Senate Standing Committees on Environment and Communications

Inquiry into Environmental Offsets

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This submission addresses three of the terms of reference of the inquiry, namely:

- The principles that underpin the use of offsets;
- The processes used to develop and assess proposed offsets;
- The adequacy of monitoring and evaluation of approved offset arrangements to determine whether promised environmental outcomes are achieved over the short and long term

Summary

The concept of offsets is simple. But they are complex to design, assess, and successfully deliver in practice. The principles that underpin the credible use of offsets include:

1. Adherence to the mitigation hierarchy (i.e. avoid, minimise, mitigate, then finally, offset)
2. A clear statement of an objective that is defined with respect to the affected entity, and that is spatially and temporally referenced
3. Commitment to like-for-like compensation
4. Early identification of the limits of what can be offset
5. Clear rules and measurement systems for quantifying losses and gains to ensure fair exchange
6. Accounting for uncertainties and risks that might affect the environmental outcomes of offsets over the short and long term
7. Transparent and effective compliance, monitoring and enforcement of approved offset arrangements

This submission elaborates on each principle, explains what challenges each involves and comments on how *EPBC Act 1999* offsetting policy and practice measures up, particularly in relation to Whitehaven Coal's Leard State Forest-Maules Creek project and Waratah Coal's Galilee Coal project.

Despite the recent adoption of offsetting in many countries, the lack of rigorous post-approval monitoring and evaluation means there is little available evidence on whether offsets are an effective and reliable tool for improving and maintaining the viability of impacted protected matters. Published evidence for 'no net loss' or 'net gain' outcomes in any jurisdiction is very limited/absent and the small amount of evidence about outcomes from offsetting policy in Victoria indicates that it has not reduced biodiversity loss.

In contrast, there appears to be mounting evidence of serious problems at every stage of offset design, assessment, approval, implementation, compliance and enforcement. This reinforces the importance of managing impacts via the mitigation hierarchy and respecting the limits of when offsetting is inappropriate or unachievable, until further research can provide evidence regarding the performance of offset actions under real-world conditions.

Definition of offsets

In the EPBC Act Environmental Offsets Policy (hereafter, the Policy) offsets are defined as "measures that compensate for the residual adverse impacts of an action on the environment"[1]. We prefer the more comprehensive definition of biodiversity offsets developed by the Business Biodiversity Offsets Programme (BBOP) as it captures some of the key principles relating to the use of offsets:

> Biodiversity offsets are "*measureable conservation outcomes* of actions designed to *compensate* for significant *residual* adverse biodiversity impacts arising from project development *after appropriate prevention and mitigation measures have been taken*. The goal of biodiversity offsets is to achieve *no net loss* and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity"[2].

Principles that underpin the use of offsets

The principles that underpin the credible use of offsets include:

1. Adherence to the mitigation hierarchy (i.e. avoid, minimise, mitigate, then finally, offset)
2. A clear statement of an objective that is defined with respect to the affected entity, and that is spatially and temporally referenced
3. Commitment to like-for-like compensation
4. Early identification of the limits of what can be offset
5. Clear rules and measurement systems for quantifying losses and gains to ensure fair exchange
6. Accounting for uncertainties and risks that might affect the environmental outcomes of offsets over the short and long term
7. Transparent and effective compliance, monitoring and enforcement of approved offset arrangements

1. Adherence to the mitigation hierarchy

Offsets are controversial. There is a perception that offsets effectively signal a "license to trash"[3] and could encourage regulators to approve projects with severe biodiversity impacts as long as offsets are provided as compensation, Recently >140 international environmental groups, including the World Rainforest Movement, Friends of the Earth International and Save Our Woods (UK), signed a statement condemning biodiversity offsetting[4].

The traditional defence against this charge is that regulatory (and voluntary) frameworks for offsetting require adherence to the mitigation hierarchy[1,5]. In theory, this designates offsetting as the least favoured measure, to be used as a "last resort"[3] to compensate for *residual impacts* after all reasonable measures have been taken to avoid, minimise and mitigate biodiversity impacts *in situ* (Figure 1).

