

Nesting MBIs in current institutions and structures – can it be done and what are the implications?*

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Abstract:

Market based instruments are becoming a ‘mainstream’ policy instrument for managing a wide range of environmental issues. Despite this, there are many issues that need to be carefully considered in the design of such an instrument if an MBI is to cost effectively achieve the environmental objectives desired. One such consideration is how the MBI sits within the currently operating institutional frameworks. This paper illustrates this concept through a case study of the application of a development offset MBI to achieve desired development and enhanced ecosystem services in the Murrindindi Shire of Victoria, Australia.



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1. Introduction

A number of important ecosystem services are provided by the environmental assets in our catchments including, amongst others, provision of clean water and maintenance of biodiversity and liveable climates. Different land uses may generate alternative sets of ecosystem services. The range of land use and management options available will lead to a range of benefits and costs, some of which are priced in markets while others go unpriced. For example, agricultural produce is extensively traded in markets and hence prices are both observable and widely known. On the other hand, environmental outcomes associated with various land management choices are generally ‘externalities’ or public goods that are not traded and so their value is not observed as market prices nor captured by landholders in exchange for their provision. These may include ecosystem services such as biodiversity and ecosystem conservation, watershed protection, groundwater recharge and land salinisation, greenhouse gas sequestration and soil conservation. Because they are unpriced in a market framework, many ecosystem services are under provided.

The uses to which land is put are rapidly changing in many catchments across Australia. A key driver in the neighbourhood of Australian cities is a demand for rural residences and lifestyle farming opportunities. Whilst people demanding these housing products are quite often attracted to certain areas because of the supply of ecosystem services, the rural residential actions of these people also represents a potential threat to the supply of the very ecosystem services which they are attracted to.

Murrindindi Shire, located within easy driving distance of Melbourne, is one area where land use is being converted from relatively low intensity, extensive grazing enterprises to lifestyle farming, hobby farming and rural residential areas. The growth in rural residential land uses may change the quality and quantity of ecosystem services generated within the catchment. For example, more intensive settlement may generate increased nutrients thus reducing water quality in the Goulburn Broken Catchment.

Until recently, a regulatory “command and control” approach was common to managing the supply of a good, such as ecosystem services, that is underprovided in the market. More recently, government has become engaged in the provision of these goods through market based approaches due to the potential efficiency benefits. One approach considered appropriate to achieve Murrindindi Shire’s goals of sustainable rural residential development and enhanced ecosystem services is a development offsets market based instrument (MBI).

Whilst this approach, like many MBIs, has the potential to bring about benefits greater than those of regulation, there are many design issues that must be considered and acted upon to ensure that the MBI not only functions in terms of market operation but also functions to achieve the set environmental objectives. The first and probably the most fundamental design issue for any MBI is understanding the current institutions and structures in which the MBI has to operate with and from within.

Most MBIs, as they begin, are small so do not justify a new structure to facilitate their operation. It therefore makes political sense, and saves on resources, to design an MBI

such that it can work from within a current structure such as a local council rather than create a new structure for the MBI. The small stature of many MBIs in their beginning also means that they are most likely to deliver on objectives if they are designed to capitalise on current institutions. Working with existing institutions such as the legislative (*Planning and Environment Act 1987*) and formed process (for example zoning, permitting, development application) of rural residential development not only capitalises on current information and knowledge, reducing transaction costs but also creates a demand for the MBI.

With this in mind, and using the rural residential development in Murrindindi as a case study, two relationships between current institutions and structures and a development offset MBI are explored. First, whether the current institutions and structures for rural residential development of the Murrindindi Shire can accommodate and provide the institutional context for a development offsets MBI. Secondly, if by “nesting” with current institutions and structures the transaction costs of designing and implementing the development offsets MBI are reduced.

The paper is presented in seven sections. A profile of the Murrindindi Shire and rural residential development is discussed in section two. The third section describes the function of ecosystem services in the Goulburn Broken catchment and Murrindindi Shire and provides insight into the ecosystem services demanded by rural residential development. Section three also provides some discussion on the impact of rural residential development on the production of ecosystem services. The conceptual framework, discussing why ecosystem services are underprovided in the current market is developed in section four. Section four also describes the concepts of nesting and transaction costs as these relate to an MBI. A description of development offsets and the key design issues associated with this MBI is outlined in section five. The discussion of current institutions and frameworks in which rural residential development currently occurs in Victoria allows an assessment of the potential to nest in section five. Finally, section six discusses the implications of nesting on the transaction costs associated with the implementation and operation of the MBI. Conclusions are provided in section seven.

2. Background

2.1 The Murrindindi Shire

The Murrindindi Shire is located on the north fall of the eastern section of the Victorian Highlands. With the exception of a small area south of Kinglake, the entire of the Murrindindi Shire’s area of 3,887 square km’s is located in the foothills of the Upper Goulburn section of the Goulburn Broken Catchment (GBC) (Figure 1 and Figure 2) (Habitat Planning, 2003; GBCMA).

Figure 1: Map of the Goulburn Broken Catchment



Source: GBCMA

Figure 2: Map of Murrindindi Shire

2.2 Rural residential development

Rural residential development is described by the Murrindindi Shire Council (Habitat Planning, 2003) as that catering for persons seeking a rural lifestyle based on a high level of rural amenity that may or may not involve agricultural activity. The Murrindindi Shire Council highlights that rural development is occurring in the Shire due to the attractiveness of the natural beauty associated with the sub alpine and water features of the Shire (Habitat Planning, 2003). Demand for rural residential living is reported to have increased towards the end of the last century as improvements in transport and communications overcame the isolation of living in rural areas (Habitat Planning, 2003; CSIRO, 2001).

The urbanisation of rural landscapes commonly occurs in three different forms: rural residential development, hobby farms, and rural retreats. Key to the impact of the rural residential development on surrounding properties and the environment is the spatial distribution of each land use (Archer, 1977).

Rural residential developments tend to be clustered together and fringe existing urban centres (Sinclair, 2001). Property sizes generally range between 0.4 and 2 hectares. Proximity to existing urban centres allows residents to commute to employment and therefore they generally have no productive requirement for the land they occupy other than to support some stock for recreational use. Development in the Murrindindi Shire is categorised rural residential for both small (0.4 – 2 hectare) and larger blocks ranging from 4, to 20 and 40 hectares¹.

Hobby farms require larger parcels of land for their operation in order for the economics of producing livestock or grain to provide reasonable contributions to family income. However, there will often be off-farm sources of income that support the hobby farm operation. The desire to generate produce either using traditional or novel agricultural methods tends to focus hobby farms on areas of higher productivity. To some degree this offsets the need for a larger property.

