Resolving the Jagged Problem of Offsetting: A Tool for Freshwater Management?

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ABSTRACT

New Zealand's freshwater resources have come under increased scrutiny over the last decade or so, culminating in the recent National Policy Statement aimed at strengthening the planning, allocation, utilization and monitoring of the quantity and quality of our freshwater resources. The NPS-FM provides direction on how local authorities are to carry out their responsibilities under the Resource Management Act 1991 when it comes to managing fresh water. As such local authorities are increasingly looking to alternative management strategies and practices to help achieve national objectives at the local scale. While the NPS-FM is silent on specific strategies for managing freshwater resources, globally there has been an ever greater emphasis on the use of market or pseudo market based practices based on a perceived 'win-win' outcome. Environmental compensation, offset mitigation, and biodiversity offsets epitomize this ideal and have become prominent tools in local authority's toolboxes for counteracting adverse environmental effects on both terrestrial and aquatic resources. Are these tools a sure pathway to greater losses? Can they produce gains as part of the stormwater management tool box, under the current New Zealand context? This paper briefly explores the jagged problem of offsetting by examining some of the challenges, in the context of offsetting in NZ, with the aim of better understanding the practicability of freshwater offset mitigation succeeding as a stormwater management tool under the New Zealand context.

KEYWORDS

Offset, mitigation, compensation, win-win

PRESENTER PROFILE

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1 INTRODUCTION

While offset mitigation is no 'silver bullet' in the conflict between economic development and the protection and maintenance of fresh water resources, offsetting under the right conditions increasingly has a role to play. Offset mitigation's growing momentum as a policy of choice by an ever increasing number of governments globally, is arguably cementing its place in the tool boxes of resource managers responsible for balancing development impacts and their adverse effects on the environment. As a result, this brief investigation of the challenges being faced is intended to help clarify the practicability and appropriateness of offsetting adverse effects on fresh water resources in New Zealand. In this regard this paper leverages the synthesis of key offset controversies or challenges identified by Maron et al, (2016) as a framework for evaluating the barriers, possible resolutions and the practicability of implementing those resolutions under the New Zealand context. Despite the jagged nature of offsetting and the many challenges surrounding the effective implementation of offsetting, this paper argues offset mitigation has a complimentary role to play in the future proofing of New Zealand's fresh water resources.

2 SAFE GUARDING NZ'S FRESHWATER RESOURCES

It is well understood that fresh water is a fundamental component of not only New Zealand's environmental and economic health but also of New Zealander's general well-being and national ethos. To this regard, the relatively recent admission that our fresh water resources are far from the '100% Pure' persona that is so prominently communicated to the rest of the world has sparked much debate. While New Zealand's freshwater quantity and quality is still enviable by much of the global community, recent debate on whether New Zealander's should be satisfied with the status quo has generated much reflection and scrutiny of the ways in which fresh water resources are managed in this country. Whether it is 'townies' pointing their finger at the ostensibly 'dirty' farmers for not doing more to safe guard against the adverse effects of ever greater farm intensification or rural communities pointing their finger at those living in the country's city centers for not recognizing the adverse effects urbanization has on fresh water quantity and quality, there is growing awareness of the need to look at things differently. In this regard, the release of the National Policy Statement on Fresh Water Management and its subsequent amendments represent a small but positive step in the right direction. The National Policy Statement on Freshwater Management sets out central government's National Objectives Framework and thus provides regional councils and local authorities greater direction on how to carry out their responsibilities under the Resource Management Act 1991 when it comes to managing fresh water resources (MOE 2014).

As a result, Regional and local authorities are increasingly looking to alternative management strategies and practices to help achieve national objectives at the local scale. Globally this has meant an ever greater emphasis on the use of market or pseudo market based practices based on a perceived 'win-win' outcome. Environmental compensation, offset mitigation, and biodiversity offsets epitomize this ideal and have become prominent tools in local authority's toolboxes for counteracting the adverse effects of economic development on both terrestrial and aquatic resources.