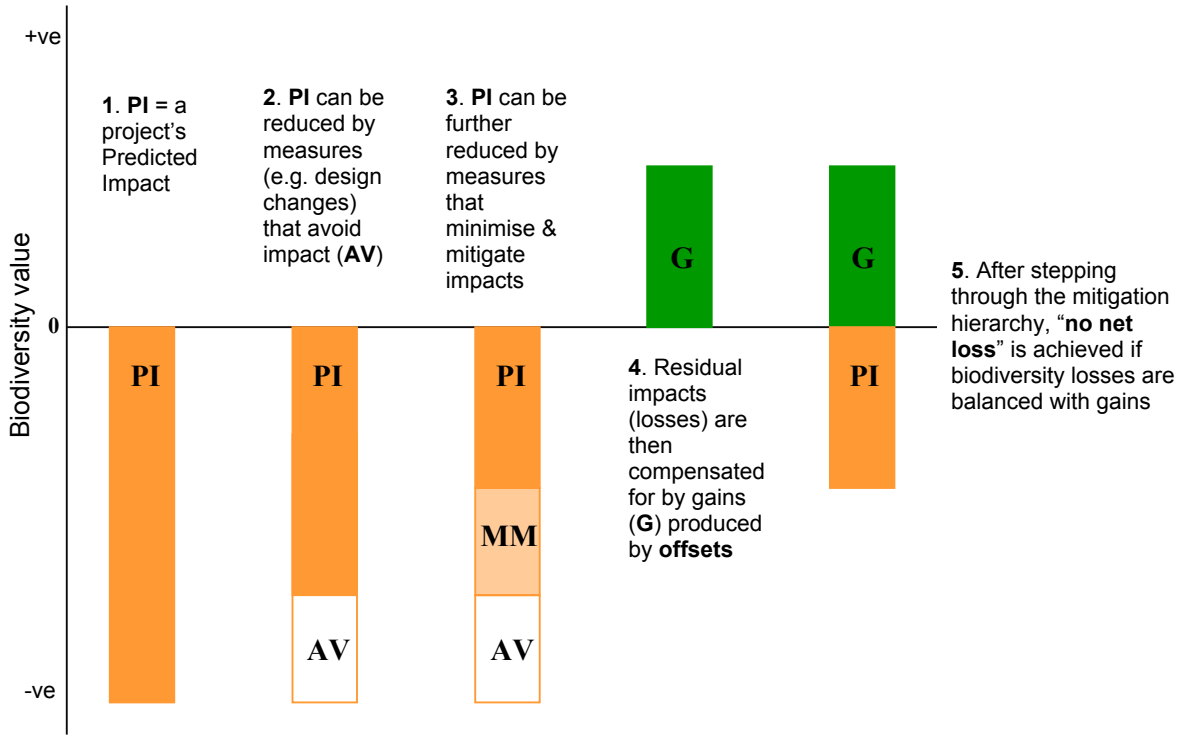

Figure 1. The sequential steps of applying the mitigation hierarchy (left to right) and the role of offsets in satisfying a "no net loss" objective[6].

Adherence to the mitigation hierarchy is therefore what confers legitimacy to offsets and should be a non-negotiable component in any credible and defensible framework. This may seem obvious, but as an example, we note that under the Victorian government's new *Permitted clearing of native vegetation* regulations, compliance with the mitigation hierarchy will not be required for clearing applications deemed to be 'low-risk'[7]. Assessment of the risk pathway of a clearing proposal relies on modelled and mapped data, but this mapping tool has been shown to be substantially flawed[8,9].

The Policy expresses a commitment to the mitigation hierarchy, stating that "Offsets will not be considered until all reasonable avoidance and mitigation measures are considered, or acceptable reasons are provided as to why avoidance or mitigation of impacts is not reasonably achievable" (p. 7).

However, the Policy is missing:

a) the concept of 'minimise' – to address situations where complete avoidance is not possible but there is potential to minimise impacts before considering mitigation measures[10];

b) guidance on avoidance, minimisation and mitigation[10,11]; and

c) guidelines on the standard of proof required to demonstrate that all reasonable measures have been taken to avoid, minimise and mitigate impacts[10,11]

These missing components are necessary for proper and consistent assessment of whether all reasonable measures have been made by a proponent, before they are allowed to potentially avail themselves of the last resort of using offsets to compensate for residual impacts. But the final determination of whether offsets are appropriate should only come after a rigorous assessment of whether the residual impacts *can* be offset, which we address in section 4 below.