Rural retreats tend to be located more distant to urban centres and often on less productive land. Such retreats might be used for weekend recreation (Victorian Department of Agriculture, 1991) or retirement. Proximity to employment and services is of less concern to these residents. Consequently these developments are often co-located with large publicly owned remnants of native vegetation that have been left on the higher more unproductive parts of the landscape. This co-location with public native vegetation (Nelson, 1992; Beatley, 1994; Power, 1996) and remoteness from urban areas (Sengupta and Osgood, 2003) is likely to enhance the aesthetic and commercial value of such properties, as often residents are seeking greater connection with the natural environment. This differs in emphasis from rural residential developments where the residents desire the benefits of rural society.

The difference in purpose between each type of rural subdivision influences the placement of the developments within the landscape, the productive potential and

¹ Rural residential development is used more formally in the State planning literature to describe land zoned both low density rural zone and rural living zone (RLZ). The minimum subdivision area of these zones is 0.4ha and 8 ha respectively (Habitat Planning 2003:5). Yea and Alexandra have recently been rezoned to allow a second level to the RLZ with a minimum subdivision area of 20ha (amendment C14 DSE). The rural use zone (RUZ) has a minimum subdivision size of 40ha.

resilience of the land being used, the intensity of land management activities and also the relative dispersal of impacts across the landscape. Institutions designed to offset the negative impacts of rural subdivision need to take both the spatial and management differences between each type of subdivision into account when evaluating the offset methods used.

2.3 Rural residential development in the Murrindindi Shire

The Murrindindi Shire contains two service towns to the agriculture and timber industries of Alexandra and Yea. The smaller townships in the Shire include Narbethong, Buxton, Taggerty, Thornton, Flowerdale, Yarck, Hazeldene, King Parrot, Taylor Bay, Toolangi, Murrindindi, Eildon and Molesworth (Habitat Planning, 2003).

At the 2001 Census, the enumerated population (those that were in the Shire on census night) of the Murrindindi Shire was 13,109 persons, an increase in population of 657 from 12,452 in the previous Census of 1996 (Municipal Strategic Statement (MSS), 1999). In 2001 the Victorian Department of Sustainability and Environment (DSE) projected that population of the Murrindindi Shire would increase to 13,882 by the year 2021 (Habitat Planning, 2003). The DSE's projection saw an increase in population of 34 additional people per year.

In 2001 there were 4,787 dwellings recorded for the Murrindindi Shire (Habitat Planning, 2003). Over the same period the DSE projected that the total number of households in the Shire would increase to 7,915. Housing demand is projected to increase at a rate of about 60% per year (Habitat Planning, 2003). Table 1 demonstrates the number of new dwellings in Murrindindi between 1990 and 1997. The Murrindindi Shire Council also reports that it is now receiving around 400 permits for development each year. Two thirds or just over 250 of these applications are to develop rural land (Pers Comm Matt Parsons, Murrindindi Shire Council, November 2004)².

Table 1: New Dwellings in the Murrindindi Shire 1990 - 1997

	Alexandra	Yea	Marysville	Eildon	Kinglake	Total
1990	25	7	10	8	22	72
1991	13	6	11	11	20	61
1992	15	5	6	4	20	50
1993	12	5	6	11	14	49
1994	9	6	4	9	12	40
1995	4	6	2	5	9	26
1996	9	9	4	4	12	38
1997	12	4	4	6	11	35
Total	101	45	47	58	120	371

Source: Murrindindi Municipal Strategic Statement 2003 (DSE)

2.4 Impacts of rural residential development

Rural residential development impacting on surrounding lands is not a new issue (see The Australian Industry Commission, 1998; Victorian Department of Agriculture, 1991; and Archer, 1977). The Murrindindi Shire has been aware of the potential rural residential development pressures in the region for some time. During the preparation of the Murrindindi Planning Scheme in 1996, the market demands for rural residential

² Most of these applications are to subdivide land for future dwelling development not for actual dwellings.

were identified and documented in the Local Planning Policy Framework (Habitat Planning, 2003).

The Murrindindi Shire is well aware that there are many costs and benefits associated with rural residential development. Some of these costs and benefits as identified by Habitat Planning (2003) are listed in Figure 3.

Figure 3: Costs and benefits of rural residential development

Costs	Benefits
<ul style="list-style-type: none"> • Loss of agricultural land • Conflict with operational commercial farms • Poor land management • Increased risk of hazards due to higher density populations • Increase in property value may prohibit the expansion of commercial farms 	<ul style="list-style-type: none"> • Increased income in the local community • Degraded land rehabilitated • Revegetation of cleared land • Pest and weed control • Increased development opportunities of large commercial landholders • Enhanced property security from higher population density • Strengthen local community spirit and facilities

Despite established concerns about the negative impacts of rural subdivision, there is a surprising lack of published Australian research on this subject. Most of the literature that addresses this issue is drawn from the shrub and forest communities of North America. Here, over 1 million hectares of broad scale grazing land has been subdivided between 1982 and 1992 (Knight, 1999).

There are several plausible mechanisms for rural subdivision to impact directly on native plants and animals. These include: vegetation clearing; predation by domestic pets; decline in species viability due to fragmentation of habitat; behavioural change in response to human activity; and road kill. In general, the literature does not directly relate human impact to outcome. Instead, in discussing the impact of rural residential development on the environment, the impact on biodiversity is discussed in relation to the location, density and infrastructure of development and the potential impact of these on the environment.

2.4.1 Impacts on fauna

The first impact of rural residential development on the environment is the location of the development in proximity to the previously unaffected environments. For example in shrubby woodland vegetation in California some bird species are more likely to be found close to human development than other bird species which tend to cluster away from humans (Odell & Knight, 2001). Further, residential development also commonly attracts bird species that prey on other birds or that are nest parasites (Hansen *et al*, 2002). Odell and Knight (2001) found a similar effect for mammals with domestic pets such as dogs and cats in higher abundance close to human development and red foxes and coyotes more abundant away from humans.

In contrast, the relative density of human development does not appear to impact on either avian and mammal communities. Odell and Knight (2001) found no difference in the relative abundance of either birds or mammals with regard to different densities of development³. However, there were significant differences between areas of development and non-development.

The combined relationships of proximity to development and density of development suggest that rural subdivision would have the least negative impact on native biota if they were concentrated in high density clusters leaving larger areas of rural land where development does not occur.