3 UNDERSTANDING THE JAGGED PROBLEM OF OFFSETTING

It is well understood that environmental offsetting remains a contentious and controversial policy instrument. Environmental offsetting represents a deliberate form of trade-off, whereby a negative environmental impact is compensated for by an environmental improvement elsewhere, effectively offsetting a loss with a gain (Maron et al., 2012). Since the popularization of offset mitigation in the late 1970's under the Clean Water Act in the United States, the use of offsets has grown rapidly, with a sharp proliferation of a variety of different frameworks and methodologies being implemented globally (BBOP 2012). Examples include, South America's payment for ecosystem services (PES) which places monetary value on the services humans derive from nature in an attempt to efficiently allocate conservation action and maximize gains (McAfee & Shapiro, 2010). In the US, wetland mitigation trades ecosystem function under acre for acre transactions with a goal of no-net-loss (Robertson, 2004); while in Australia, bio-banking uses measurable credits traded in exchange for vegetation clearing, whereby credits are defined by biodiversity metrics (Bekessy et al., 2010). Yet these schemes and others are subject to much scrutiny in terms of their ability to successfully deliver planned outcomes.

As the diversity in offset schemes and policies being rolled out continues to grow, so too do the many perspectives on offsetting. Societal concerns with regard to the implementation of offsetting, encompass a broad spectrum of issues. From technical questions regarding the additionality and fungibility of trade-offs, and the ways in which environmental impacts and offset gains are measured, to the social and ethical equality of realized losses and gains, the outcomes remain questionable (Brownlie et al., 2013). To this end Brownlie et al. (2013), Walker et al. (2009), Robertson (2006) and others point to the inadequacy of over simplified currencies of trade, ill-chosen biodiversity proxies and the unsophisticated metrics of measurement used in the accounting of complex socio-ecological values distributed across space and time. In addition to technical accounting issues many have pointed to governance failures whereby schemes simply suffer from a lack of execution and compliance (e.g. Brown et al, 2013; Gibbons and Lindenmayer 2007; Quigley and Harper 2006) or as Clare et al. (2011) suggest, application of the mitigation hierarchy is frequently compromised by a premature emphasis on offsets as enabling, rather than precautionary measures of 'last resort' (Brownlie et al. 2013; Walker et al. 2009).

In this regard, Maron et al. (2016) have succinctly synthesized the most contentious issues related to offsetting under the broad categorization of social, ethical, technical and governance challenges. As part of this synthesis they discuss the main barriers to resolving these challenges as well as the paths for reducing conflicts. Understanding these challenges can shed light on whether offsetting is fit for purpose, or even worth pursuing as an effective policy instrument in particular jurisdictions. Therefore, this paper leverages this synthesis as a framework to explore the appropriateness and practicability of offset mitigation as a means of reducing the adverse effects of development on freshwater resources in the New Zealand context. The intent of this exercise is to simply generate discussion and reflection on how offsetting is not only currently used in New Zealand but how it could be in the future.

4 THE STATE OF OFFSETTING IN NZ

Legislation

Offsetting environmental harm is increasingly becoming the preferred means in the pursuit of sustainable development globally (Norton 2009; Pilgrim et al. 2013, Maron et al. 2016)). Under the Resource Management Act 1991 (RMA) the practice of offsetting in New Zealand has been widely used in the pretense of environmental compensation, despite the absence of a legislative definition or framework (Brown 2013). Environmental compensation, involving ad hoc activities (e.g. indigenous vegetation planting, pest control and the placement of protective covenants) to create positive environmental outcomes intended to offset the residual adverse impacts of development, are increasingly being incorporated into development plans in order to secure resource consent (Norton 2009; Brown 2013).

Under section 104 of the RMA, proposed compensation or offsetting of ecological harm is one of the aspects that local authorities are able to consider when making a determination on whether to issue consent and what conditions are to be applied (Brown 2013). However, in contrast to international policy, decisions regarding the consenting of offset proposals in New Zealand are made in the absence of a strict adherence to a mitigation hierarchy. The avoid-remedy-mitigate construct under the RMA, places no particular priority on any one element and as such development proposals frequently emphasis mitigation in its various forms rather than avoidance, or minimization (Brown 2013).

Policy

Despite much public discourse, academic research and international practice, the National Policy Statement released by New Zealand's central government is silent on the potential role or use of environmental compensation or offset mitigation in managing fresh water resources. However, the proposed National Policy Statement on Indigenous Biodiversity, which aims to halt the decline of all indigenous biodiversity on private land clearly incorporates the use of biodiversity offsets, as part of the wider concept of environmental compensation. National Policy Statements are influential under the RMA framework whereby regional policies and district and unitary plans are required to "give effect" to them, and resource consent applications must consider the relevant provisions.