2. A clear statement of an objective that is defined with respect to the impacted entity, and that is spatially and temporally referenced

The Policy states that suitable offsets "must deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action" (p. 6). This is comparable to the 'net gain' and 'no net loss' goals used in the frameworks of other jurisdictions nationally and internationally[2,12,13].

However, the Policy is missing the requirement to deliver improvement or maintenance of the viability of the impacted entity *within an appropriate spatial locality and time frame*. This will vary depending on the impacted entity, but may need to be within the local vicinity of the impacted entity or less restrictively, within the same bioregion. The environmental outcomes of offsetting should persist for the duration of the impact. Where the impact is permanent, the environmental outcomes of offsetting should endure in perpetuity.

3. Commitment to like-for-like compensation

The offsetting of any impacted entity protected by the *EPBC Act 1999* should *always be like-for-like* to ensure that the entity is not systematically degraded over time. We highlight this point because the Policy currently permits up to 10% of offset requirements to be met through so-called 'indirect offsets'. Indirect offsets "do not directly offset the impacts on the protected matter, but are anticipated to lead to benefits for the impacted protected matter, for example, funding for research or educational programs" (p. 9). No justification has been provided for this 'discount' on like-for-like compensation, available without conditions to all proponents.

Worse, the extent of dilution of the principle of like-for-like compensation seems to be negotiable, with the Policy indicating that deviation from the 90% direct offset requirements may "be considered where:

- it can be demonstrated that a greater benefit to the protected matter is likely to be achieved through increasing the proportion of other compensatory measures in an offsets package; or
- scientific uncertainty is so high that it isn't possible to determine a direct offset that is likely to benefit the protected matter. For example, this can be the case in some poorly understood ecosystems in the Commonwealth marine environment" (p. 8)

We contend that neither of these points are defensible grounds for seeking reduced direct offset requirements. With respect to the first dot point, EPBC protected matters are the responsibility of the government and owed a duty of care and management under that responsibility. Offsets must "be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs" (p. 6). We would argue that it is difficult to demonstrate exactly how indirect offsets satisfy the requisite degree of 'additionality'. The second consideration for deviating from direct offsets appears to be in direct conflict with the precautionary principle. Using uncertainty as a justification for a weaker offset requirement makes no sense. It would make more sense to demand a higher offset premium in cases where uncertainty is high in order to place the onus on proponents to avoid the impact or resolve the existing uncertainty. We address the role of the precautionary principle in assessing whether the impact *can* indeed be offset, in section 4 below.

The criteria and process used to determine the possibility and magnitude of deviation from 90% direct offsets is not described in the Policy. How does the decision-making process ensure that the approved offsets package (both direct and indirect) will "deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action"?

4. Early identification of the limits of what can be offset

The Policy states that "Offsets do not mean proposals with unacceptable impacts will be approved. They simply provide an additional tool that can be used during the environmental impact assessment process" (p. 7). However, the Policy does not provide any guidance on when offsetting is not (and never will be) appropriate.

There are a limited number of ways in which gains that satisfy the principle of 'additionality' can be generated at offset sites (Box 1). Early identification of the limits of what can and cannot be offset should be an essential part of the formal environmental and social impact assessment of a project. The following list, compiled from the research literature[6,14,15,16], is a non-exhaustive list of situations in which the offsetting of impacts is inappropriate and/or unachievable:

i) the impacted entity (e.g. species/community/ecosystem) is critically endangered, and any further loss will increase its risk of extinction;

ii) the impacted entity is unique and irreplaceable;

iii) the impacted entity has a highly restricted distribution, occurring only at a few sites or populations and is effectively irreplaceable because there are no or too few viable offset sites outside the area affected by the project;

iv) the impacted entity is in good to excellent condition and there are few, if any opportunities to make gains at available offset sites via **enhancement** (see Box 1);

v) the background rates of loss for the impacted entity are low and there are few, if any opportunities to obtain gains at available offset sites through **averted loss** (see Box 1);

vi) lack of knowledge and/or effective restoration techniques mean it is uncertain if ecologically equivalent gains can be made at the offset site(s) within an acceptable time frame and level of certainty (e.g., attempting to restore 'full' floristic diversity or 'old-growth' habitat); and

vii) the resources required to generate the requisite gains at offset sites is prohibitive

Box 1 Three ways in which biodiversity offset actions can generate gains: enhancement, averted loss and creation[6]

Biodiversity offset actions can produce gains in biodiversity value at an offset site through three mechanisms: enhancement, averted loss and creation (Figure 2).