2.4.2 Impacts on flora

The impact of development on plant communities will depend on what the land was used for prior to development and the intensity of this use. Because the temperate grazing systems of eastern Australia generally have high stocking rates, native species diversity in the ground vegetation layer can in fact increase with rural residential development (Maetas *et al*, 2003; Mack *et al*, 2000; Tyser and Worley, 1992).

In the past, disposal of sewage waste has been a major issue in rural residential developments in North America. Like Australia, in the USA (LaGro Jnr., 1996) much of the residential development has occurred along river and lake shores, coastal areas or in proximity to ecosystems of significant aesthetic and conservation value. The consequential potential for significant contamination of ground and river water systems is large.

The issue in the USA is not individual occurrences of septic sewage systems. Experience from New Mexico (Perkins & Hanson, 1990) indicates that groundwater quality degradation by septic sewage systems results from the collective impact of all discharges in a community or subdivision. From this perspective dispersal of rural residential development should be favoured as a means of diffusing contamination of ground water systems. However, while this would provide reductions in sewage impacts it has the potential to increase the biodiversity impacts discussed in previous paragraphs.

Whilst nutrient runoff is more widely studied in Australia, few studies could be found that provided a comparison of nutrient runoff between rural subdivisions and agricultural land uses. In two local studies (DeRose *et al*, 2002 & 2003) nitrogen runoff was found to be 40-60% higher for rural residential areas than for grazed areas. In the Goulburn Broken (DeRose *et al*, 2003) similar increases were found in comparison to cropping, whereas in the semi-tropical regions cropping produced more than 200% greater nitrogen loads than did residential development (DeRose *et al*, 2002). In both studies phosphorous loads were equal or less in residential areas compared with land used for agricultural. While nitrogen loads from rural residential land use was higher than from cropping and grazing in the Goulburn Broken, both are significantly lower than the nitrogen loads exported from urban areas and irrigated crops and pasture.

³ Rural residential development can further impact on fauna through increased road use and therefore road kill. This issue is not discussed here.

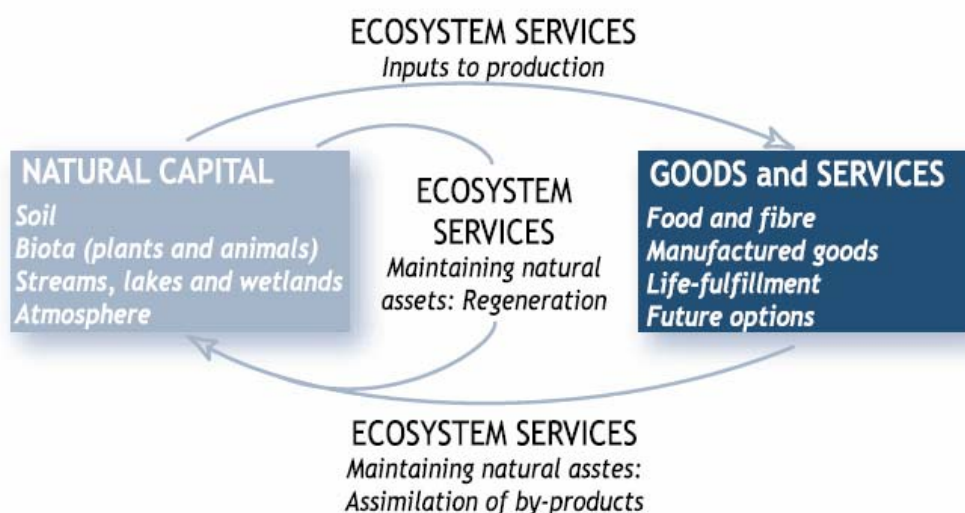
Impacts from rural residential development, however, are not all bad. One of the more commonly acknowledged positive impacts of rural residential development such as hobby farmers and rural retreatists is their capacity to bring external funds into their properties. The Australian Industry Commission (1998) quoted from a submission by the South Australian Farmers Federation that *“this type of land use had also been associated with increased capital investment and can often sustain higher levels of production”*. They also quoted from a submission by Environment Australia that says *“because of their off-farm income, hobby farmers often could afford to retain native vegetation and biodiversity and are more likely to enter into conservation agreements”*.

3. Ecosystem services and rural residential development in the GBC and Murrindindi Shire

3.1 What are ecosystem services?

Ecosystems provide many services from which humans benefit (Figure 4). Ecosystem services are the transformation of a set of natural assets or natural capital such as soil, biota, air and water into things that we value.

Figure 4: What are ecosystem services?



Source: CSIRO (2001)

Some examples of ecosystem services provided by natural assets include (CSIRO, 2001):

- Provision of clean water
- Maintenance of liveable climates and atmospheres
- Pollination of crops and native vegetation
- Control of species that could become pests
- Fulfilment of intellectual, cultural and spiritual needs

Knowledge of ecosystem services and their importance is growing. Despite this, it is already well known that the maintenance of ecosystem services has potentially large economic, social and ecological benefits (CSIRO, 2001).

3.2 Ecosystem services in the GBC and Murrindindi Shire

In 2001, CSIRO Sustainable Ecosystems economists and scientists along with catchment stakeholders conducted an analysis of the ecological, social and economic processes that currently affect ecosystem service provision inside and outside the GBC. This study assessed the major land uses in the GBC and listed the key ecosystem services required to maintain the land use. Rankings were determined based on the ecosystem service input to production⁴ and the impact of the land use on the capacity of the asset to produce the ecosystem service (CSIRO, 2001).

Housing was one of the main 'production' activities identified by the CSIRO (2001) for the foothills of the GBC, the area in which the Murrindindi Shire is located. Figure 5 lists the main ecosystem services required for the production of housing along with potentially degrading processes for these ecosystem services as identified by Archer (1977), Victorian Department of Agriculture (1991) and Sinclair (2001) and discussed previously.

The description of the ecosystem services for the production of housing in the Goulburn Broken catchment are as follows (CSIRO 2001):

- Life fulfilment is the provision of aesthetic beauty, cultural, intellectual and spiritual inspiration, a sense of place, existence value, scientific discovery and serenity.
- Maintenance and regeneration of habitat is the service of maintaining the biota through processes of regeneration, the maintenance of viable populations of fauna and flora and the management of vegetation to facilitate production, dispersal and growth of seed.
- Provision of shade and shelter is the service provided by vegetation that ameliorates extremes in weather and climate at a paddock scale for plants, animals and structures.
- Waste absorption and breakdown captures the roles played by various organisms in absorbing and breaking down waste.

⁴ Combined weighting of the value of the value of goods associated with each land use/industry and the importance of the ecosystem service in producing the goods (CSIRO, 2001).