Under the proposed Biodiversity NPS, offsets are defined as "measurable conservation outcomes resulting from actions which are designed to compensate for more than minor residual adverse effects on biodiversity, where those affects arise from an activity after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no-net-loss (NNL) and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure and ecosystem function" (MOE, 2011, pg 3)

Planning

The Auckland Unitary Plan, as an example of a local scale land use planning framework giving effect to the RMA, incorporates offsets as an instrument to be used in mitigating the adverse effects stemming from specific land use activities. The AUP defines offsets as "Compensation for significant residual adverse biological effects arising from subdivision, use and development." With regards to fresh water resources the Plan requires that permanent loss be minimized and significant modification or diversion of lakes, rivers, streams and wetlands be avoided. Where adverse effects cannot be avoided, remedied or

mitigated, the plan makes provision for residual adverse effects to be offset by providing environmental benefits either onsite or offsite. Under the Plan, offsets are only to be contemplated after appropriate avoidance, remediation, prevention and mitigation measures have been taken.

5 OFFSETTING ADVERSE EFFECTS: AN ADDITIONAL TOOL IN THE STORMWATER MANAGEMENT TOOLBOX?

Freshwater lakes, rivers, streams and wetlands serve as vital components of any stormwater management network as they provide important functions for not only the re-integration and conveyance of stormwater from both our natural and built environments but as valued social and ethical assets. Within our built environments streams have been heavily modified, piped, re-aligned, and filled in to reclaim land for urban development and to accommodate important infrastructure such as roads, stormwater and wastewater networks as well as a growing list of other utility services. Despite this, urban streams provide important ecosystem services and contribute to our overall biodiversity values at a meaningful level (AUP 2017).

As a result it is vital that a delicate balance be struck between the need to provide for the ongoing growth of our built environments, including the requirements for critical infrastructure, and the protection, maintenance and enhancement of our freshwater assets. Ongoing development must therefore unfold in a sustainable manner whereby the retention and enhancement of lakes, rivers, streams and wetlands must be accommodated for where practicable (AUP 2017).

In this regard stormwater management is progressing away from simple 'hard infrastructure' solutions and adding concepts such as Water Sensitive Design (WSD) and stormwater offset schemes to its tool box of instruments (Lloyd et al. 2004). Water sensitive design is an innovative stormwater management paradigm applied to land development which aims to protect, and enhance natural freshwater systems, through design options which mimic or sustain natural processes to achieve enhanced outcomes for ecosystems (Lewis et al. 2015). As this paradigm matures we have seen the inclusion of offset schemes designed to incentivize the management of various environmental stressors (e.g. contaminants, erosion, piping, riparian vegetation removal etc); whereby, management or design actions undertaken by developers leads to an incremental offset against a stressor, resulting in an overall improvement in environmental quality (Shuster et al. 2013)

As a result this paper briefly investigates the practicability of using offset mitigation as a means of achieving this balance between ongoing development and future proofing natural fresh water systems. In doing so this paper refers to an abridged list of the key challenges in offsetting policy, prepared by Maron et al. (2016), in which to evaluate the practicability or appropriateness of fresh water resource offsetting as an instrument in New Zealand's stormwater management toolbox. The key challenges chosen are a). value conflicts; b). targeting no-net-loss; c). applying the mitigation hierarchy; d). biodiversity proxies e). uncertainty and temporal delays; f). institutional issues; and g). monitoring and compliance.

Table 1 below summarizes the individual challenges, the barriers to resolution, the practicability of solutions to be implemented, and the required actions to overcome the barriers. Practicability of solutions is rated based on a scale of low to high whereby low =

the challenge is virtually impracticable; moderate = theoretically solutions can be found but a lack of knowledge, or political motivation limits the likelihood of solutions being implemented; and high = workable solutions exist or are can be easily uncovered.