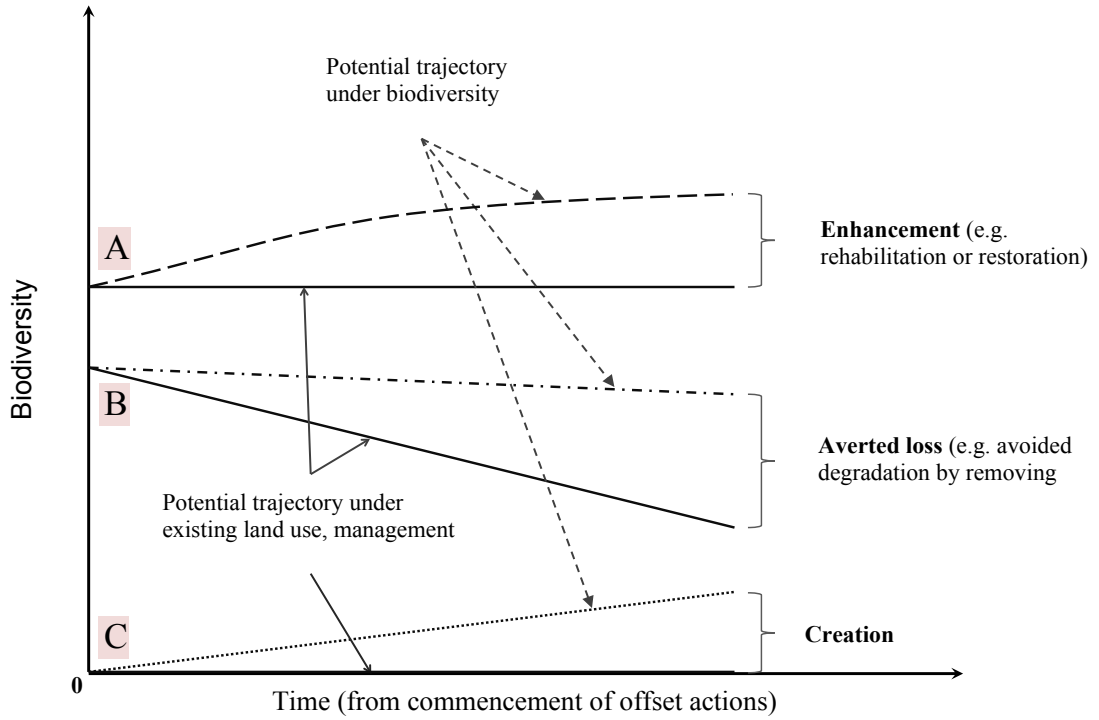

Figure 2. Schematic representation of how enhancement, averted loss and creation can theoretically generate biodiversity gains. Solid lines show the projected trajectory of biodiversity value at three hypothetical offset sites under the existing land use, management regime, or threatening processes (e.g., logging, grazing, weed or predator invasion). Dotted lines show the corresponding trajectories of biodiversity value under an offsets action regime at each site.

The relevant mechanism for generating gains at an offset site depends on a range of factors, including starting state, existing land use, management regime and threatening processes. For instance, site A (Fig. 2) is in relatively good starting condition and not subject to degrading forces (trajectory of biodiversity value under existing regime is flat); rehabilitation or restoration actions (e.g., weed control, reinstatement of woody debris) have the potential to produce gains in biodiversity value through **enhancement**. Note however, that offset sites that are in excellent or very good condition may have limited potential for further improvement, so would supply only a small quantum of gains. Site B is of poorer quality than site A to begin with and is subject to strong degrading forces (trajectory of biodiversity value under existing regime has a negative slope). To produce a gain from **averted loss**, site B will require offset actions that can effectively mitigate threatening processes and reverse degradation to bring about improved biodiversity value. This might require enacting a set of several actions such as fencing, predator control and re-vegetation, concurrently. Finally, at site C, gains from **creation** will require offset actions that can effect measureable increases in biodiversity value from a site where they were initially absent (e.g. successful translocation and subsequent persistence and ongoing reproductive viability of the translocated individuals/populations).

