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Transferable Mitigation of Environmental Impacts of Development: Two Cases of Offsets in Australia

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ABSTRACT *Transferable offsets are a means of mitigating the adverse environmental impacts of resource developments. Based on insights from institutional economics, there are three elements that need to be in place for offsets to be effective: (1) property rights over the mitigating good can be defined and assigned; (2) a difference exists between the marginal cost of supplying the mitigating good and the community's marginal value for it; and (3) the transaction costs of exchanging the mitigating good are less than the trade benefit. We suggest that these elements can be used to evaluate the design and performance of offset schemes and illustrate how this can be done using two Australian environmental offset schemes. Trade-offs between cost and environmental outcomes are apparent in the design and operation of these schemes.*

KEY WORDS: offsets, transferable mitigation, institutional economics, property rights, transaction costs, policy design

1. Introduction

Resource developments can have adverse environmental impacts. Examples are reductions of sunlight in adjacent gardens, nuisances such as noise, or losses of ecosystems that are valued by immediate and more distant communities. Land-use planning involves weighing up these costs against the benefits derived from development and where appropriate requiring actions that will reduce or mitigate those environmental impacts. Mitigation actions can be financial or material and

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can be taken by either the developer that causes the impact, or the authority that approves the impacting development.

Mitigation actions can occur either on or immediately adjacent to the site of impact. However, site-focussed mitigation might not be the most efficient option. Potentially, the same or greater improvements in the well-being of society as provided by on-site mitigation can be achieved at lower cost if conducted at off-site locations or even by taking actions that are not directly related to the original environmental impact (such as financial compensation). This type of impact mitigation is referred to as transferable mitigation and is increasingly being applied in the field as offset policies.

The use of offsets to flexibly manage the impact of development on the environment is not new. Madsen *et al*. (2010) identify 39 active offset policies across the world and 25 under development. Over the last 30 years, offsets have been used to manage the impact of development on wetlands (Bayon, 2008; Race & Fonseca, 1996; Shabman & Scodari, 2004) and endangered species habitat (Fox & Nino-Murcia, 2005) in the United States (USA); and on fish habitats in the USA and Canada (Harper & Quigley, 2005; Matthews & Endress, 2008). Maron *et al*. (2012) highlight a number of offset programmes under development or under way in the UK, Latin America and South Africa. In Australia, offsets have been introduced to manage the impacts of development on native vegetation, iconic species habitat, biodiversity and marine fish habitat in the states of Victoria, New South Wales (NSW)[1] and Queensland (Queensland Government, 2008). In early 2007, the Australian Government amended the *Environment Protection and Biodiversity Conservation* (*EPBC) Act*, *1999* (Australian Government, 1999) to incorporate offsets into the suite of tools available to manage the impacts of development on ecological communities of national environmental significance (NES) (Australian Government Department of the Environment Water Heritage and the Arts, 2007a, 2007b).

Matched to the increasing on-ground application of offsets is an ecological literature critiquing the use and design of offsets to manage the impact of development on the environment (Bekessy *et al*., 2010; Bendor, 2009; BenDor & Brozovic, 2007; Fox & Nino-Murcia, 2005; Gibbons & Lindenmayer, 2007; Kiesecker *et al*., 2009; Madsen *et al*., 2010; Maron *et al*., 2010, 2012; McKenney & Kiesecker, 2010; Moilanen *et al*., 2009; Norton, 2009; ten Kate *et al*., 2004). The existing ecological literature is predominately descriptive and focused on specific cases. Hence it does not always conceptualize offsets and offset systems into a framework that can be used for broader analysis. The objective of this paper is to address this shortcoming. To do this we deconstruct offsets and offset systems to provide a conceptual framework that can then be used to analyse the design and performance of offset schemes. We do this by explaining offsets as a form of transferable mitigation and identifying the essential elements necessary to underpin transferable mitigation. We then demonstrate how these elements can be used to assess offset schemes through an assessment of two Australian offset schemes.

This paper extends the existing literature in several ways. It deals with the intrinsic nature of land—its immobility—in relation to the working of environmental offsets market. In addition, it extends the literature on the compensation for and mitigation of the adverse environmental impacts of urban development. While there is an extensive literature on compensating measures for development impact, particularly related to the provision of affordable housing (see, for example, Crook *et al*., 2006), very little has been written on the other forms of obligations and systems. This paper also contributes to the literature on transferable development rights. Again,

much has been written on transferable development *rights* (see, for example, Janssen-Jansen *et al*., 2008; Malone *et al*., 1987; Micelli, 2002; Renard, 2007), but the literature is sparse on transferable *duties* (referred to as actions throughout the paper). Finally, by explaining and illustrating offsets as a form of transferable mitigation, this paper provides a conceptual discussion and definition of offsets which has the potential to inform future economic policy and ecological discussions.