Figure 5: Housing, ecosystem services and degrading processes

Highly ranked ecosystem services for housing	Degrading Processes							
	vegetation clearing	effluent disposal	domestic pets	increased bushfire risk	surface water harvest	human pressures on public lands	nutrient runoff	reduction of aesthetic values
Life fulfilment	√	√	√	√		√		√
Maintenance and regeneration of habitat	√			√		√		
Provision of shade and shelter	√	√						
Waste absorption and breakdown (Phosphorous and Nitrogen)	√	√		√	√		√	

Source: CSIRO, 2001

Archer (1977), Victorian Department of Agriculture (1991) and Sinclair (2001)

To assess the importance of the ecosystem service on the land use and the land use to the maintenance of the ecosystem service the CSIRO (2001) study ranked the functions of the ecosystem services against the inputs to production and the maintenance of the ecosystem service. Inputs to production highlighted the overall importance of the ecosystem service to production whilst the maintenance criteria demonstrated the impact of the land use on the capacity to maintain the ecosystem service. For housing, regeneration of habitat and the provision of shade and shelter were ranked medium and high ecosystem services as inputs to the production of housing. The production of housing was recorded to have a high impact on the production of natural assets that generated life fulfilment, maintenance and regeneration of natural habitat and waste absorption and breakdown ecosystem services. Issues for ecosystem services and housing and management of these are listed in Figure 6.

Figure 6: Ecosystem service issues for housing

Ecosystem Service	Issues	Cause of Issue	Management Actions
Life fulfilment	Subdivision and housing development are having an impact on views and vegetation	Poor planning	Opportunity to capture improved land management as land changes ownership through planning and subdivision process
Maintenance and regeneration of habitat	Decline in health of native vegetation	Grazing pressure and impact of pests and weeds within remnant vegetation are leading to a decline of remnant vegetation with associated aesthetic impacts	Fencing and active ongoing management to control pressures. Protect and enhance remnants through reveg by natural regeneration, direct seeding and planting
Provision of shade and shelter	Impact of wind and exposure on temperature regulation in houses	Loss of vegetation to provide shade and shelter	Planning to include trees for shade and shelter
Waste absorption and break down	Housing produces significant organic wastes that require treatment through town sewerage and septic	Some septic leak. Organic waste in waterways	Best practice waste management systems. Buffer strips to cope with leakage.

Source: CSIRO, 2001

Whilst rural residential development such as housing consumes a number of ecosystem services in its production, rural residential development also impacts on a number of ecosystem services. Some of these are used in the production of further housing but some are used downstream in the production of other completely separate goods. To achieve goals of sustainable development, the Murrindindi Shire must seek to achieve rural residential development at the same time as sustaining ecosystem services for this development as well as for other downstream ecosystem service users. The remainder of the paper focuses on ways to achieve the sustainable and potentially enhanced provision of ecosystem services in the Murrindindi Shire.

4. Conceptual Framework

4.1 Missing property rights and ecosystem services

The basic underlying cause of an under supply of environmental goods such as ecosystem services is a case of markets failing to send signals to firms and individuals who are either having a detrimental impact on the environment or able to provide a demanded level of environmental service (Van Bueren, 2001).

One of the key reasons for market failure is the lack of fully defined property rights (Van Bueren, 2001; Salzman *et al*, 2004). Well defined property rights provide access security, defensibility of ownership and transferability of access and use. The literature suggests that property rights are well defined if they are adequately configured in three dimensions (Van Bueren, 2001):

1. that they are clearly defined so as to reside with a specific person or entity;

2. easily defended against non owners who might wish to steal the entitlement; and
3. fully transferable by the owner to others on whatever terms are mutually satisfactory to buyer and seller. Divisibility is often a key attribute in transferability

Murtough *et al.* (2002) highlights a number of property right characteristics that are essential for market operation (Figure 7). For many private goods such as a car or a house these characteristics are present and therefore exchange can occur, but this is often not the case for goods such as environmental services.

Figure 7: Property right characteristics for creating markets

Property right characteristic	Description
1. Clearly defined	Nature and extent of the property right is unambiguous
2. Verifiable	Use of the property right can be measured at reasonable cost
3. Enforceable	Ownership of the property right can be enforced at reasonable cost
4. Valuable	There are parties who are willing to purchase the property right.
5. Transferable	Ownership of the property right can be transferred to another party at reasonable cost.
6. Low scientific uncertainty *	Use of the property right has a clear relationship with cause and effect.
7. Low sovereign risk *	Future government decisions are unlikely to significantly reduce the property right's value.

* Low in the sense that it does not prevent a market from forming. Moderate levels of risk and uncertainty are not necessarily insurmountable barriers to the operation of a market.

Source: Murtough *et al.* (2003)

4.2 Policy Options

Governments have typically responded to the under provision of an environmental service through a regulatory response. This commonly involves setting minimum performance standards or stipulating 'best practice' technologies for cleaner production. Recently, the command and control approach has been criticised because it typically does not provide firms with any financial incentive that may encourage them to be innovative or efficient, nor to make improvements beyond the minimum standard. Further, this approach does not provide any opportunity for firms who may find it costly to meet their minimum standard to "offload" onto other firms that find it cheaper⁵. It has also been suggested that this approach could in fact provide a disincentive for firms to adopt greater than the minimum standard technology for fear that the minimum standard of compliance could rise (Van Bueren, 2001; Hockenstein *et al.*, 1997).

Anderson (2004) is critical of the command and control Pigouvian approach to the provision of public goods such as ecosystem services. Anderson argues that by specifying who should be taxed or compensated, this approach assumes a set of

⁵ Because of its rigidity, the command and control approach, whilst seeking to avoid and minimise impacts on site, does not have the ability to reduce residual impacts. These residual impacts are as important as the direct impacts and are often more difficult to capture on site.

property rights and works from this assumed allocation of rights. Instead, Anderson suggests that a better approach is investigating the reason for the market failure in the first place and therefore understanding and rectifying the lack of fully specified, transferable and enforceable property rights. MBIs are intended to do just this.

MBIs are policy tools that seek to encourage certain behaviours through market signals rather than through explicit directives (Stavins, 2000). By understanding and rectifying uncertainties associated with property rights along the lines of Coase (1960), MBIs 'harness market forces' to redefine the agenda of firms and individuals such that improved environmental outcomes such as the provision of ecosystem services are in their own best interest. There is growing interest in MBIs as they can often deliver equivalent outcomes to 'command and control' regulatory approaches at lower cost (Collins, 2004a; Van Bueren, 2001).