Offset actions to generate gains from enhancement or averted loss must be over and above any duty of care that is already required at the offset site, whether by law, planning regulations or any other schemes or programs. In accordance with the principle of additionality, only gains that would not have occurred without the offset actions can be counted.

5. Clear rules and measurement systems for quantifying losses and gains to ensure fair exchange

Clear rules and measurement systems for quantifying losses and gains are necessary to ensure a fair exchange that delivers an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by the EPBC Act and affected by the proposed action.

The basic elements of offset design include:

- the choice of biodiversity components and their measures;
- methods or protocols for estimating these measures;
- details and justification for how the 'metric' or 'currency' is constructed;
- details of the 'accounting model', including 'exchange rules'; and
- explicit calculation of losses and gains at matched impact and offset sites

Some key considerations and guidance on these offset design elements are outlined in Table 1.

Table 1. Offset design elements and some key considerations and guidance on their use[6].

Design element	Key considerations, guidance and examples
Choice of biodiversity components and their measures	Not everything can be measured, so what are the key components or features that need to be explicitly captured? These may be specific to impacted entities such as threatened species and their particular life-history requirements, or relate to biodiversity patterns more generally, or some combination of both. Potential measures for: • target species include: number of breeding pairs, number of young produced per year, survival rates, abundance, or amount of high quality habitat • biodiversity include: composition, structure or ecological processes. For instance, native plant species richness, basal area and density of overstorey, mid-storey and understorey vegetation, and site spatial characteristics such as size, shape, configuration, juxtaposition with other habitat types in the region, connectivity value and irreplaceability. Some measure of irreplaceability is important to avoid assigning low value to what may be an instance of a degraded but highly threatened and irreplaceable habitat[17].
Methods/protocols for estimating these measures	Methods for estimating the selected measures should be fit-for-purpose, rigorous and clearly described for correct and consistent application by assessors. In some jurisdictions, regulatory authorities have specified standards for minimum desktop analysis requirements, minimum field survey effort, survey techniques for target taxa, accredited site assessment methods and modelling and mapping of species and/or habitats (e.g. see ref[18]).
How is the "currency" constructed?	Once selected, biodiversity components and their associated measures are often integrated into a biodiversity **currency** or **metric** that represents biodiversity value. The currency needs to be devised with care because it forms the basis for what is meant by losses and gains. Two important points to highlight are that: • characteristics not adequately incorporated into the currency will only be protected by chance and risk being lost in the exchange[19,20]; and • care must be taken to ensure that construction of the currency reflects the underlying ecological rationale/intent. For instance, an "area x condition" index is a common form of currency where the condition is based on scoring a set of attributes, weighting and then calculating the sum (e.g., Habitat Hectares, see ref [21]; and BioMetric, see ref[22]). Use of additive scoring

	implies that the attributes are independent and substitutable[23]. If attributes are not actually independent, then the use of additive scoring implies a degree of 'double-counting' for correlated attributes. Substitutability also implies that a low score in one attribute can be perfectly compensated for by a higher score in another attribute. This can lead to perverse scenarios where negative changes in an attribute, for instance, the felling of standing trees, can be perfectly compensated for by say, an increase in the abundance of logs[24]. A multiplicative index would prevent this problem[24]. The "area x condition" form may also be problematic if it allows a small, high biodiversity value site to be compensated for by a much larger but low quality offset site. In practice, "exchange rules" (see below) are used to prevent this by stipulating the degree of exchangeability between area and condition. Continuous improvement through careful testing and user feedback is important for ensuring that a currency is robust and ecologically meaningful.
The "accounting model"	The accounting model specifies the rules for estimating net balance with regard to type, amount and quality/condition of biodiversity over some defined space and timeframe[20]. Demonstrating ecological equivalence across type, space and time is challenging because no two sets of biodiversity, separated in space and time are going to be identical. To preserve equivalent or near-equivalent exchanges, "**exchange rules**" are used to limit out-of-kind exchanges that might undermine the delivery of "no net loss". So for instance, rules can be set to: • prohibit exchange of biodiversity components of high irreplaceability for components of lower conservation/threat status • limit exchanges to the same species, communities or ecosystem types (i.e. impacts to a given species cannot be compensated for by improvements to another species) • disallow exchange of area for condition (i.e. cannot exchange a small, high quality site for a larger but lower quality offset site) • require exchanges within the same watershed or biogeographic region • stipulate the permitted time lag (if any) between loss and gain
The explicit calculation of losses and gains at matched impact and offset sites	In cases where selected biodiversity components include – 1) a mix of specific entities, 2) more general habitat attributes, and 3) site characteristics with landscape-context measures, – multiple loss-gain assessments may be required to transparently account for the different components and/or currencies[20].