The paper is structured as follows. In the next section we provide definitions and a discussion of the concept of transferable mitigation. Thereafter, we pay attention to the implications of transferable mitigation in dealing with environmental externalities in the land market. The focus is then directed to the elements that must be present for a transferable mitigation approach to operate. We highlight that these elements can be used to evaluate offset schemes and then illustrate how this might be done by providing an evaluation of two Australian offset schemes. Lessons learned about the use of these 'essential elements' in offset evaluation and about offsets more broadly are discussed in the conclusion.

2. Offsets as Substitutable and Transferable Impact Mitigation Actions

Mitigation actions are taken to compensate for a negative environmental impact. This makes mitigation actions distinct from actions taken to avoid or minimize development impacts (Crowe & ten Kate, 2010). Land-use planning involves weighing up the benefits and costs of alternative allocations of the land resource. Where a land use generates negative environmental impacts and hence costs to society, action may be warranted to minimize those impacts. This could occur through development approval conditions which constrain the extent or location of the impacting activity on the site. However, avoidance and minimization do not always eliminate impact. There may be a residual cost to society from the remaining environmental impact. When this occurs, mitigation might also be warranted (see Crowe & ten Kate (2010) for discussion of the mitigation hierarchy).

Depending on the outcome determined in the planning process to deliver the most efficient use of resources, mitigation can be substitutable around the *type* or *location* of actions which are employed to offset the residual impact. Substitution of type occurs when a material impact is mitigated by an activity that is not directly related to the impact being mitigated. For instance, when a financial contribution to a fauna protection fund is used as a substitute for direct material mitigation of species numbers. The outcome objective of this type of mitigation is important to decisions about the substitutability of actions. For example, if the mitigation outcome is for the conservation of a population of a species, then the substitution of an investment in research into the management of diseases, which may have catastrophic implications for the species in question for a loss of habitat, may be appropriate. There is much debate around the practicality and processes of substitution of action types in practice (Bayon, 2008; Bekessy *et al*., 2010; Gibbons & Lindenmayer, 2007; Maron *et al*., 2012; Moilanen *et al*., 2009; Norton, 2009; Race & Fonseca, 1996; ten Kate *et al*., 2004). Much more analysis is needed into understanding the extent to which action types are substitutable.[2]

Substitution can also occur on the *location* of actions. This means that the mitigating action can be carried out in a location that is remote from the impacted site. This location does not need to be owned by the person who is causing the impact; the mitigation action can be traded to someone else, which makes mitigation both transferable and tradeable.[3]

The substitution of type and the location of mitigation can also coincide, as is the case when a loss of habitat at one location is compensated elsewhere by, for instance, road-related works to prevent vehicle impacts on endangered species. In this case, both the type and the location of the action have been substituted. Once again, the appropriateness of this in practice depends on the outcome and is subject to much debate. Both the *site* and the *substitutability* dimension lead to the matrix that is presented in Figure 1.

Figure 1 shows that by thinking about the ability to substitute actions and locations and whether this substitution can occur on or off-site leads to four types of mitigation. There is evidence of each type in practice. Type A is non-substitutable mitigation on-site. These are actions that can only be undertaken on-site, and are specific in terms of location of the action (for example, a fauna passage or crossing that connects habitat that has become disconnected as a result of the development). It needs to be noted that the distinction between this type of mitigation and the earlier mentioned minimization of impact is purely analytical; in practice the dividing line is subject to debate. There might also be cases in which these actions can be substituted (type B) by other actions elsewhere on the same site (i.e. there is flexibility within the site with regard to the mitigation measures). In the case of off-site non-substitutable mitigation (type C), there is only one possible action that needs to be made off-site. For instance, if the entrance to a development site attracts a lot of extra traffic to the main road, a fence might need to be erected opposite the entrance and off the site—this action is off-site but not substitutable by another location or action. Type D actions can be of any type—directly or indirectly related to the impact—and on any location on or off-site but usually within some geographic limits, such as within the same ecological region.

Only the substitutable mitigations, type B and D actions (in grey in Figure 1) are considered offsets, since only these two allow for flexibility in terms of the type of action and the location of mitigation. To summarize, an offset is about substitutable mitigation, which

- can be tradeable;
- can be financial as well as material and
- can occur either on or off the impact site.

3. The Rationale Behind the Use of Offsets

The creation of offsets is an attempt to generate a tradable good from the natural environment that may otherwise be non-marketed because of its public good characteristics (Salzman & Ruhl, 2000). Markets in goods and services are operating

	Non-substitutable (in terms of the type and/or location of the action)	Substitutable (in terms of the type and/or location of the action)
On-site	A	B
Off-site	C	D

Figure 1. A typology of mitigation of development impact (development offsets in grey).

efficiently if the resultant allocation of the resources involved is such that they are used by those who value them the most. Efficiency is defined here in Pareto terms; that is, there are no more gains possible from trade. Nearly all goods are mobile and can therefore be transferred from one place to the other. This allows for the transfer of a supply surplus in one place to another place with a high demand. The mobility of the goods therefore helps to match demand and supply.