Table 1: A synthesis of the key ethical, social, technical and governance challenge's impeding the effectiveness of freshwater offsetting outcomes in New Zealand

Challenges	**Barriers to resolving**	**Practicability of implementing solutions**	**Required actions to lower barriers**
Ethical			
Value conflicts	Competing philosophies and beliefs make individual value judgments unresolvable	Low	Facilitate informed debate and ensure reliable capture of values
Social			
No-Net-Loss	Declining biodiversity values obscure target; Agreement on which ecological components, functions or services are to be included in the balance sheet? Agreement on what can be substituted for what?	Moderate	Use of explicit frames of reference and allowance for periodic revision of baselines in light of new knowledge. Explicit and transparent statement on valued ecosystem components, functions and services
Technical			
Applying the mitigation hierarchy	RMA and environment court rulings cement the current avoid-remedy-mitigate construct;	Low	Facilitate productive debate and RMA reform;
Biodiversity proxies	Disagreement on appropriateness of substitutions; lack of knowledge regarding biodiversity and societal choices	Moderate	Investigate societal acceptance of substitutions and associated consequences, Strengthen monitoring of biodiversity responses
Ecological uncertainty and temporal delays	Natural systems are 'jagged', multi-dimensional systems; Unintended and unexpected outcomes	Moderate	Incentivize feedback mechanisms to increase learning and reduce uncertainty in interventions; Develop mitigation banking policy; Develop appropriate discount rates reflective of preferred time lines for biodiversity outcomes.
Governance			
Institutional issues	Economic gains tied to under delivering on offset commitments; Acceptance of incommensurable trade-offs is easy; Transparency and critique of offset outcomes likely politically incompatible	Moderate	Incentivize compliance with results based social licenses, and lower consenting costs; Increase compliance monitoring/auditing, engage in community monitoring
Monitoring and compliance	Lack of resources and capacity for oversight. Increased transparency in offset outcomes may	Moderate	Leverage existing/design fit for purpose monitoring and compliance auditing

	be politically incompatible		programs focused on offset outcomes at the technical and policy levels. Store, analyze and share offset outcome results

5.1 PRIORITIZING VALUES

Debate surrounding whether offsetting is appropriate often centres on the dichotomy between intrinsic and utility values. Some people believe that not only nature as a whole, but its individual parts alone have intrinsic value and as such, nature inherently precludes the influence of market forces and thus the inclusion in any comparative valuation (Maron et al. 2016). This inherent contradiction in the commodification of nature ensures that all offset policies emphasize the use of utility values. Although utility values are somewhat removed from the influence of moral choices they are nonetheless values which reflect individual philosophies and beliefs and thus are fundamentally unresolvable (Maron et al. 2016).

5.2 NO-NET-LOSS

Although offsetting in New Zealand has been undertaken in a rather ad-hoc fashion to date (Brown 2013), the release of the proposed NPS on Biodiversity and the non-statutory Guidance on Good Practice Biodiversity Offsetting in New Zealand place the concept of NNL at the center of any proposed offsetting in New Zealand. Unfortunately the concept of NNL lacks sufficient clarity and as such not only obscures the understanding of the net consequences of offset exchanges but perpetuates false or unachievable expectations (Maron et al. 2016). Fundamental questions around the appropriate baseline or frame of reference from which NNL is to be measured or which ecosystem components, functions or services are NNL claims to be applied to renders the concept a 'jagged' problem. This jaggedness stems from the multi-dimensional nature of the socio-ecological systems at play and their complex interrelationships (Rose 2016). Whereas the one dimensional nature of NNL policy is evident in the implicit frame of reference used in crediting the protection of existing values under a claim of avoiding biodiversity loss. For under this logic biodiversity levels are presumed to be declining, otherwise there would be no need for the protection against loss (Maron et al. 2016).

5.3 APPLICATION OF THE MITIGATION HIERARCHY

The RMA 1991 does not explicitly outline a mandatory cascading mitigation hierarchy of avoid, remedy and mitigate. This is at odds with much of the globally mature offset mitigation policy and available guidance on best practice biodiversity offsetting including the Business and Biodiversity Offset Programme (BBOP) and New Zealand's own Guidance on Biodiversity Offsetting. Arguably, the adherence to a strict mitigation hierarchy, whereby offsetting to achieve NNL is only applied to residual adverse effects once avoidance, then remedying then mitigating has been exhausted, would require a significant departure from the common understanding of the intent of Part 2, Section 5 of the Act whereby sustainable management clearly incorporates a level of acceptable loss;.

……"managing *the use, development and protection of natural and physical resources in a way or at a rate, which enables people and communities to provide for their social, economic and cultural wellbeing*"……

In this way the act can be seen as more permissive than precautionary and has been clarified as such through various environment court rulings such as JF Investments Limited v Queenstown Lakes District Council C48/2006 (Norton 2009). As a result, in the

absence of legislative reform aimed at re-constructing the RMA's flat, rather than hierarchical mitigation paradigm, there is an increased need for clear rules on whether there is a minimum level of either avoidance, or remedying required before mitigation can be considered or residual impacts defined.

