



Understanding the relationship between social change and its impacts: The experience of rural land use change in south-eastern Australia

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A B S T R A C T

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This study investigated socio-economic impacts of land use change, giving explicit attention to the relationships between independently observed land use change and associated socio-economic changes, perceived land use change and socio-economic change, attributed cause of change, and experienced impacts of change. Using a case study region in south-east Australia, we examined the impacts of growth in use of land for dairy farming, cropping, blue gum plantations and rural residential development on (i) rural population trends, and (ii) the amount and nature of employment available in the study region. Perceptions and impacts of change were assessed using multiple qualitative and quantitative methods. Results demonstrate that local residents were not always aware of the extent and nature of land use change, and had difficulty attributing social changes and their impacts to the land use changes that underlie them. Furthermore, the felt impacts of land use change appeared dependent on a person's awareness of that change, and on their beliefs about the causes of social change. These findings highlight avenues for theoretical development to better specify the processes by which social change processes are experienced as human impacts. The findings also have implications for land use policy and social impact assessment, illustrating the importance of understanding both perceived and actual social change.

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1. Background

Rural land use is changing rapidly in many parts of the world (Curry et al., 2001; Petit, 2009; Rudel, 2009). While shifts from agricultural to non-agricultural land uses, such as wind farms or reforestation, often attract the greatest public (and academic) attention, the largest land use changes frequently involve a shift from one traditional rural land use to another, such as a shift from grazing to broadacre cropping (Williams, 2011). All types of land use change have the potential to significantly impact rural communities through both positive and negative socio-economic change, often accompanied by social contention and debate (Kruger, 2005; Xu et al., 2007). While policy makers seek to promote positive benefits of rural land use change and reduce any negative impacts, these efforts may be complicated by conflicting views among stakeholders and the general public regarding the

impacts of land use changes (Schirmer, 2007; Wester-Herber, 2004). Understanding the reasons for different views on the impacts of land use change is crucial to developing appropriate responses to community concerns. This paper contributes new insights by comparing independently observed land use change and associated socio-economic changes, with perceptions of those changes, and the impacts of change on the lives of rural people.

Regional land use change is the outcome of many small scale drivers and changes, with decisions made at an individual or property scale influenced by regional, national and global norms, environmental change, policy and market forces (Barr, 2000; Verburg et al., 2008). As such, the extent and impacts of change may be highly variable across even relatively small areas. A shift in what is grown on the land is accompanied by flow-on changes in socio-economic production systems, such as a shift to new forms of land ownership (for example, from the family farm to corporate management), or in the supply chain, for example through intensification of production and resultant change in the nature of farm inputs purchased and utilised (Barr et al., 2005). Regional land use change is often unevenly distributed in spatial terms (Petit, 2009; Verburg et al., 2008). Local and regional variation in rainfall, soil quality, and infrastructure access mean that land use changes may

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be localised to only some parts of a region (Thomas and Sporton, 1997). In addition, many rural regions experience multiple drivers of land use change simultaneously, and the impacts of each depend in part on how different land use change drivers and responses interact (Barr, 2008). This complexity is illustrated by the work of Barr et al. (2005) and Barr (2008) who examined rural land use change in Victoria, Australia. He found a complex mix of interacting forces shaped land use change, including changing terms of trade for agricultural producers forcing them to increase farm size to remain competitive, an ageing farming workforce, increasing demand for high-amenity land by urban residents seeking to shift onto small rural properties, and increasing use of off-farm work by farmers. These and other factors interacted to produce multiple distinct rural landscapes, in each of which a different mix of causative factors resulted in a unique profile of land use change. For example, in production-oriented landscapes, land use change was dominated by amalgamation of farms, expansion of cropping, and population decline. In rural amenity landscapes, by contrast, attractive natural features and accessibility by road networks to larger population centres led to smaller landholding size as 'sea-changers' seeking small rural properties for lifestyle purposes shifted into the areas, and population was more likely to grow. The complexity of rural land use change means that identifying socio-economic impacts of this change can be challenging, requiring methods that are suited to untangling the range of factors at play (Schirmer, 2011b).