The land resource is somewhat different in that it is immobile. A surplus in one area cannot be transferred to another area with a shortage of supply. This might not lead to inefficient resource allocation *per se* if every location offered the same possibilities for development (supply) to catch up with the demand, or change of use was cost-less. However, every piece of land has unique location and additional associated features (for example, the proximity to transportation services, flora and fauna, views, etc.). Therefore, some locations have 'locational advantages' over others and are more suitable for particular developments compared with others and are therefore in higher demand. Competition between alternative uses implies that some land-uses will not be accommodated.

The same logic applies to the environmental impacts arising from the development of land. Impacts associated with the use of mobile resources can be changed by altering the location of the resource. For instance, people who use their mobile/cell phone in such a way that they cause a nuisance to others can be required to move away from crowded areas so as to reduce their impact. Conflicting uses of immobile land resource cannot simply relocate.

The operation of offsets allows, at least to some extent, the relaxation of the land location immobility constraint. Because mitigation can be both traded and transferred, even though the impact itself cannot, this makes mitigation of land-based conflicts more flexible. This flexibility enables the costs of mitigation of environmental impacts to be reduced compared to on-site avoidance actions. Offsets allow substitutable mitigation by other landholders or on other sites where there is the potential for the offsetting environmental gains to be achieved at relatively lower production costs. Offsets allow the party facing high environmental damage avoidance costs to produce offsetting benefits on the same site, on another site belonging to them, or to pay another party with lower production costs to conduct compensatory actions on their behalf within the physical limits of the ecosystem. Therefore, offsets can be used to facilitate achieving no net impact from development at least cost.

4. Essential Elements of an Effective Transferable Mitigation System

Economic theory, and particularly that of institutional economics, offers useful insights into the elements that are essential to the efficient working of a market-based policy instrument such as transferable mitigation. Barzel (1997) in particular presents a theory describing the emergence or creation of markets in goods that would normally be classified as public goods. Goods are said to be public if they are non-excludible and non-rival (Ostrom & Ostrom, 1999). That is, the cost to exclude others from using the good outweighs the net benefits which can be captured through trade and the consumption benefits enjoyed by one party do not impinge on those of another. However, public goods can be and are captured from the public domain if the value of privatising these goods (through the assignment of property rights and the gains from trade) exceeds the (transaction) cost.[4]

Barzel (1997) applies this positive theory to explain the emergence of property rights. This approach has been criticised for its behavioural assumptions—such as

the quest for utility maximization—and for failing to account for institutional path dependency and the influence of power differences on institutional design (Libecap, 1989; North, 1990). Nevertheless, we present these conditions as useful analytical structure within which to evaluate the workings of two case study offset schemes.

From Barzel's hypothesis, three (interrelated) variables or essential elements for goods to become private and tradable can be derived. They characterize contexts in which transferable mitigation arrangements such as offset markets become feasible. These are: (1) property rights can be defined and allocated to these goods; (2) there is value in trading the good and (3) the transaction costs of trade are sufficiently low to permit gains from trade. These essential elements are discussed in more detail below.

By defining resource access and ownership, property rights provide a bundle of rights to possess, use, benefit from and dispose of valuable and scarce assets that the state will agree to protect (Bromley, 1991; Kasper, 1998). A property right defines a good in terms of who can own it, when it can be owned, how it can be transferred, who can transfer it and potentially to whom it can be transferred. In terms of development offsets, the suite of property rights related to land and land use should define what development impacts are to be avoided, minimized and mitigated on-site; which mitigation is substitutable on and off-site (what can be traded); and what rules and conditions surround this substitutable mitigation (quantity and quality, timeframes and/or geographic requirements of trades, etc.).

Once property rights are assigned, scarcity must be established so that the good becomes valuable in trade. Scarcity occurs when competing demands exceed the available supply: '[...] markets involve multiple exchanges, multiple buyers and multiple sellers, and thereby *a degree of competition*. A market is an institution in which a significant number of commodities of a particular, reasonably well-defined type are regularly exchanged' (Hodgson, 2002, p. 44, italics ours). Without scarcity, trading schemes will not develop (Lindblom, 2001). Barzel (1997) demonstrates that there is a reciprocal relationship between the definition and enforcement of property rights and the scarcity value of a good. If a good is not scarce, it will have little if any value. Hence, the costs of defining and defending property rights to that good will outweigh the benefit generated from the trading in the good. Society would therefore be worse off if property rights to the good were defined and defended. However, poorly defined and defended property rights can cause the costs of trading to be higher than it could be. The implication then is that trade is impeded by these weak institutions and the benefits available from trade are not being completely utilized. Barzel's observations regarding the implications of weak institutions on the feasibility of trade builds on the work of Coase (1960) and provides a link to the third essential element: the costs of transactions.

To take goods from the public to the private domain, the net benefits of making a good private and tradable must outweigh the public costs of assigning the property rights and administering trades, and the public and private cost of trading. Although there is an increasing literature referring to and reporting on the extent of transaction costs incurred when establishing, administering and participating in the trade of environmental goods and services (Falconer, 2000, 2002; Falconer *et al*., 2001; Howitt, 1994; Kuperan *et al*., 2008; McCann & Easter, 2000; Mettepenningen *et al*., 2009; Rorstad *et al*., 2007; Vatn *et al*., 2002), in this paper the focus is specifically on the *role* transaction costs play in offset schemes. Two Australian offset schemes are analysed to this effect in the next section.

