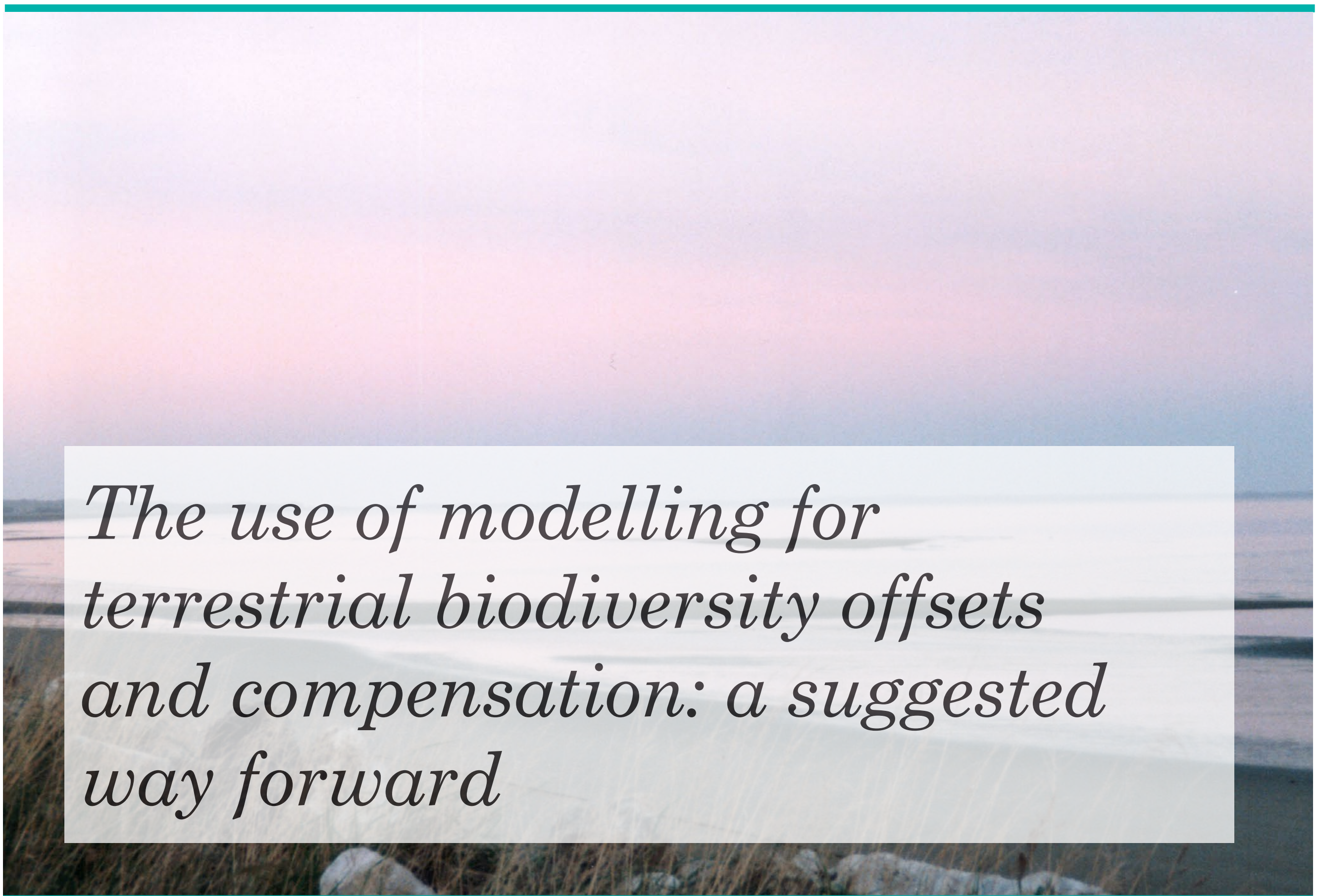

The use of modelling for terrestrial biodiversity offsets and compensation: a suggested way forward

Authors:

M Baber, M Christensen, J Quinn, J Markham, G Kessels, G Ussher and R Signal Ross

INTRODUCTION

In recognition of New Zealand's indigenous biodiversity decline, offsetting and compensation principles are increasingly identified in statutory planning documents to address residual effects on terrestrial biodiversity. The proposed National Policy Statement for Indigenous Biodiversity (NPSIB), when finalised (likely April 2021), is expected to require the use of these measures more generally.

A key challenge for consent decision-makers is determining the adequacy of offsets and compensation for residual adverse effects on terrestrial biodiversity values (i.e. those adverse effects remaining after all appropriate avoidance, minimisation and remediation measures have been sequentially applied). To our understanding no operative or proposed policy documents mandate a specific method for the calculation or assessment of the adequacy of offsets and compensation, and there is currently no consistent approach used.