Despite the potential advantages of the market based approach, there are a number of factors that can potentially adversely affect the performance of such an instrument. Hockenstein *et al* (1997) argues that one of these factors is the transaction costs involved in implementing the instrument. This is particularly the case when property rights are not pre-existing, as is often the case for goods such as ecosystem services.

4.3 Property rights, transaction costs and the supply of ecosystem services

The allocation of property rights facilitates the basis of exchange in markets. Coase (1960) argues that if there were no costs of exchange, the final outcome of exchange is not dependent on the initial ownership of property rights and full information will be revealed through trades. In most cases, however, the assumption of no costs of exchange is not reasonable; transaction costs are prevalent in market institutions (Williamson, 1985; 1988).

Transaction costs are the costs of coordinating people in the market. These costs arise because of uncertainty in the market place. To address uncertainty, operators have to find and test knowledge through actions such as finding contract partners, gaining knowledge of materials and production, negotiating and concluding contracts and monitoring and enforcing non fulfilment of contracts (Kasper, 1998). Human interaction of any form inevitably leads to transaction costs (Kasper, 1998). But where transaction costs are too high as a result of high uncertainty, such as the case when property rights are not fully defined as for ecosystem services, the quantity and quality of interactions will be reduced. For ecosystem services, these interactions are often reduced to zero.

MBIs seek to reduce these costs enough such that exchange can occur. In doing this, the MBI itself incurs transaction costs. Transaction costs incurred in the MBI can be defined as those incurred in the definition and allocation of property rights (these only occur when a market has not previously existed). These transaction costs are associated with codifying property rights and identifying and enforcing ownership over property rights. Secondly, transaction costs are incurred in the general operation of the market regardless of the level of pre-existing property rights. These transaction costs are associated with the actions of:

- seeking out buyers and sellers of property rights;
- negotiating a sale;

- measuring quality and quantity of goods; and
- contracting specifications about the transfer of property rights.

Transaction costs associated with the MBI can be categorised as either institutional or bureaucratic. Institutional transaction costs are described by Whitten *et al* (2003) as those associated with the gathering of information, defining property right frameworks and designing exchange institutions or rules. Institutional transaction costs are those associated with establishing and trading property rights. Bureaucratic transaction costs are those associated with the setting up of structures to manage and monitor the market exchange.

Both institutional and bureaucratic transaction costs can be incurred as fixed costs at the start of the MBI or incurred in the day to day running of the MBI (ongoing or variable). These costs may also be incurred publicly by the organisation responsible for the management of the market approach (the institution) or privately by landholders engaged in the market approach. A summary of these costs is provided in Figure 8.

Figure 8: Transaction costs associated with the establishment of MBIs

	Public		Private	
	Transaction Cost	Definition of TC	Transaction Cost	Definition of TC
Fixed	Design information	Defining the scale and the scope of the problem to be addressed and gathering and analysing information about potential policy	Information /learning	Cost of additional information beyond compliance with policy
	Enactment	Cost of legislation including dead weight cost of lobbying	Infrastructure/ set up	Essential equipment to be engaged in new institution (eg computer or web account for on line trading)
	Implementation/set up costs	Regulatory design and development of agency structures and protocols required for administrating the policy		
Ongoing /variable	Administration	Negotiation, contracting and transfer costs	Negotiation	Contracting etc
	Monitoring	effectiveness and evaluation of policy	Detection and protection	Monitoring and enforcement costs of claiming, codifying or defending rights
	Prosecution	Enforcement	Fees and charges	market involvement

Source: Whitten, S.M and Bennett, J (2005)

4.3 Institutional and Structural “Nesting”

Institutions are the rules, often legislated, of human conduct whose violations incur sanctions. Institutions define the framework in which social interaction occurs

(Kasper, 1998). Institutions as they relate to rural residential development include such processes as planning and environmental legislation, development permits and zoning. Structures are the organisations that develop, manage and administer the institutions. In the rural residential framework, structures are the local council, catchment management authority (CMA), State and Federal Government.

Nesting in this paper refers to the ability of an MBI to operate within the current structures and with the current institutions that these structures manage. Nesting within current structures allows the MBI to use current norms in operation, information dissemination, monitoring and enforcement. Nesting in current institutions also gives legislative weight to the MBI. Finally, nesting reduces the political costs inherent in the adoption of new mechanisms. It makes sense to nest an MBI into current structures rather than create a new structure for the MBI.

Nesting is also important in the first steps of an MBI as it has the potential to significantly reduce a number of MBI transaction costs. Whilst there will still be some transaction costs such as defining or refining property rights in MBI design, nesting could potentially reduce the transaction costs associated with the enactment, implementation, administration, monitoring and enforcement for the public sector. Private transaction costs of knowledge and learning could also be reduced through nesting (see figure 8 for transaction cost categories). Whilst nesting has the potential to reduce costs and increase the speed of uptake, it is important to understand the structures and institutions in which an MBI may nest. If current institutions and structures present with weaknesses that could be detrimental to the operation of the MBI⁶ a different approach should be taken.

Using the rural residential development and sustainable ecosystem service provision problem in Murrindindi Shire as a case study, the remainder of the paper assesses two things:

1. If a development offsets MBI can be accommodated and therefore “nested” in the current institutions and structures of the Murrindindi rural residential planning system; and
2. If nesting reduces institutional and bureaucratic transaction costs incurred in the implementation of the MBI.

5. Can Development offsets “nest” with current institutions and structures?

5.1 What are development offsets?

Development offsets are a quantity based MBI which seek to create a property right for environmental goods such that if the good is to be damaged in a private action, the damage needs to be offset either on or off site such that no net loss or even a net gain of this good is achieved (Morrison, 2004). By requiring developers to offset impacts, the development offset creates a market for the production of these environmental assets. By assigning property rights for the maintenance and creation of these goods, development offsets reduce uncertainty in the market place. Development offsets also

⁶ For example, if current frameworks do not reflect the full economic value which the MBI aims to capture.

allow developers to increase their operating flexibility and potentially lower operating costs.

Offset trading can be a cost-effective solution to environmental problems arising from new developments. Offsets allow one party, facing relatively high ecosystem service provision costs to compensate another party with lower costs to provide these. With the flexibility offered through an offset mechanisms, new development can proceed without imposing net environmental degradation (Collins 2004b:2).

5.2 How do we know if it will nest?

To gain an understanding of the potential to nest this MBI, the design issues associated with the MBI must first be considered. Once we know what is required in the development offset development and implementation, this can be assessed in comparison with the current institutions and structures. If the current institutions and structures facilitate the design of the MBI, the MBI can be nested.

