefit for the target biota, although greater risks may be involved.

8. *Multipliers*

Under NNL, a ‘multiplier’ can refer to the relative quantity of biodiversity gained and lost at offset and impact sites respectively, or the relative areas over which the impact and the offset actions are undertaken. So for example, a multiplier of two implies that the gains from the offset were required to be twice as large as losses from the area impacted – or, that offsets occupying twice the area of the impacts would be expected to generate a gain equivalent to the losses. The term ‘compensation ratio’ is also commonly used to refer to the relationship between gains and losses (Laitila et al., 2014). Multipliers are often not labelled as such in offset implementation, or simply not specified at all (Bull et al., in review).

Multipliers are one strategy amongst many (e.g. equivalency analysis; Quétier & Lavorel, 2012) for managing uncertainties in biodiversity gains from offset activities, and to account for time lags in which the offset gains accrue compared to impacts (through time discounting, e.g. Gibbons et al., 2015). They are also used for other reasons – e.g. imposing higher requirements on offsets for threatened habitats (South Africa; Laitila et al., 2014). In practice, multipliers are often determined based upon negotiation between stakeholders involved in a given development, rather than as a result of robust scientific considerations (Bull et al., in review). Multipliers are sometimes less than or equal to one (i.e. biodiversity gains are smaller than losses in terms of the biodiversity measure specified; e.g. Quigley & Harper, 2006). In such cases the term 'multiplier' is appropriate, but subject to the considerations of appropriate baselines (see point 2), the trade should not necessarily be treated as achieving NNL.

We recommend that multipliers or compensation ratios and their purpose be explicitly specified with justification in NNL policies and projects. For example, whether the goal of a multiplier is to increase the amount of benefit expected from an offset to achieve an outcome of better than NNL, or whether it is to adjust for factors such as uncertainty and time lags, should be clearly specified. Further, any multipliers less than one ought to be particularly closely scrutinised. It must be more widely recognised that multipliers that account for scientific matters such as uncertainty and time lags are a crucial component of achieving NNL, and therefore not necessarily open to negotiation when the goal is NNL.

Concluding remarks

As can be seen, there remains considerable linguistic inconsistency around NNL policies, arising from both vagueness in the terms themselves and from the variation in standard regulatory language across jurisdictions. In our experience, this causes considerable conceptual confusion. Here, we have highlighted eight key terms associated with NNL policies that have yet to achieve linguistic and conceptual convergence – making suggestions as to how such convergence might be sought (Table 2). We do not claim that these are the only NNL terms applied inconsistently, but they are some of the most fundamental and therefore important to clarify. The terms cover interrelated aspects across NNL policy (Fig. 1), and so the vagueness that arises in each is compounded. We accept that the language of policy and regulations varies across jurisdictions, and that linguistic uncertainty arises when translating terms between spoken languages, and accordingly our intention in writing this article is not to encourage changes in the terms employed by existing guidelines or legislation. Rather, it is to seek shared understanding of the concepts underlying the NNL principle, whatever language is then used to express those concepts. We consider it unlikely that all researchers and practitioners will agree with our suggestions here, but welcome any discussion that our proposals encourage on this crucial topic.

Data accessibility

Data have not been archived because this article does not contain data.

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Table 1. Terminology used to refer to 'biodiversity offset' type mechanisms in selected languages