5.4 BIODIVERSITY PROXIES

Ecosystems are dynamic, complex systems with highly variable components and interrelationships which respond to stressors differently. As such no two ecosystems or ecosystem components are identical. This is problematic in accounting for biodiversity losses or gains and as such abstractions and oversimplifications are necessarily made to identify attributes that can be easily observed, estimated or measured. These unsophisticated metrics combine multiple ecological components into a single index value in order to allow for nature's complexity to be described in terms of functional values for entire sites (Maron 2016; Robertson 2012). However, the transparency of these indexes is frequently low with somewhat arbitrary weighting of particular components, undeclared assumptions, and the obscuring of any substitutions. In the Auckland Region this index is called the Stream Ecological Valuation (SEV) method for assessing the ecological functions of Auckland streams. The SEV casts a broad net and tallies fourteen different variables for hydraulic, biochemical, habitat provision and biodiversity functions (Storey et al. 2011). Under the SEV and many other similar indexes a single score is produced by summing the individual variable scores and averaging the total. While a single score is more convenient and pragmatic in terms of discussing exchanges or trade-offs, the ecological significance of the number produced is pretty unclear. Frequently these index tools offer only an unsupported assertion that the value produced is not simply an arbitrary, unitless data (Robertson 2006).

Finding the balance between a rapid and simple assessment method that comprehensively captures the valued biodiversity components in order to avoid loss in any offset exchange is a fundamental challenge. Robust and consistent monitoring under an adaptive management approach to evaluate and compare offset outcomes is required to feedback into the effectiveness of these indexes and refine them to ensure they are capturing current knowledge.

5.5 ECOLOGICAL UNCERTAINTY AND TEMPORAL DELAYS

Offsetting is dogged by the inherent conflict between the exchange of certain and immediate loss for uncertain and delayed gains (Beckessy 2010; Moilanen et al. 2009). This conflict is most commonly addressed through the ad-hoc use of multipliers or ratios aimed at hedging the uncertainty in predicted gains against overestimation (Maron 2016; Moilanen at al. 2009). In this regard, relatively recent work which focused on capturing uncertainty and temporal delays in offset outcomes found that that "very high offset ratios may be needed to guarantee a robustly fair exchange, compared to simply matching mean expected utilities. These results demonstrate that considerations of uncertainty, correlated success/failure, and time discounting should be included in the determination of the offset ratio to avoid a significant risk that the exchange is unfavorable" (Moilanen e al. 2009 pg 470).

Mitigation banking or bio-banking is one relatively mature approach to managing the risk of uncertain outcomes. Born in the US out of the wetland mitigation industry and the Clean Water Act, mitigation banking is analogous to a traditional savings account but where the deposits and withdrawals are ecological assets. Mitigation banking allows for already established, verified and measurable offsets to be deposited and withdrawn from the bank as needed. This has the obvious effect of eliminating the time lag between when losses are realized and gains are produced. Similar to banking, Brown et al. (2013)

found that in New Zealand, where bonding and compensatory activities were required to be verified prior to project consent, effectively insuring against uncertain outcomes or non-compliance, compensatory conditions were much more likely to be completed and deliver planned gains (Brown et al., 2013). Appropriately structured, stable and transparent policy that incentivizes and supports the development of mitigation banks and the market place to ensure efficient transactions can greatly aid in reducing the uncertainty and temporal delays inherent in offsetting (Maron et al. 2016; Robertson 2004)

5.6 INSTITUTIONAL ISSUES

Governance frameworks and the diverse set of actors, interests and objectives that operate within them are inherently subject to institutional issues stemming from the unequal distribution of information, knowledge, risk and power among the actors. Institutional incentives founded on economic and political gains associated with underperforming on offset commitments, accepting incommensurable exchanges or over estimating the predicted gains from an offset outcome are greatly influenced by the number of actors involved. Hence, clear, structured and transparent processes in which governance oversight and accountability can be delivered is required to help reduce the risk of offset failure as the divergence between impacts and offsets grows with the number of actors involved (Maron et al. 2016). For example, Brown et.al (2013) found that predictors of compliance associated with consented ecological compensation and offset conditions across New Zealand were strongly correlated with the structural processes impacting project costs and risk. While many institutional issues will persist despite our best efforts, implementation of transparent, and publicly accessible reporting on offset outcomes based on robust monitoring and evaluation can help bridge the gap.