5.2.1 Development offset design issues

Collins (2004b) outlined a number of design issues that must be thought through in a development offsets MBI. Design issues are listed in Figure 9.

Figure 9: Design issues for a development offsets scheme

	Process	Activities
1	Information for the design of the development offset	<ul style="list-style-type: none"> Identifying who will demand offsets, where demand will start (ie above what level of duty of care) and how will demand be created What and where is the supply of offsets What currency will be used? How to manage equivalencies in exchange and difference in time, space or type in exchange Are there issues of irreversibility
2	Establishing market infrastructure	
2a	Creating the offset – how to know what offset to create and that it has been created	<ul style="list-style-type: none"> Rules (such as metrics) to inform what offsets can be created and traded for what purpose Verification process to ensure the proposed offset is commensurate with landscape change Ongoing monitoring and enforcement to ensure that offsets are undertaken at the required level and then maintained
2b	Offset trading – who can buy and sell and how does exchange occur for environmental objective	<ul style="list-style-type: none"> Who can own offsets – can they be on and off site? Trading ratio – determining the number of offset credits required for trades
2c	Offset use	<ul style="list-style-type: none"> Is banking and borrowing allowed? Approval process such as site inspections and development submissions to ensure offset is in line with public values. Monitoring and enforcement for offset failure
3	Administering the offset scheme	<ul style="list-style-type: none"> Tracking offset requirements and trades, Verifying offset generation, Auditing and enforcing, Assessing and reviewing the scheme in comparison with alternative policy.

5.2.2 Current institutions and structures to manage rural residential development

Local government in Victoria have been granted relatively broad powers in relation to environmental control, protection and conservation. In relation to planning, local government are responsible for developing and enforcing planning schemes for areas within their jurisdiction. Local government planning schemes generally sets out policies and requirements for the use, development and protection of land.

Local government planning schemes must, however, follow the structure of the Victorian Planning Provisions which include the State and Local Planning Policy Frameworks as well as zone and overlay provisions (Cripps *et al* 1999). Because of the integrated nature of planning the discussion of current frameworks commences at a State level and works down to the local level. The layers of planning as they relate to rural residential development management are summarised visually in Figure 11.

5.2.2.1 State Structures and Institutions

The State Planning Policy Frameworks (SPPF)

The State Planning Policy Frameworks (SPPF) provides a context for spatial planning and decision making by all planning authorities across Victoria. The SPPF seeks to ensure that the objectives of planning in Victoria, as set out by the *Planning and Environment Act (1987)* and *Ministerial Direction Number 6 (amended 1997)* are fostered through appropriate policies and consistent across the State. The SPPF specifies provisions as they relate to settlement, environment, management of resources, infrastructure, economic well being, social needs and regional cooperation. The SPPF also specifies how national and regional agreements and strategies should be met in local planning.

There are a number of clauses within the SPPF that are particularly relevant to rural residential planning and development for the Murrindindi Shire. These particularly relate to protection of catchments and waterways, protection from wildfire, conservation of native flora and fauna and principles of zoning for rural living and rural residential development (Habitat Planning, 2003; DSE).

Victoria's Native Vegetation Management Framework – A Framework for Action
Victoria's Native Vegetation Management – A Framework for Action (the framework) (DSE, 2002) establishes the strategic direction for the protection, enhancement and revegetation of native vegetation across the state. The Framework addresses native vegetation management from a whole catchment perspective but focuses primarily on private land and aims to generate a net gain in native vegetation for Victoria. The Framework specifies that all development planning must demonstrate avoid, minimise and only then offset any damage to vegetation. Criteria for offsetting are such to encourage avoiding and minimising impact on native vegetation.

Significantly, the Framework establishes descriptions for the measurement of different vegetation classes and land types and establishes some principles for achieving equivalencies between vegetation offset type, location and age. The Framework also provides guidance on offsetting to achieve different ecosystem service outcomes such as waterway protection, salinity control and soil conservation

(DSE, 2002). The DSE is also developing a brokering program to facilitate the trading of biodiversity credits and debits (Pers Comm Fiona McCallum, DSE, Benalla). This program could potentially facilitate an offsets scheme.

5.2.2.2 Local and Regional Structures and Institutions

The Goulburn Broken Regional Catchment Strategy (RCS)

The Goulburn Broken regional catchment strategy (RCS) is a blueprint for integrated natural resource management across the region. The RCS identifies threats, actions and priority targets for the catchments natural assets. These targets are for water, land, land use, biodiversity and climate change. Targets and objectives identified in the RCS guide planning in the Murrindindi Shire and inform and direct policy such as development offsets (eg location and type) in the Shire.

Local Planning Policy Framework (LPPF)

Sitting under the SPPF is the Local Planning Policy Framework (LPPF). This framework includes a Municipal Strategic Statement (MSS) and an operation of local planning policies (LPP). The MSS is a statement of key strategic planning, land use and development objectives within the municipal and the strategies to achieve these. The Murrindindi Planning Scheme sits under the MSS and specifies key local planning policies whilst the LPP states responsibilities within the Shire for these strategies (DSE). Key local policies related to rural residential development include preferred subdivision lot sizes as well as specifications on lot design and house siting.

Zoning

Significant to achieving the goals set in the MSS is land zoning. Zones specify the uses of the land that do and do not require a permit and uses that are prohibited. Murrindindi has recently conducted a review of zones to facilitate sustainable rural residential development. Until recently, whilst demand for rural residential blocks was high, zoning did not always allow for subdivision. Zones and specifications for Murrindindi Shire are listed in Figure 10.

Figure 10: Land zones and specifications for Murrindindi Shire

Zone	Specification related to rural residential development
Low density residential zone	Requirements for sewerage and potable water. Permit required for subdivision – each lot must be greater than 0.4ha
Rural Zone	Dwellings allowed but rules for all weather road, sewerage, potable water and electricity. Permit required for subdivision with lots must be greater than 40ha.
Environmental rural zone	Applicable in Lake Eildon - Min subdivision area 5ha. Authority must consider environmental and aesthetic impacts
Rural living zone	Permit required for subdivision – minimum subdivision size is 8ha (6ha in Buxton and 4ha in Alexandra). Authority must consider environmental and aesthetic impacts. Recent amendments have seen a second RLZ available near Alexandra and Yea where minimum subdivision is 20ha (1).
Farming zone	Permit required for subdivision. Minimum subdivision size is 40ha. Permits given after consideration of environmental, agricultural and aesthetic issues.