One of the key principles of an offset is achieving 'no net loss' (NNL) or preferably net gain (NG) of indigenous biodiversity. However, demonstrating that NNL/NG will occur at the consenting stage is difficult due to data deficiencies and uncertainty in the success of the measures proposed. Correspondingly, efforts to address residual effects often default to compensation, which in many instances is based solely on professional opinion and may include the use of compensation ratios or 'multipliers' (i.e., wetland enhancement at a ratio of 1:3 to address wetland loss). These approaches have been challenged due to a lack of transparency and rigour, and their often ad-hoc application.

This article considers the merits of two different modelling approaches for providing guidance on the type and amount of habitat restoration and enhancement activities needed for a project to achieve NNL or NG at the consenting stage: Biodiversity Offset Accounting Models (BOAMs) and Qualitative Biodiversity Models (QBMs).

We conclude that QBMs are useful as the primary modelling approach at the consenting stage because, unlike BOAMs, QBMs can provide guidance on both offsetting and compensation requirements and can be readily applied across the full spectrum and scale of consent applications. That said, to provide greater assurance that NNL/NG outcomes are achieved if consent is granted, BOAMs based on ongoing biodiversity monitoring should be used to verify NNL/NG outcomes are achieved and/or guide adaptive management needs as required.

BACKGROUND: OFFSETS AND COMPENSATION IN NEW ZEALAND

A biodiversity offset is a 'measurable conservation outcome' that meets certain principles and balances adverse residual effects that cannot reasonably be avoided, remedied or mitigated, to a NNL/ NG standard. While offsetting requires a measurable outcome that has been quantified through a robust and transparent process, biodiversity compensation does not necessarily need to be quantified and measurable.

While there is, at present, no general requirement under the Resource Management Act 1991 (or the Conservation Act 1987) for an applicant to provide offset or compensation to address the residual adverse ecological effects of a resource consent proposal, many councils include biodiversity offsetting and NNL/NG outcomes in their statutory planning documents.

Policy guidance on biodiversity offsets and environmental compensation was developed by the Business and Biodiversity Offsets Programme (BBOP) and in subsequent papers which apply the principles to the New Zealand context (for example, Maseyk and others, 2018).

BOAMs have been developed to help determine the type and amount of biodiversity offset required to achieve NNL/NG outcomes (Maseyk and others, 2015; Maseyk and others, 2018). To demonstrate an offset, such models require explicit quantitative measures of loss of biodiversity values at impact sites versus gains in biodiversity values at offset sites. For example, at the impact and offset site(s), this may include the quantification of the relative abundance of tui using standard bird count methods or the quantification of a range of vegetation and habitat characteristics using standard vegetation plot methods. In summary, BOAMs:

- account only for 'like for like' biodiversity trades aimed at demonstrating NNL;
- use Net Present Biodiversity Value (NPBV) to estimate whether NNL is achieved;
- incorporate the use of a discount rate to account for the time lag between impact associated with project activities and the gain at the proposed offset site(s); and
- adjust for the likelihood of success regarding the proposed offset actions and account for the risk of under-estimating losses at the impact site or over-estimating gains at enhancement sites.

PRACTICAL CHALLENGES OF BIODIVERSITY OFFSETS AT THE CONSENTING STAGE

Despite increased policy recognition of offsets, efforts to demonstrate that offsets have been achieved through the use of BOAMs are still rare (see Christensen and Baker-Galloway, 2013 for a summary of offsets case law prior to 2013). Notable consenting examples since then include: the Oceana Gold Deepdell North Stage III Mine (decision of independent Hearing Commissioners, 23 September 2020), Matawii Water Storage Reservoir, September 2020 (decision of the Expert Consenting Panel under cl 37, sch 6

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of the COVID-19 Recovery (Fast-track Consenting) Act 2020) and Te Ahu a Turanga: Manawatū Tararua Highway Project (decision of independent Environment Court Commissioners, 13 November 2020).

Moreover, where modelling has been used, decision-makers have at times expressed concern that the use of models may result in more confidence being placed in the model outcomes than is warranted or reasonable. See for example *West Coast Environmental Network Inc v West Coast Regional Council and Buller District Council* [2013] NZEnvC 47 at [218] and *Waka Kotahi NZ Transport Agency v Manawatu-Whanganui Regional Council* [2020] NZEnvC 44 at [175].

These issues primarily reflect challenges with demonstrably offsetting residual effects through the application of BOAMs at the consenting stage. Ultimately, this means that most if not all proposed measures to address residual effects default to compensation. These challenges include:

1) Offsetting cannot always be feasibly or demonstrably achieved.