The Offsets Assessment Guide (hereafter, the Guide) that accompanies the Policy "gives effect to the requirements of the Policy, utilising a balance sheet approach to estimate impacts and offsets for threatened species and ecological communities"[25]. The Guide incorporates protocols and calculators (programmed into an Excel worksheet) that formalise the rules for computing the:

- quantum of impacts;
- raw gain value of proposed offsets;
- adjusted gain after accounting for the level of certainty about the success of the offset;
- final net present value of the proposed offset taking into account the annual probability of extinction and the relevant time horizons; and
- cost of other compensatory measures (if the proposed offset achieves at least 90% of the total offset requirement)

Separate worksheets are required for each impacted protected matter attribute and this provides welcome transparency with respect to the explicit calculation of losses and gains (Table 1). Most of the key offset design elements described in Table 1 are incorporated into the offset assessment

worksheet tool and the logic, ecological rationale and implementation of the tool seems sound. It is a valuable world-leading contribution to rigorous assessment of offset proposals.

However, the guidance on the input data required to populate the worksheet is limited and requires improvement. Some of the required inputs are fairly straightforward to determine (e.g. 'conservation status of the protected matter') while others require measurement in the field (e.g. 'site condition' and 'species stocking rate' at impact and offset sites) and/or a substantial component of subjective expert judgement (e.g. 'risk of loss' and 'confidence in result'). Detailed guidance on what constitutes suitable and adequate data, as well as acceptable protocols and methods for obtaining such data or judgements should be provided. For instance, this might involve guidelines on minimum field survey effort, best practice survey techniques for target taxa, accredited site assessment methods and so on. This would help ensure rigorous and consistent assessments and provide an audit trail for offsetting decisions.

6. Accounting for uncertainties and risks that might affect the environmental outcomes of offsets over the short and long term

The Policy recognises that suitable offsets must "effectively account for and manage the risks of the offset not succeeding" (p. 6). It is, however, surprisingly silent on the types of uncertainties and risks proponents and regulators should be aware of and indeed, on what is required to effectively manage the risks of the offset not succeeding.

Uncertainty arises at every stage of the offsetting process. For instance, uncertainties in quantifying losses and gains in offsetting can arise from[6]:

- measurement error of biodiversity components due to inaccuracies in measurement relating to equipment, observer technique, and instrument/operator error
- systematic error due to biases in survey or sampling methods or excluding an overlooked biodiversity component
- natural variation in dynamic systems that undergo cycles of disturbance and recovery (e.g., fire- or flood-prone ecosystems), thereby confounding attempts to obtain "representative" measurements from a single time period[24]
- model uncertainty, i.e., uncertainty in working conceptions and representations of the system of interest. This could lead to error in projections of predicted impacts and/or errors in expected gains from offset actions (e.g., misdiagnosis of threatening processes)
- subjective judgement as a result of data interpretation and/or use of expert judgements for estimates when data are scarce and/or error-prone

These sources of uncertainty are well known and should be accounted for in the offset development and assessment process.

Uncertainties and risks that may cause offsets to fail are many and varied. Some typical sources include[6]:

- environmental stochasticity (e.g., storms, fires, floods and landslides)
- partial or total failure of threat mitigation, rehabilitation or restoration techniques relied upon to generate enhancement, averted loss and creation gains

- insecurity of tenure at offset sites (e.g. overturning of conservation covenants and agreements[26]; amendments to state environmental planning policy in relation to mining proposals[27])
- insufficient funds to resource the full package of offset actions

Again, we would argue that these risks and uncertainties are foreseeable, and should be anticipated, identified and accounted for in the relevant stages of offset planning, assessment and approval. In particular, consideration of losses from environmental stochasticity should take account of the increased likelihood of extreme events as a result of climate change[28].