Source: DSE

(1) Source: C14 amendment to the LPPF, Murrindindi Shire Council 2004. Not yet finalised.

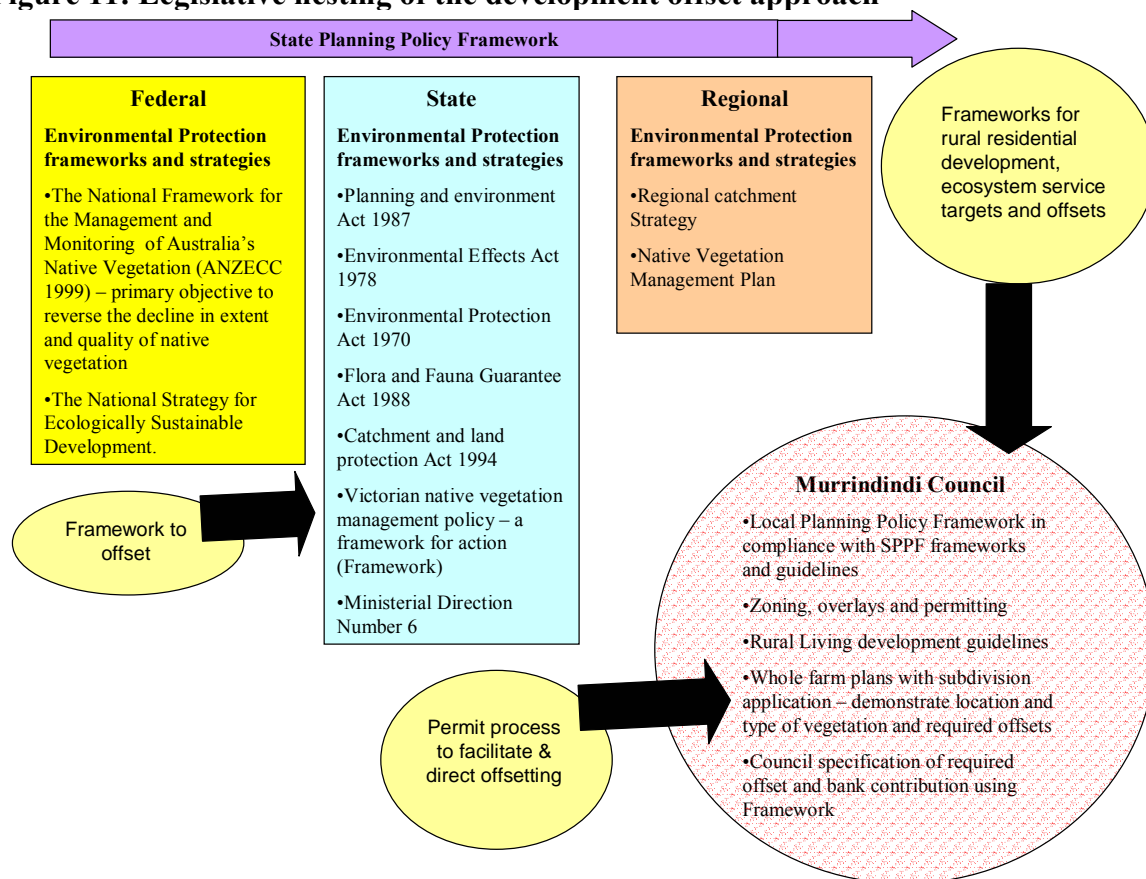
Within the zones are planning overlays to protect specific attributes of the land. Overlays might only be applicable in certain geographical areas within a zone and

may restrict the development type or require specific actions to protect high quality agricultural or environmental features (Habitat Planning, 2003).

Rural Living Guidelines

The rural living guidelines (RLG) (Murrindindi Shire Council, 2004) for the Murrindindi Shire are a recent initiative to integrate the layers of legislation and inform landholders regarding what is required in rural residential development. Integrating the SPPF and LPPF, the guidelines require a whole farm plan to be developed for all subdivisions. Whole farm plans require the documentation of site features and constraints, impacts on adjoining land and net environmental gains. The RLG's and whole farm planning facilitate and manage the implementation of the Framework's native vegetation policies of avoid, minimise and offset. The RLG's also direct what offsets need to be undertaken for the proposed development. The actions under the guidelines may also facilitate developer contribution to an offset bank to offset any additional impacts of development (eg water quality).

Figure 11: Legislative nesting of the development offset approach



5.2.3 Matching the two up - can development offsets be nested in current institutions and structures?

This section of the paper compares the key design issues associated with a development offsets approach with the current institutions and structures to assess whether the MBI can be nested (Figure 12).

Figure 12: Can the MBI be nested?

	Design Issue	Current institutions and structures
1	Information for the design of the development offset	<ul style="list-style-type: none"> • Demand for offsets through legislation such as the Framework, SPPF, RCS and LPPF. • Knowledge of demand through local research into number of submissions for rezoning and development applications • Supply of offsets guided by the Framework guidance on type of offset for type of vegetation and landscape disturbed. The Framework essentially establishes an exchange rate and a level of duty of care • Location of supply guided by local government land type studies • Irreversibility's managed through zoning and permit assessment process
2	Establishing market infrastructure	
2a	Creating the offset – how to know what offset to create and that it has been created	<ul style="list-style-type: none"> • The Framework as a part of the SPPF available to guide offset type required for vegetation and landscape type disturbed and the type, location and timing of offset • Unknown how to manage offsetting of impacts to non native vegetation ecosystem service impacts • Established permitting system and whole farm planning provides the structure to verify offset creation prior to development proceeding. Structure can also provide the ongoing monitoring of the creation of the offset.
2b	Offset trading – who can buy and sell and how does exchange occur for environmental objective	<ul style="list-style-type: none"> • The Framework establishes both the ability to offset on or off site and the units of exchange to facilitate trade. The exchange rates in the Framework are primarily in place to encourage offsets in high conservation significance areas such as riparian zones or salinity recharge areas • Development applications must develop a whole farm plan showing development and vegetation etc. The whole farm plans can facilitate offsets on site or be used to indicate offsite offsetting. • Council is considering a vegetation bank to facilitate additional offset contributions • DSE is developing a biodiversity credit on line trading facility
2c	Offset use	<ul style="list-style-type: none"> • Structure could also facilitate banking but unlikely that borrowing can occur due to permit compliance process • Current permitting system will be used to assess type , management and monitoring of the offset. Development can not be sold until compliance with required offsets is established
3	Administering the offset scheme	<ul style="list-style-type: none"> • Current structure such as local council planning available to undertake ongoing administration. Structure may require additional resources to undertake successfully.