Offsetting is generally limited to certain 'low-hanging' biodiversity values. Such values include young, regenerating native habitat types with low complexity and common forest birds for which existing monitoring techniques are reliable and sufficient information can be collected. Most other biodiversity values cannot be demonstrably offset. For example:

- Complex habitats such as old-growth forests that take a long time to replace may require monitoring over centuries to verify that an offset has been achieved.
- Rare or cryptic fauna (for example, lizards) are difficult to detect or monitor, are often at low abundances and their response to offset and compensation measures may be slow or uncertain.
- Highly mobile species such as long-tailed bats or Australasian bittern have extensive home ranges which obscure site-specific cause and effect.
- Ecosystem functions such as ecological connectivity, buffering potential or sediment control are inexplicit.
- Not all habitats can be recreated or replaced (for example, coastal marine inter-tidal habitat or many wetland habitats).

2) Verifying offsets with an acceptable degree of confidence.

Proposed habitat enhancement and restoration actions adhere to the principle of additionality and as such, at consent lodgement they are typically yet to be implemented. Projected biodiversity gains must therefore be based on assumptions, which makes it difficult to convincingly demonstrate an offset at the consenting stage with the necessary degree of confidence. For example, a BOAM for tui would require an expert ecologist to predict tui counts at an offset site at some point in the future, which depends on numerous site-specific factors and landscape dynamics. Correspondingly, despite quantitative data inputs giving the impression of increased precision, a BOAM can amount to little more than a best guess based on professional opinion.

3) Application to small projects.

Small- to medium-scale projects disproportionately contribute to net biodiversity loss through 'death by a thousand cuts'. However, the extent and cost of detailed field investigations required to inform the BOAMs can be prohibitive for all but the largest projects.

4) Bang for buck.

Beyond information requirements to inform an assessment of effects, the additional data needs for a BOAM can be costly, complicated and incompatible with project timelines. Moreover, this level of data can go far beyond what is commensurate with the 'scale and significance' of a project and does not necessarily provide further value to the effects assessment. Additionally, if consent is granted, this pre-consent information often becomes redundant because it is superseded, either:

- by more recent data gathered from impact and offset sites in the same time period and closer to the time of impact to allow more meaningful comparisons; and/or
- through changes to the biodiversity offset monitoring indicators or methods between consent application lodgement and certification of Ecological Management Plans.

These practical challenges in applying offsets are not restricted to New Zealand; see for example the International Union for Conservation of Nature (IUCN) Commission on Environmental Management's work on impact mitigation and ecological compensation (IUCN, n.d.).

QUALITATIVE BIODIVERSITY MODELS (QBMS)

More recently, and in response to the challenges set out above, QBMs have been used on projects at the consenting stage to provide guidance on the type and magnitude of offsetting and compensation requirements that are expected to generate NNL/NG outcomes. While not without their limitations (Tonkin & Taylor, in preparation), the key advantages of using QBMs at the consenting stage is that, compared to ad hoc approaches, they:

- offer a transparent, science based, systematic, scalable and practically feasible modelling approach to provide guidance on **all** residual effects associated with a project. Of key importance and unlike BOAMs, QBMs can be used to provide guidance on residual effects that cannot be measured or quantified with adequate precision, which is typically the case at the consenting stage; and
- can be converted to BOAMS if consent is granted, i.e. through the provision of real data at offset sites after the commencement of habitat restoration and enhancement activities.

QBMs are similar to BOAMs in that they are informed by field investigations at the impact site(s) and by expected gains at the proposed 'offset' site(s), and they account for uncertainty and the time lag between biodiversity losses and gains. However, unlike BOAMs, QBMs include the use of science-based qualitative data where quantifiable data is not available or lacks adequate precision.

For example, rather than the use of detailed quantitative measurements on a range of habitat and vegetation characteristics for a particular habitat type, a QBM would include a qualitative biodiversity value score. This biodiversity score would be based on field assessments and assigned to the affected habitat type before and after impacts (losses) and before and after implementation of restoration or enhancement measures (gains). For habitat-type QBMs, these biodiversity scores are based on the four sub-criteria, i.e., representativeness, rarity/distinctiveness, diversity and pattern, and ecological context, which are used to assess "Ecological Value" under the Ecological Impact Assessment Guidelines (Roper-Lindsay, 2018). For species or species assemblages, biodiversity values are based on a field assessment of the importance of habitats for a particular species or assemblage before and after impacts and before and after restoration or enhancement measures based on scientific literature and field investigations.

To date, QBMs (previously termed Qualitative Biodiversity Compensation Models or QBCMs) have been used in relation to the Peacocke Structure Plan Area (PSPA) and the proposed Amberfield subdivision for Hamilton City Council; the proposed Auckland Regional Landfill project for Waste Management New Zealand; and Te Ahu a Turanga: Manawatū Tararua Highway for Waka Kotahi NZ Transport Agency.