We note that except in cases where offset 'credits' must be paid up front before any project impacts are permitted, most offsetting situations involve *immediate* and *certain* biodiversity losses in exchange for uncertain, future gains. This is extremely problematic because the expectation that mitigation, rehabilitation and restoration techniques can generate the required gains is not supported by the available evidence[15]. When there is substantial uncertainty about whether biodiversity components can be successfully restored and/or the time lag required is unacceptably long, regulators and proponents should revisit the feasibility of offsetting the impacts (see section 4). In all other cases, the risk of failure should be underwritten[29]. A common approach for incorporating this risk is to use multipliers or offset ratios to guarantee that offset areas deliver at least as much gain as is lost from impact sites, with a high probability[30]. The method for setting multipliers or offset ratios should be clearly documented and justified. A recent simulation analysis showed that comprehensive accounting of uncertainty can result in the need for very high offset ratios – 10s to 100s of units for each unit lost – in order to be robust[30].

The protection of offsets in perpetuity is proving to be a particular obstacle to the use of offsets, as exemplified by:

- the Bulga Milbrodale Progress Association's appeal against the Minister's approval of Rio Tinto application to expand their Mount Thorley Warkworth mine; and
- Waratah Coal's Galilee Coal Project

Under the 2003 development consent for the Warkworth mine, Rio Tinto agreed to conserve and manage lands and endangered ecological communities in Habitat Management Areas (HMAs) and non-disturbance areas (NDAs). Despite the different label, NDAs are essentially offsets – to be "[p]ermanently protected...for conservation and exclude open cut mining"[31]. Rio Tinto's approved 2012 expansion plan would renege on the existing offset deal and result in further clearing of four types of endangered ecological communities[31].

Justice Brian Preston of the NSW Land and Environment Court found that Rio Tinto's proposed offsets package would not adequately compensate for the project's significant impacts[31] and also that almost every one of Rio Tinto's arguments in favour of the Warkworth mine expansion was seriously flawed[31]. He found that the NSW government had "gravely erred"[27] in granting permission for mine expansion and withdrew approval.

Rio Tinto has appealed Justice Preston's decision and the matter is scheduled to be heard in the NSW Court of Appeal in August 2014[27]. In the meantime, the NSW state government is seeking to amend state environmental planning policy such that in future, relevant decision makers (i.e. senior public servants and judges) will have to give much greater weight to the claimed economic

significance and benefits of a mining proposal[27]. It will preclude equal weight being given to adverse environmental and social impacts – as Justice Preston did in his decision[27].

On 20 Dec 2013, Federal Minister Greg Hunt approved Clive Palmer's Waratah Coal mine in the Galilee Basin. The project will completely destroy the ~8,000 hectare Bimblebox Nature Refuge[26] in the Desert Uplands bioregion, a region currently underrepresented within the National Reserve System[32]. It contains remnant native vegetation over 96% of its area[33] and was supposedly protected in perpetuity under the Bimblebox Nature Refuge Agreement signed with the Queensland state government in 2002. It turns out Nature Refuges, as a form of conservation covenant, are not exempt from mining. Waratah Coal has proposed to offset the lost conservation values of Bimblebox Nature Refuge with a minimum of 16,000 hectares of a grazing property. Incredibly, they propose that this offset be accorded the same tenuous protection as Bimblebox by being gazetted as a Nature Refuge under Queensland legislation![33].

The mounting evidence for the lack of security in the tenure of existing offset sites and the poor prospects for improved security of tenure in future, seriously calls into question the effectiveness and credibility of offsets as a tool for balancing development and conservation.