From the match up (Figure 12) it can be concluded that whilst structures may need additional resources such as staff and expertise the structures and institutions are largely in place to take on a part of their required resource management through development offsets. Further, initiatives such as BushBroker, currently being developed by the Victorian State Government could further facilitate more advanced offsetting institutions⁷ and reduce some of the pressures on current structures to

⁷ Potential future online vegetation bank managed by the DSE which allows private landholders to either buy or sell vegetation plots for offsetting purposes.

facilitate offsetting. However, with any offsetting initiative, the offsets need to be managed, monitored and enforced over the long term to ensure that they achieve the environmental objectives set. Anecdotal evidence suggests that resources in this area are already inadequate under current institutions and current structure will find 'policing' of future offsets difficult (Pers Comm Nigel Waterhouse (DSE), Matt Parsons and Mike Dalmau (Murrindindi Shire Council)).

The ability to offset other non native vegetation ecosystem service impacts of rural residential development may be limited under the current institutions and structures. It is likely that development will have a number of ecosystem service impacts additional to native vegetation removal. These impacts might include sediment and nutrient build up in water ways from increased runoff from driveways and a higher density of septic systems. At present the cause and effect relationships are uncertain. This uncertainty makes it difficult to know the appropriate offset for the impact. In addition, not all impacts should be offset. To resolve this, minimum compliance standards are set and developers will be required to contribute to a bank to offset any ongoing impacts to ecosystem services caused by development. Banks would then be established according to priorities specified in the regional strategies (eg planting in riparian areas, ridge tops or salinity recharge zones).

6. Nesting and Transaction Costs

The final part of the analysis asks the question whether nesting an MBI, such as development offsets, reduces the transaction costs associated with the design and implementation of such a scheme.

Recall from Section 4, the definition and allocation of transaction costs for an MBI. That is, transaction costs associated with the market based instrument can be categorised as either institutional or bureaucratic and in both categories may be fixed and associated with the set up, or variable and associated with the ongoing operation of the MBI. Further, transaction costs are incurred by both the public and private agents affected by the MBI.

Figure 13 demonstrates that the nesting of the MBI can impact on the private and public fixed and ongoing transaction costs for the development offsets MBI. For the public agent most transaction costs pass as fewer resources are needed to set up and manage the MBI.. For private agents transaction costs will fall if they are already operating in a zoning and permitting scheme compared to if they had to learn the market from the beginning.

Figure 13 demonstrates that there are a few areas where transaction costs may increase. This increase is most likely to occur on the public side of the MBI due to the ongoing administration of the MBI. This increase is particularly associated with the additional on ground assessment, verification, monitoring and enforcement of created offsets. For private agents, transaction costs will increase slightly due to an additional requirement to acquiring a development permit. Transaction costs here may include the identification and management of the offset as well as the cost of offset failure (if there are monetary fines associated with offset failure).

Figure 13 Transaction costs and current institutions and structures

	Design Issue	Addressed in current	Transaction cost	Fixed	Ongoing	Implication for Transaction costs ⁸
PUBLIC						
1	Information for the design of the development offset	Yes	Design information, research and decision design.	√		Reduced
2	Establishing market infrastructure					
2a	Creating the offset – how to know what offset to create and that it has been created	Yes	Design information, research and decision design.	√		Reduced
			The fact that there is demand for an offset is within legislation so also an enactment transaction cost	√		Reduced
2b	Offset trading – who can buy and sell and how does exchange occur for environmental objective	Yes	Implementation and set up	√		Reduced
2c	Offset use	Yes	Implementation /set up costs	√		Reduced
3	Administering the offset scheme	Yes	Administration		√	Increased
		Yes	Monitoring		√	Increased
		Yes	Enforcement		√	Increased
PRIVATE						
	Landholder knowledge of what is required	Yes ⁹	Information and learning	√		Reduced
	Landholder purchase of equipment to comply and engage in MBI	Yes ¹⁰	Infrastructure and set up	√		Reduced
	Determining offsets required and location and type of offset	Yes ¹¹	Negotiation		√	Reduced
	Determining, implementing and managing offset	Yes ¹²	Detection and protection		√	Increased
	Additional effort on DA if offsets are used	Yes ¹³	Fees and charges		√	Marginal increase

⁸ Transaction costs are compared to a situation where there are no current institutions or structures.

⁹ Through permitting & zoning

¹⁰ Most likely already have any necessary equipment

¹¹ Permitting requires whole farm plan

¹² Potentially through allocations of offset risk

¹³ Required as a part of permitting ie whole farm planning

7. Conclusions

As the experience of MBI practitioners increases some design issues are resolved whilst new ones are discovered. All the while, very little is written about one of the fundamental design issues with any MBI - understanding what the current institutions and structures are and what these mean for the MBI. This understanding is fundamental because in most cases the MBI must be incorporated and implemented largely within the current structure. Furthermore, this is often necessary for the current institutional frameworks to be accepted and to keep design and implementation transaction costs lower than the potential gains from trade. Whilst large scale institutional change can occur to resolve some environmental service supply problems, most environmental policy begins small and evolves to new institutions over time.

Using a development offsets MBI to address the goals of rural residential development with the maintenance of ecosystem services this paper explored two issues. One, whether the current institutions and structures currently managing rural residential development in the Murrindindi Shire could facilitate a development offsets MBI. This was assessed by observing the key design issues of a development offsets approach and determining if these issues could be resolved in the current frameworks. Second, this paper assessed whether nesting the MBI in the current institutions and frameworks would lower the fixed and ongoing institutional and bureaucratic transaction costs associated with the design and implementation of the development offsets MBI were reduced.

There are a number of design components to a development offsets MBI, which if not thoroughly resolved, can lead to the failure of the MBI to achieve environmental outcomes set. When assessing the ability to nest, this paper specifically focussed on these key design issues. The analysis resolved that the current institutions and structures had the capability to accommodate the MBI such that these key design issues were resolved. However, whilst the structures and institutions are in place, the human capital required to undertake some of the tasks which ensure a successful development offsets MBI may not be adequate. This is particularly reflected in the areas where transaction costs for the MBI design and implementation increase, primarily for ongoing offset assessment, monitoring and enforcement.

The analysis also highlights that nesting in current institutions and structures does not occur easily for all aspects of an MBI. Using development offsets to manage the delivery of ecosystem services during rural residential development, this analysis demonstrated that impacts and increases in native vegetation can be managed through current institutions and structures. The impacts on other ecosystem services such as water quality are much more difficult to offset.

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