5. Applying the Essential Elements: Two Case Study Offset Schemes

5.1 *Offsets Under the Australian Government's* Environment Protection and Biodiversity Conservation *(*EPBC*)* Act *1999*

The *Environment Protection and Biodiversity Conservation Act (EPBC) Act* 1999 (Australian Government, 1999) (hereafter referred to as the *Act*) is the Australian Government's key piece of environmental legislation. One objective of the *Act* is to provide for the protection of the environment and especially matters of NES. Any action or activity that may have an impact on a species listed as of NES triggers the *Act* and therefore has to be 'referred' to the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) for approval. Once referred, DSEWPaC reviews the application and, if deemed necessary, applies conditions on the development approval. One type of condition is an offset to manage the residual impacts of an action.[5]

Under the *Act*, offsets (referred to as EPBC offsets) can be direct or indirect (Australian Government Department of the Environment Water Heritage and the Arts, 2007a, 2007b). Examples of a direct offset are covenants on private land that secure the long-term protection of the existing habitat, the restoration of degraded habitat or re-establishing habitat. Indirect offsets can be financial contributions to a fund that delivers offsets or can include activities such as research on ways to further mitigate development impact.

Whether offsets are required and whether they are direct or indirect is not prescribed in the *Act* or subsequent guidelines from DSEWPaC. Instead this is assessed on a case-by-case basis with both the applicant and the Department having much discretion over the content of an offset, with the Department having the final say (Australian Government Department of the Environment Water Heritage and the Arts, 2007a, 2007b).

Development at Mission Beach in far north Queensland (Figure 2) has been heavily conditioned under the *Act* due to the area's population of the critically endangered Southern Cassowary (*Casuarius casuarius johnsonii*) (Figure 3). Since 2007, many of these conditions have included an offset component. By late 2010, there had been 25 developments (residential and others) in the Mission Beach area that had been referred to the Australian Government to be assessed under the *Act* due to the potential for these developments to impact on the cassowary through habitat destruction and vehicle strike (Crome & Moore, 1990; Moore, 2007). Eight of these applications were approved without conditions. Eleven were approved with conditions, of which six required an offset (www.environment.gov.au *EPBC Act 1999* referrals search accessed 1 November 2010).6 Mission Beach has both the heaviest geographic concentration and the largest number of offsets under the *Act*.

A description of the Mission Beach developments that have been conditioned with offsets under the *Act*, along with the offsets themselves, is provided in Table 1.

5.2 *Offsets Under the Queensland Governments* Vegetation Management Act (VMA) 1999

Clearing of remnant vegetation on freehold land in Queensland is regulated by the *Vegetation Management Act (VMA) 1999* (Queensland Government, 1999). Clearing applications are assessed using assessment codes which articulate performance requirements and acceptable solutions which ensure that approved clearing

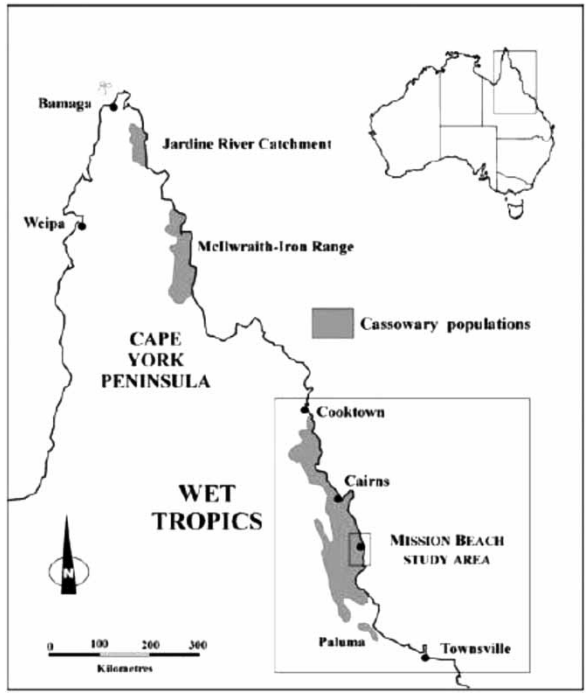

Figure 2. Mission Beach in Far North Queensland, Australia.
Source: Moore (2007).

Figure 3. The endangered Southern Cassowary (*Casuarius casuarius johnsonii*).
Source: Google images.