In respect of *Waka Kotahi NZ Transport Agency*, the type and quantum of proposed habitat restoration and enhancement measures was ultimately determined using QBMs, with the BOAM used to provide additional detail where warranted.

The overall approach was supported by ecology expert witnesses (Department of Conservation, Forest and Bird, Queen Elizabeth II National Trust and Horizons Regional Council) through joint witness statements in advance of the Environment Court proceedings. The Court also accepted at [169] that:

> *… these offsets and compensations are consistent with agreed biodiversity offsetting principles including No Net Loss and Net Gain outcomes, increased landscape ecological connectivity, additionality, permanent protection of restored areas, and ecological equivalence.*

At [173], the Court also noted that "there is no compulsion to use any particular model or for the model to do more than assist the Court in making a decision as to whether reasonable mitigation (sic) is being applied".

Key lessons learned through these projects were that:

- Adherence to biodiversity offsetting principles was necessary to satisfy decision-makers that the level of residual adverse effects and the approach to residual effects management was likely to achieve NNL/NG outcomes.
- The QBMs were useful for guiding the type and magnitude of restoration and enhancement measures that are likely to generate NNL/NG outcomes for biodiversity. However, it is important to include a NG buffer in the QBM to reduce the risk of false positives.

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A false positive indicates NNL/NG outcomes when the converse is true and may occur if 'Net Loss' outcomes transpire for biodiversity values that are not or cannot be factored into a model or if data inputs and assumptions underplay impacts or overstate benefits.

- Application of BOAMs at the consenting stage can also be useful but can be incredibly resource intensive and detailed and does not guarantee or necessarily provide additional confidence that an offset will be achieved.
- If BOAMs are used at the consenting stage, they should be used in a selective manner where conservation concern/risk is high, likelihood of NNL/NG outcomes less certain and predicted gains can be estimated with a reasonable degree of accuracy.
- Additional certainty of outcomes is best achieved at the decision-making stage through adherence to all offsetting principles; strong performance measures in conditions; and comprehensive, robust, quantitative-based offset monitoring and reporting requirements that include offset verification and contingency measures.

A SUGGESTED WAY FORWARD

In the absence of meaningful change in the way residual effects on indigenous biodiversity are managed, the ongoing decline in biodiversity will continue. In particular, and as highlighted above, there is a pressing need for a more scalable and pragmatic modelling approach to guide offset and compensation requirements at the consenting stage.

To this end, we consider the QBM approach to strike the best balance between offsetting theory and practice at the consent application stage, and it has the potential to generate significantly better ecological outcomes than the status quo. Of key importance, this approach is at the 'as close to offset as possible' end of the compensation continuum, which is termed "biodiversity compensation" in the proposed NPSIB. This was recognised in respect of *Waka Kotahi NZ Transport Agency* with the Environment Court acknowledging at [183] that:

> *[T]he Project's proposed compensation package follows the same hierarchy as provided for in the (Regional) Plan and requires that there be a demonstrated and verifiable outcome even if this is not quantifiable in the strict terms of an offset package.*

In broad terms, the QBM approach involves two steps to provide greater certainty that the intended NNL/NG outcomes will be achieved for a given project.

Step 1: apply qualitative biodiversity models (QBMs)

QBMs are used as a decision support tool at the consent application stage to provide guidance on the type and amount of habitat restoration and enhancement that is **likely** required to achieve NNL/NG outcomes. These qualitative models are not used instead of the BOAMs but rather as a precursor to these more comprehensive tools as per step 2 below.

Step 2: implement a biodiversity offset monitoring programme

Assuming consent is granted and the project commences, QBMs should be converted to BOAMs based on quantitative data collected at both the impact and offset sites through a biodiversity monitoring programme implemented as a condition of consent (via a certified management plan). Data can be used to demonstrably verify that an offset or **likely** offset (compensation) has occurred or is on-track. Resource consent conditions can be used to ensure that the desired offset or likely offset outcomes are verified based on real data and that contingency measures are in place if required.

CLOSING

In our view, the approach suggested above can be implemented within the current regulatory framework. It is likely that the replacement of the RMA with new legislation as proposed by the Government will create an even greater need to implement measurable, transparent and consistent approaches to offsetting residual adverse effects on biodiversity. We consider it would be helpful if the proposed RMA reforms enable the application of biodiversity offsetting principles through modelling approaches such as we have outlined here. However, we consider some flexibility critical, particularly in respect of the effects management hierarchy, to avoid perverse ecological outcomes and/or incompatibility with other legislation, as has recently become evident in respect of natural freshwater wetland policy via the National Policy Statement For Freshwater Management (Minhinnick and Atkins, 2020).

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