7. Transparent and effective compliance, monitoring and enforcement of approved offset arrangements

Transparent and effective governance arrangements are vital to ensure that approved offset arrangements do in fact, "deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action". To this end, governance arrangements should address several key issues, for instance[6]:

- *Roles and responsibilities*: specify exactly who is responsible for each stage of the offsetting process, what needs to be done at each stage, what minimum standards will be applied, how those standards will be enforced, the consequences of non-compliance and the time limits within which regulators need to respond to non-compliance. Performance bonds – set at an appropriate level, subject to periodic review and explicitly linked to the license to operate – may be a useful tool to help incentivise proponents to deliver the agreed environmental outcomes.
- *Resourcing*: financing provisions for all stages of the offsetting process including implementation, monitoring, evaluation and finalisation must be adequate, sustainable and sufficiently robust to withstand changes in economic conditions[29].
- *Reporting and auditing regime*: periodic reporting of monitoring and auditing results and the rationale for implementation adjustments is important for demonstrating accountability and providing assurance that the required gains will be delivered (even if temporary setbacks occur). Lessons learnt will be important for designing future offsets.

We note that while the Policy provides little detail on compliance and enforcement, the project approval decision and conditions under the EPBC Act do explicitly stipulate a range of compliance and enforcement measures.

These are welcome but ought to be enacted and enforced in a timely manner. Whitehaven Coal's Leard State Forest-Maules Creek project is a case in point. Whitehaven Coal's project will destroy up to 544 hectares of the critically endangered White Box-Yellow Box-Blakely's Red Gum Grassy

Woodland and Derived Native Grassland[34], which is down to 0.1% of its original range[35]. Whitehaven's offset proposal identifies properties for purchase which it claims contains large areas of the relevant critically endangered community. However, four independent ecologists have disputed this[35]. Indeed, Dr John Hunter estimates that "95 per cent of their mapping is wrong" and "at maximum, five per cent of what they are saying is box gum woodland is there"[35].

Approval condition 10 requires that the proponent

> "must verify through independent review the quantity and condition class of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland and the quantity and quality of habitat for the regent honeyeater, swift parrot and greater long-eared bat within all proposed offset areas...Details of all independently verified offset areas must be submitted to the Minister for approval by 30 December 2013. The findings of the independent review must be published on the proponent's website."[34]

The independent review was submitted to the Department of Environment on 27 December 2013 but has not been published on the proponent's website[36]. The Department is aware of this but more than 3 months after the report was submitted, the proponent has not been compelled to publish it on their company website, nor will the Department publish it on its own website[36]. The Department is also investigating whether it has been misled on those offsets and expects to have the investigation resolved "within a matter of months"[36]. Meanwhile, clearing continues at the project site.

It seems that in this case, 'conditions of approval' have been defined in a manner that does not prevent (irreversible) impact from occurring, even when there is serious, well-founded doubt about whether approval conditions have been met. Does the Department consider that this meets community expectations and standards for compliance and enforcement of offsetting practice under the *EPBC Act 1999*? It seems the depth of feeling in the community concerning this situation is being given expression in the 'Leard Blockade'[37,38].

Conclusion

The concept of offsets is simple. But their function is to address complex, imperfectly understood ecological characteristics and processes to improve or maintain the viability of impacted protected matters. The difficulty of this task is compounded when the protected matters in question are poorly known and/or subject to a range of dynamic threatening processes. This makes offsets complex to design, assess, and successfully deliver in practice, particularly given the attendant risks and uncertainties.

Despite the recent adoption of offsetting in many countries – they are now part of the statutory framework in Australia, USA, Canada, Brazil, Columbia, New Zealand, South Africa and some European nations[39, 40] – published evidence for 'no net loss' or 'net gain' outcomes in any jurisdiction is very limited/absent. The lack of rigorous post-approval implementation monitoring, performance monitoring and evaluation means there is little available evidence on whether offsets are an effective and reliable tool for improving and maintaining the viability of impacted protected matters. The small amount of evidence about outcomes from offsetting policy in Victoria indicates that it has not reduced biodiversity loss[41,42].

On the other hand, as described in this submission, there is mounting evidence of serious problems at every stage of offset design, assessment, approval, implementation, compliance and enforcement. This reinforces the importance of managing impacts via the mitigation hierarchy and respecting the limits of when offsetting is inappropriate or unachievable, until further research can provide evidence regarding the performance of offset actions under real-world conditions.

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The signatories are academics and researchers from the Quantitative & Applied Ecology Group (QAECO, http://qaeco.com/) in the School of Botany, University of Melbourne. The lead author and seven of the signatories were co-authors of a 2011 Submission to the Dept of Sustainability, Environment, Water, Population and Communities on DSEWPaC's Environmental Offsets Policy – Consultation Draft (see ref [11]).

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