Table 1. Description of Mission Beach developments, impacts and offset requirements[a]

	Description of the original proposal	Type of impact	Final negotiated offsets
1	41 residential lots on 10.5 ha of land	Largely vehicle impacts	Within 12 months of development approval the person taking the action must provide a financial contribution towards a conservation programme for the Southern Cassowary to be agreed with the Department of Environment Water, Heritage and the Arts
2	Development impact is proposed to be over 8.516 ha's of the 27 ha site. The site supports some remnant regional ecosystems. The proposal is not to clear these remnant regional ecosystems. Vegetation is also identified as essential cassowary habitat	Largely vehicle impacts	1. Construction of a cassowary-specific road crossing on the Tully Mission Beach Road (main road thoroughfare for the development) to specifications. The crossing must be at a certain place in the road between two blocks of habitat 2. A suite of other offset measures including: (a) Within 12 months of the approval, finalize a binding on-title nature refuge agreement over 75 ha of appropriate cassowary habitat with provision for ongoing weed management and fencing activities (this is likely to be amended to a financial contribution to Terrain) and (b) Funding of weed control and vegetation restoration on a specified block east of the development site
3	40, 4,000 square metre lots on 18.42 ha of a 27.13 ha ex banana farm. Remnant vegetation on the site is identified as essential cassowary habitat	Vehicle and habitat impacts	1. Provide a (specified) sum of money to the local regional body or other organization to conduct rehabilitation works and plantings of native species outside of activity area on the subject site 2. Provide a (specified) sum of money to the local regional body or other organization to construct appropriate cassowary road management on main access road 3. Protect a 2 ha block of cassowary habitat within 10 km of the activity site

(*Continued*)

Table 1. Continued

	Description of the original proposal	Type of impact	Final negotiated offsets
4	Building footprint over 3.2 ha's and 16 ha protected by a conservation covenant	Habitat (~17% of vegetation cleared) and vehicle impacts	Within 12 months of the approval provide a suite of offset measures including: 1. Post cyclone emergency cassowary feeding (for a period of time) 2. Traffic impact and mitigation research and 3. Off-site cassowary habitat corridor restoration.
5	30 lot residential sub division on a 25,000 square metre block which is currently cleared and vacant	Vehicle impacts	1. Install visible and legible signage at a specified location to warn of cassowaries in the location and to limit speed 2. Install a speed hump at a specified location 3. Contribute a specified sum of money into a nominated bank account of the Cassowary Coast regional Council to be used for cassowary protection road projects
6	Golf course-based tourist and residential estate (312 residential allotment) on a 200 ha ex grazing block	Habitat and vehicle impacts	1. Construction of a cassowary-specific road crossing at a specified location 2. Upgrade road to improve driver visibility to avoid cassowary collision 3. Construct traffic calming devices at certain locations 4. Finalize a binding-on-title Nature Refuge agreement over 55 ha of cassowary habitat including funding for ongoing weed management. This was amended to a conservation agreement under s305 of the EPBC Act between the Minister land title holder and the developer 5. On site habitat restoration and weed and pest control at northern end of site

[a]Detail of developments and offset requirements are available on the EPBC Act website at http://www.environment.gov.au/epbc.

meets legal requirements (Queensland Government, 2009a). Land-based offsets can be proposed as an alternative solution to meet the performance requirements after it is demonstrated that impacts have been avoided and minimized as much as possible (Queensland Government, 2009b). The final agreement on the offset requirement and offset site is determined after a process of negotiation between the administrator and developer within the defined and consistent rules of the Queensland Government offset policy. The administrator also negotiates with

the offset provider regarding management of the offset site and its protection over time. The offset buyer and seller negotiate the price. At the end of 2011, there had been between 60 and 80 clearing applications in Queensland that required an offset.

6. Method

Qualitative data were collected through a mixed method, which included semi-structured interviews with key informants from both case study schemes and an analysis of policy and legal documents. Interviews were conducted in late 2009 for the EPBC offset case study and mid-2011 for the VMA offset case study. Informants included offset buyers (developers), sellers (landholders) and key personnel from the policy administrator. Questions asked in the semi-structured interviews sought to understand what constituted the final offset, how the offset was determined, what the process was for determining the offset, what resources were involved in determining the offset and what activities had been done since the offset decision. A summary of key informant numbers and types for each case study are given in Table 2.

Data collected in interviews and literature review were analysed using a technique which Yin (2009) refers to as explanation building. This is where the finding

Table 2. Key informant type and numbers interviewed

EPBC Act (1999) offsets			VMA (1999) offsets		
Key informant type	Key informants interviewed	Notes	Key informant type	Key informants interviewed	Notes
Offset buyers (developers)	5	6 developers had offsets as a part of their approval conditions	Offset buyers (developers)	5	Representing 16 developments
Offset seller (landholder)	2	One as a first-party supplier[a] and one as a third-party supplier.[b] The third-party supplier did not complete the sale	Offset sellers (landholders)	5	
Administrator: EPBC Act approvals branch	5		Administrator (on-ground regional)	5	Representing all VMA offsets in their region
Administrator: EPBC Act monitoring and audit branch	2		Administrator (strategic head office)	3	Representing the 60–80 developments with offset requirements
Intermediaries	4	Involved as information provider, broker and clearing house	Intermediaries	5	Representing the 60–80 developments with offset requirements