5.7 MONITORING AND COMPLIANCE

Monitoring, evaluation and reporting of outcomes is integral to the success of any public policy, particularly policy surrounding increased access to natural resources based on the premise of planned outcomes. Without monitoring and evaluation it is impossible to determine whether offset outcomes reflect what was expected or whether there are any learnings to be had that could be incorporated into future offset decisions. Generally speaking there are very few empirical evaluations of offset outcomes. It could be argued this has contributed to the counterfactual belief that NNL can successfully slow the decline of biodiversity. A thorough search of the most prominent academic literature databases found very few examples of successful NNL habitat offset programs or monitoring programs aimed at evaluating success. A single case study aimed at offsetting habitat loss associated with urban development and the removal of pond habitat important to a population of threatened green and golden bell frog (*Litoria aurea*), in South-east Australia was noted. The results of which showed that NNL in population size to 95% confidence was achieved, but only through extensive levels of habitat creation (i.e. 19 times the pond area lost) through which intensive monitoring was required in order to detect change even at a local population level (Pickett et al. 2013). In New Zealand, Brown et al. (2013) likely represents the largest scale evaluation of environmental compensatory outcomes undertaken to date. She found that compensation outcomes have been coming up short when it comes to adequately securing planned gains, with c. 35% of all consented compensation requirements not being achieved.

There are obvious technical challenges which hinder the implementation of offset evaluation programs at the scale and intensity that the outcomes of Pickett et al. (2013)

and Brown et al. (2013) suggest is required. Not only does the dynamic nature of ecosystems and the heterogeneity in their components and interrelations require specialized technical knowledge, but it also requires significant financial and resource investment due to the long temporal delays before measurable outcomes are realized. As a result strong and stable funding schemes are critical and need to be reflected in the overall offset cost to ensure that there is adequate funding to undertake monitoring and evaluation beyond just the establishment phase. This rarely happens and as such represents a significant governance challenge (Maron et al. 2016; Brown et al., 2013). In addition to the financial and resourcing burden, Maron et al. 2016 and Clare et al., 2013) suggest there may even be institutional disincentives at play in response to the possible financial and political costs associated with increased public scrutiny that comes from greater transparency in reporting and evaluation of outcomes.

Despite the vital role that monitoring and evaluation plays in measuring public policy performance, there is no recognized guidance on the design of monitoring programs aimed at demonstrating the effectiveness of offsetting adverse effects either at the individual or program level (Maron et al. 2016). As a result, transparent evaluation guidelines, with effective data storing, sharing and performance based incentives tied to social licenses or contracts may represent innovative approaches to limiting risk.

6 CONCLUSIONS

This brief review highlights that offsetting adverse effects on freshwater resources, faces several challenges. This brief investigation of the challenges being faced helps clarify the practicability and appropriateness of offsetting adverse effects on fresh water resources in New Zealand. Identification of the challenges suggests offset mitigation demands a precautionary approach and that practical steps are needed to improve both policy and practice where possible. Despite the few fundamentally unresolvable challenges identified, this paper synthesizes a number of actions extracted from the growing genera of literature critiquing offsetting, that are easily implementable in addressing the key social, technical, and governance challenges faced. Although many of the resolutions identified will not be realized for some time once action is taken, it is important that the steps be taken as soon as possible by both public and private sector actors charged with designing, amending and implementing both stormwater management and offset policy alike in New Zealand.

As the list of challenges faced by offset policy suggests, offsetting adverse effects is not a silver bullet and as such there remains significant risks in its ever expanding application, particularly in the face of some of the seemingly unresolvable issues identified. Despite these challenges and the scrutiny applied through both public discourse and academic research, offsetting has a role to play in managing the adverse effects on not only biodiversity but fresh water resources values more generally. This is supported by offset mitigation's growing momentum as a policy of choice by an increasing number of governments globally, seeking to offset environmental harm as a means of pursuing sustainable development (Norton 2009; Pilgrim et al. 2013, Maron et al. 2016)). As a result, prioritizing resolution of the issues identified above will better strengthen offset policy in its ability to manage the risks that offset implementation carries.

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