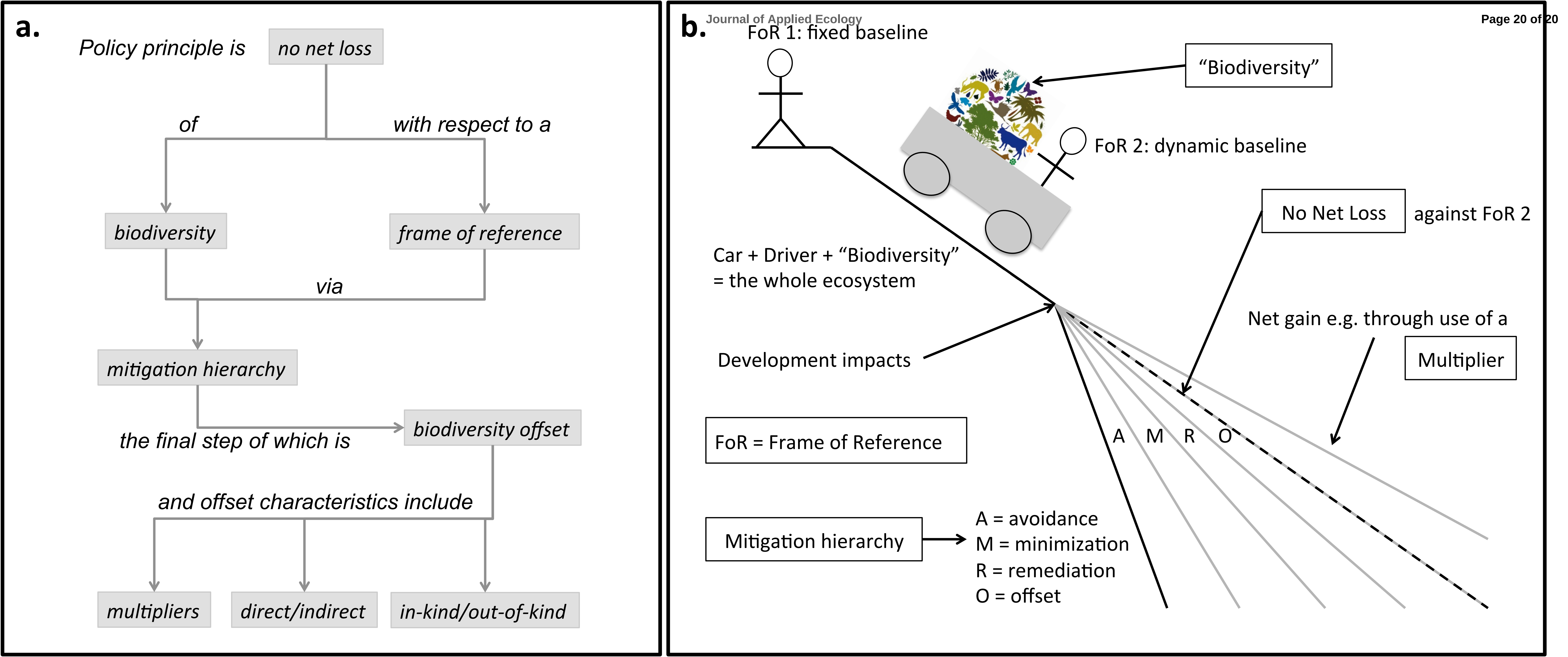
Language	Equivalent terminology for biodiversity offset	English (UK) direct translation	Relevant countries
Chinese (simplified)	shengtai buchang jizhi	eco-compensation mechanism	China
Danish	kompensation	compensation	Denmark
English (Canada)	conservation offset	conservation offset	Canada
English (UK)	biodiversity offset	biodiversity offset	Australia, New Zealand, South Africa, UK
English (US)	compensatory mitigation	compensatory mitigation	US
French	mesures de compensation; compensation écologique	compensation measures; ecological compensation	Canada, France, Madagascar
German	Ausgleichsmaβnahmen; Ersatzmaβnahmen	compensation measures; substitution measures	Germany
Japanese	'satoyama (里山) banking'	[*satoyama* is the term for a semi-agricultural ecosystem type in Japan]	Japan
Portuguese (Brazilian)	cota de reserva ambiental	environmental reserve certificate	Brazil
Russian	биоразнообразия компенсация	biodiversity compensation	Kazakhstan, Russia, Uzbekistan
Spanish	compensaciones de biodiversidad; medidas compensatorias	biodiversity compensation; compensatory measures	Argentina, Chile, Colombia, Mexico, Peru, Spain, Venezuela
Swedish	ersättning; ekologisk compensation; miljökompensation	compensation / substitution; ecological compensation; environmental compensation	Sweden

Table 2. Summary of key recommendations made in this article

Term	Recommendations
1. Biodiversity	• Explain and communicate that biodiversity in NNL policies is not 'total biodiversity' (i.e. CBD definition) • Explicitly state which components of total biodiversity are within scope
2. Frames of reference	• NNL always evaluated against some 'frame of reference' • Specify whether frame of reference is a fixed point or trend • Modify the term baseline when it is used, to be more explicit (e.g. 'crediting baseline') • Baselines and counterfactuals are both reference states/trends used for evaluating change, but counterfactuals are (by definition) scenarios that did not actually occur, whereas baselines often do
3. No net loss	• Clarify when the goal of NNL policies is not to prevent absolute biodiversity declines • Distinguish clearly between NNL and Net Gain policies
4. Mitigation hierarchy	• Develop a more concrete distinction between 'avoidance' and 'minimization' • Ensure that options to forgo development or resource use are considered before any compensatory actions are suggested • Label the third stage of the mitigation hierarchy 'remediation' • Develop a concrete distinction between 'remediation' and 'offset' • Do not label biodiversity offset measures as 'compensatory mitigation'
5. Offset	• Do not use 'offsetting' as a label for broader 'compensation measures' which do not meet the stricter definition of offsets • Do not include financial payments within offset packages unless biodiversity gains from those payments are directly quantifiable • Do not include any other interventions with non-quantifiable biodiversity outcomes (e.g. research, education*) in offset packages
6. In-kind/out-of-kind	• Seek a new label for out-of-kind offsets, communicating that they are not strictly true offsets
7. Direct/indirect	• Reserve 'direct' and 'indirect' to distinguish between the pathway for delivery of an offset, rather than biodiversity outcomes
8. Multipliers	• Always specify multipliers, and their intended function • Seek to use multipliers greater than one

** in rare cases, quantifiable ecological benefits may be achievable through education*

Figure 1. Schematic diagrams for terms discussed in this article. (a) Flow diagram containing all eight terms (grey boxes), and their interrelations. (b) Illustration of key NNL concepts, representing a deteriorating ecosystem as a car driving down a slope. Development impacts increase the steepness of the slope, measures implemented under the mitigation hierarchy return it to the original gradient. NNL is achieved for some components of the ecosystem ('biodiversity') against the frame of reference for an observer in the moving car. Indirect and out-of-kind offsets in this representation might constitute changing the slope of an alternative road. 'Biodiversity' image: modified from http://www.thebluedotpost.com/ (2014).


a.
Policy principle is
no net loss
of
with respect to a
biodiversity
frame of reference
via
mitigation hierarchy
the final step of which is
biodiversity offset
and offset characteristics include
multipliers
direct/indirect
in-kind/out-of-kind
b.
FoR 1: fixed baseline
"Biodiversity"
FoR 2: dynamic baseline
No Net Loss
against FoR 2
Car + Driver + "Biodiversity"
= the whole ecosystem
Net gain e.g. through use of a
Multiplier
Development impacts
FoR = Frame of Reference
A
M
R
O
Mitigation hierarchy
A = avoidance
M = minimization
R = remediation
O = offset