[a]Developer with land elsewhere which could be used as a supply site.
[b]Supplier of offset is separate to the developer.

from a case study/ies is compared to an initial hypothesis—in this case Barzel's essential elements. Following the recommendations of Eisenhardt (1989), Yin (2009) and Miles and Huberman (1994), the interview data were examined in several divergent ways so as to maximize the internal validity of the study. Analysis began with a review of the interview transcript by listening to the audio recordings and checking the accuracy of the transcribed text. Minor errors were detected and corrected and areas of uncertainty were checked with the respondent. This process 'cleaned' the interview data, generated researcher familiarity with the interview data, and facilitated the initial identification of recurrent themes and areas of importance. Linking the interview questions with the essential elements derived from theory enabled the use of case ordered data display (Miles & Huberman, 1994) whereby data are managed case by case but organized according to the variables of interest (the essential elements).

The next stage of analysis involved the search for patterns and themes throughout the interview data (Eisenhardt, 1989; Miles & Huberman, 1994; Yin, 2009). Interviews were compared with each other to ensure that the data were examined in many divergent ways (Eisenhardt, 1989). From these comparisons, several themes and patterns of explanations emerged that were used in the explanatory analysis. The reliability and validity of the research were improved by having a number of third parties review the analysis as a triangulation technique. For example, Eisenhardt (1989) suggests that if one member of the research team does not visit the field, she or he may be able to bring a more objective eye to the evidence. The differing perspectives that multiple researchers bring increases the likelihood of capitalizing on any novel insight from the data and adds to the empirical grounding of the findings (Eisenhardt, 1989). In this study, one researcher collected the data and the key findings were discussed with the other researchers. This process ensured that all interview details were clear prior to data assessment and that all evidence was assessed in the data analysis process.

7. Evaluation of the Case Studies Against the Essential Elements

7.1 *Offset Schemes and Property Rights*

The evaluation of the two case study schemes demonstrated some variation in how property rights are defined and assigned in each offset scheme. This has a number of implications for their operation. The *VMA 1999* offset scheme operates with clear, standardized guidance about the development impacts, what impacts must be managed on and off-site, and what can be used as an offset. For example, since 2009, VMA offsets have been informed by a policy that specifies offset limitations, ecological equivalence, how an offset is to be legally secured, implementation and management of the offset areas, information requirements, transferring of the offset obligation, advance offsets and when offsets cease to have an effect (Queensland Government, 2009b).

In comparison, EPBC offsets (and as applied in Mission Beach) have few clear and consistent rules around what, when and how offsets can take place. What can be negotiated as an offset is loosely guided by a number of draft policy papers (Australian Government Department of Sustainability Environment Water Population and communities, 2011; Australian Government Department of the Environment Water Heritage and the Arts, 2007a, 2007b). This includes some directions on how the offset should relate to the development impact (like for like), the timeframe

in which the offset must be completed (within a reasonable length of time), the length of time that the offset activities must be maintained (long lasting) and the location of the offset relative to the development impact (within the same general area). However, EPBC offsets have tended to be negotiated in an *ad hoc* and case-by-case fashion which has not always followed the guidelines.[7]

The clarity of property right definition and assignment did have a number of implications for the operation of the offset scheme and the experience of participants. EPBC offset buyers in Mission Beach (developers) noted that a lack of guidance on what was required for an offset impacted on the time that it took to propose, negotiate and secure an offset. Buyers of EPBC offsets in Mission Beach noted that the average offset took between 6 and 12 months to finalize with one developer noting that every week of negotiation cost AUD10,000 in holding and interest costs. Increased negotiation costs due to less well-defined and assigned property rights were also incurred by the government body administering the offset policy.

At the same time, VMA offset buyers highlighted that well-defined and allocated property rights surrounding offsets did ease the offset negotiation process but did not guarantee a simple and smooth running offset scheme. VMA offset buyers noted that despite well-developed rules surrounding offsets, there was still a large investment in time and resources to understand how to engage in the offset scheme which was often resolved by hiring information and exchange specialists such as brokers (Coggan *et al*., 2013). VMA offset buyers also noted that offset transactions could remain complex due to frequent changes in rules which come about with policy amendment and refinement.

7.2 *Offset Schemes and Value in Trading*

Unlike standard markets, the value generated from offset trades is not created from natural scarcity. Instead, scarcity and value are created through regulations which require offset activities to be agreed upon and sometimes finalized on-ground before development can proceed. Once this demand for offsets is established through the regulation, there is value to developers to complete the offset requirements so that they can realize the value of the development. Parties who can supply offsets can then compete to capture part of that value. Demand for offsets in both case study offset markets has been established because of the size of the potential market (Table 2).

The evaluation of the two case study schemes against this second essential element revealed that scheme design has an impact on overall scheme performance, especially as this relates to potential supply into an offset market. For example, there was ample opportunity to supply EPBC offsets due to the fact that offsets can be physical measures or other less direct activities. These included conservation of cassowary habitat, conducting works on roads to reduce vehicle impact and provision of services such as an assessment of development impact beyond the impact site. The opportunities to supply VMA offsets were more restricted, with offsets being limited to physical actions compliant with a strict set of criteria.

The evaluation also revealed that offset supply can be affected by other existing policies. For example, EPBC offset buyers noted that many properties with the potential to supply the physical offset (i.e. the land had the right habitat and was located within the required distance from the development site) already

had covenants in place (e.g. local council covenants for conservation which offered local council rate rebates). Hence these sites were not available for offset supply. For those suppliers who were not already contracted for conservation through a covenant, the institutional complexity of supplying EPBC offsets further reduced supply. To supply EPBC offsets a conservation covenant must be placed over the land being used as an offset. The covenanting process is complex because it requires a covenant that can only be secured with the state government (Queensland) to be applied to a federal (Australian Government) permit. Just because the management of a property is suitable as an EPBC offset credit does not mean that it meets the specific covenanting criteria of the state government. In 2011, this institutional inconsistency had already resulted in the redrafting of a number of offset requirements to be conservation agreements under the *Act (*1999) (see for example development 6 in Table 1).[8] The complexity of covenanting increases the transaction costs of supplying offsets, reducing supply. For some EPBC offset buyers, the lack of supply resulted in the renegotiation of offset conditions (developer 2 in Table 1), which in turn increased the transaction costs to all parties.

7.3 *Offset Schemes and Transaction Costs*

The final essential element for the assessment of a transferable mitigations scheme is that there is low cost of trade. Quantification of transaction costs is a difficult and high-cost exercise to conduct (Coggan *et al*., 2010; McCann *et al*., 2005). At present there are only a few studies that have quantified the transaction costs of environmental policies. There are no known studies quantifying the transaction costs of a terrestrial transferable mitigation scheme. While financial transaction costs were not estimated in this study, the drivers, level, nature and distribution of transaction costs were analysed. The qualitative information collected suggests significant transaction costs are incurred by all parties to an offset in both case studies. The qualitative data also indicate the importance of property right definition and allocation (policy design) to transaction costs.

The offset market design components influenced the incidence of transaction costs in several ways. First, the initial responsibility for determining the offset within the mix of avoid, minimize and on-site mitigation activities was placed on the developer. Many developers were not familiar with the concept or practicalities of environmental offsets and had a very limited understanding of ecosystem complexity. Developers incurred transaction costs through the time and resources expended first to understand what an offset was and then in determining what to propose as an offset for their impact. The effect on transaction costs depended on the guidance available to developers to determine their offset bid. Due to differences in the extent of guidance provided, EPBC offset buyers incurred greater transaction costs compared with VMA offset buyers when determining their offset bid.

Once an offset supplier was found (a process which generated transaction costs to offset buyers in both schemes), transaction costs were also incurred during negotiation to finalize the offset arrangement. Once again the design of the *EPBC* offset scheme generated comparatively higher transaction costs to buyers because the federal government had few specific guidelines about offsets or about their objectives for the region (which could guide offset proposals). Furthermore, the channels of negotiation over offsets remained vague and open through time. While finding a

potential offset supplier generated transaction costs to the VMA offset buyer, the process of negotiation was much clearer and therefore less costly.

Suppliers to both offset markets analysed also incurred transaction costs, although these were significantly less than those incurred by the developers and the policy administrators. Amongst the types of offset suppliers, transaction costs were greater for those supplying physical land-based offsets compared to those supplying service type offsets. Transaction costs were generated by two main factors. First, transaction costs were experienced in the forms of time and resources used to engage in initial negotiations with the developer about the property and what it could contribute as an offset. Second, transaction costs were experienced as time and resources to establish the covenant on the property. For some properties supplying offsets to EPBC offset buyers, the required covenant could not be established on the property, which then meant that transaction costs were incurred for no eventual benefit.

The policy administrators of both schemes also incurred transaction costs. In both cases these transaction costs occurred as time and resources to determine if impacts on the site were substitutable and therefore able to be offset; to process, negotiate and re-negotiate offset proposals by developers; and in monitoring and enforcing the offset conditions. The VMA offset administrator also noted the high costs incurred during the development of rules, particularly in the conduct of the underpinning scientific studies. However, due to the high number of potential offset trades, this was considered to be a good investment by the policy administrator.

8. Conclusions and Lessons for Other Offset Schemes

In this paper offsets are described as a form of transferable mitigation: a way of mitigating environmental impacts by transferring mitigation actions and duties to a third-party off-site provider, such that it can be conducted with least cost and greatest effectiveness. This discussion is an extension to the offsets literature. On the basis of property rights literature, especially the work of Barzel (1997), three essential elements for the effective operation of a transferable mitigation scheme such as an offset were identified: (1) property rights are defined and allocated to these goods; (2) there is value in trading the good and (3) the transaction costs of trade are sufficiently low to permit gains from trade. These essential elements can provide a way to evaluate offset schemes and provide an insight into future policy design. Barzel's (1997) essential elements were used to evaluate two Australian offset schemes and this analysis generated two principle lessons for offset policy design.

The first lesson is that clearly defined and assigned property rights have a significant impact on the cost, quantity and quality of trade. However, there are trade-offs between costs and benefits associated with defining and allocating property rights. The level to which property rights are defined and allocated should be guided by the potential number of trades and the complexity of the good being traded. If a policy-maker chooses to implement a scheme with less well-defined property rights, there are a number of supporting measures that could be established to manage the associated transaction costs. These measures include generating ways for offset buyers and sellers to quickly access accurate ecological information, supporting the emergence and use of information specialists such as brokers, and the development of a database of suppliers that is publically available to all developers.

The second lesson is that there are factors beyond property right definition that will affect the operation and outcome of the offset scheme. The EPBC offset experience demonstrated how other policies can affect the operation of an offset policy and how this can be taken into account in policy design. The evaluation of the case study offset schemes also demonstrated the impact of institutional change on policy participants. For example, VMA offset buyers noted that the benefits of clearly defined and allocated property rights were eroded by continual changes in rules. Whilst polices must be adaptive to remain relevant, supporting institutional change through actions such as consultation and gradual implementation is worth considering.

Conducting a preliminary evaluation using Barzel's (1997) essential elements also facilitates a reflection on the use of this approach as an evaluation framework. The application of Barzel's framework applied in this paper highlights that understanding property rights and scarcity can be reasonably straightforward and is essential to understanding the importance of policy design on policy performance. However, the application also revealed that there were some components of the evaluation framework that were less straightforward to apply. Conducting a quantitative evaluation of transaction costs was one such component. In our application, a complete quantitative analysis of transaction costs was too costly to conduct. It is suspected that this is likely to be the case in most offset policy evaluations. To overcome the lack of quantitative data, qualitative information about which tasks and broader factors affected transaction costs to all offset parties was used. The inclusion of qualitative transaction cost information provides a pragmatic solution to conducting this component of the framework and also demonstrated that because qualitative data provide insights into the causes behind transaction costs, this form of transaction cost information may be more useful for policy evaluation in the long run.

Finally, the analysis provided in this paper highlights two areas for future research. First, throughout this paper the lack of knowledge about the transaction costs in offset schemes is emphasized. Given that understanding transaction costs is one component of the evaluation framework, an obvious area for future research is in improving the understanding of the extent and causes of transaction costs to all parties in an offset scheme. Further research could also focus on how transaction costs in offset schemes change over time and how well qualitative transaction cost information substitutes for quantitative information within an evaluation framework such as the one presented in this paper. The second area for future research focuses on the evaluation framework as a whole. This paper reflects on the essential elements as an evaluation framework for two offset cases. With numerous offset schemes in operation or under development across the globe, the evaluation framework, and particularly the use of the essential elements as evaluation criteria could be further refined and developed by applying them in the evaluation of a greater number and variety of Australian and international offset schemes and reflecting on this experience.

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Notes

1. More information on offsets in these states is available on the Victorian Department of Sustainability and Environment (DSE) website: www.dse.vic.gov.au and the NSW Department of Environment and Climate Change (DECC) website www.environment.nsw.gov.au.
2. This includes a better understanding of the biophysical outcomes of alternative mitigation actions as well as the values held by society for those outcomes.
3. Transferability refers to possibility to change the *location* of mitigation. Tradability refers to the possibility to change the *owner* (and legal responsibility) of the mitigation requirement. The two can coincide and occur independently. Substituting the type of action such as financial mitigation is also likely to result in a location substitution.
4. While there is much literature suggesting that resources are used and managed optimally if they are private goods, others such as Schlager and Ostrom (1992) suggest that the establishment of rules and entitlements over a bundle of property rights that is not necessarily a full allocation of property rights, can result in appropriate resource management without making a good private (with a full set of property rights). To be transferable, however, as is the case with transferable mitigation, the good does need to have a fully defined suite of property rights assigned to it.
5. Australia is a federation of states. The responsibility for land-use planning and development control is largely devolved to the state and local governments (Williams, 2007). Since 1999, however, the federal government has become more involved in environmental planning and development control where matters of 'national significance' are concerned via the introduction of the *Act* (Australian Government, 1999). The *Act* works alongside and sometimes overrides state legislation.
6. Three were awaiting decisions, two had been withdrawn from assessment and one had elapsed. The numbers had not changed significantly between the time of the initial analysis and interviews in 2009 and the writing of this manuscript in 2011/12.
7. This has improved somewhat with the introduction of an amended offset policy which was released in 2012 (Australian Government Department of Sustainability Environment Water Population and Communities, 2012).
8. This process also has some significant constraints. An *EPBC Act 1999* agreement is between the Minister and the developer and is not on title. If a developer owns another property that can be supplied as a credit, this form of agreement is relatively straightforward. However, this form of agreement will be very difficult for another supplier, since that would involve an indirect relationship between federal government and the offset supplier (via the developer). This leads to problems of monitoring and compliance over the life of the offset.

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