Beyond the complexity of land use change itself, those endeavouring to understand socio-economic impacts of rural land use change are further challenged by the different ways people experience impacts of change. This is evident from the work of Vanclay and others (Slootweg et al., 2001; Vanclay, 2002) who argue that to understand the impact of any change one must identify both the social and biophysical changes occurring and the *felt experience*, or impact, of these changes. This approach recognises that an intervention such as a change in land use leads to processes of social change, but that these social change processes do not equate to social impact: instead, the impacts of social change processes will vary for different people depending on their situation. For example, a change in the number of people living in a community may be experienced as a positive impact by some residents and a negative impact by others. This means that understanding and addressing social impacts of land use change is highly complex, as impacts will vary depending on both the nature and extent of land use change and the way people experience the social changes that result from this land use change.

A range of social and psychological factors are likely to influence whether and how social change processes result in particular types of human impact. While the distinction between social change processes and social impacts has been well established, the nature of the relationship between the two has not been examined in detail in literature seeking to conceptualise social impact (for example Vanclay, 2002). Several studies have suggested a range of factors that may influence how a person experiences a social change, indicating a number of avenues by which social change processes result in differing social impacts. Schirmer (2011b) suggested that a person's goals, occupation, or life stage affect how they experience land use change, while Alston (2006) demonstrated how gender influences the experience of drought. A number of authors have pointed to the ways that the values or beliefs a person holds regarding place, rurality or belonging shape the experience of social change (Barlow and Cocklin, 2003; Convery et al., 2005; Devine-Wright, 2009). Others still have considered the influence of community and farmer adaptive responses to change (Ross and McGee, 2006; Vanclay, 2003a).

While a broad range of factors have been identified, the influence of this work on conceptions of social impact is limited: the work is dispersed across diverse fields such as rural sociology, environmental psychology and social impact assessment literature, and there has been limited attempt to synthesise or integrate this work (Ross and McGee, 2006), or to more explicitly identify the pathways between social change processes and experience of impacts arising from them as part of frameworks such as that presented by Slootweg et al. (2001).

In particular, existing models give little attention to the ways that awareness of land use change and attribution of causes of socio-economic changes influence the experienced impacts of land use change. There is good reason to suggest that these factors will make a difference to experienced impact. Some land use changes are more visible than others in a physical or perceptual-social sense (Miller, 2001; Sevenant and Antrop, 2007), and there is evidence that awareness of land use changes is variable. Surveys of residents in rural southwest Victoria found disproportionate awareness of increases in plantations relative to more common forms of land use change such as increased cropping (Williams et al., 2003). Even where there is awareness of land use change, identifying the nature of the social changes that accompany it, and attributing experiences (impacts) to those changes is fraught with difficulty. As noted above, multiple land use changes are often occurring at once; these together with other factors contribute to social change, which in turn is experienced in varying ways by different people. As such, attribution of social change is uncertain; residents may attribute negative or positive experiences to a land use that is not causally associated with the relevant socio-economic change. Despite this, there is little evidence that factors such as awareness and attribution are being considered in social impact assessment. While Slootweg et al. (2001) and Vanclay's (2002) key papers set out a compelling case for the separation of social change processes and social impacts when assessing social impact, they give little attention to how the extent and nature of awareness of social change processes, or the attributions individuals make regarding these processes, might influence a person's felt social impacts.

The accuracy of conceptual frameworks explaining how social changes do and do not lead to human impact has significant practical consequence. Policy makers attempting to assist rural communities in adjusting to land use change must correctly identify causal factors of positive and negative impact if they are to implement effective supportive policy and planning. Social impact assessment is a methodology widely used to understand the social impacts of land use and other changes. Practitioners in this field also require a sound basis for identifying how social impact occurs in rural communities (Ross and McGee, 2006; Vanclay, 2002, 2003b). This paper contributes to this understanding through a detailed examination of the socio-economic impact of rural land use change occurring in a relatively large region in south-eastern Australia. The analysis incorporates explicit consideration and comparison of observed land use change, observed socio-economic change, and experienced impact of land uses in relation to awareness of land use change and attribution of socio-economic change. The study was conducted over a three-year period (2006–2009). Multiple methods were used to explore social change and impacts of change. We focus primarily on two aspects of socio-economic change: changes in population, particularly population decline and turnover; and changes in employment. Past research has indicated significant concern about how land use changes affect local populations and employment opportunities (Berry et al., 1990; Curry et al., 2001; Schirmer, 2000; Williams et al., 2003), and about the social impacts any change in population and jobs may have on those living in the region (Barlow and Cocklin, 2003, p. 509).

2. Case study region

The study region extended from Robe in South Australia to Colac in Central Victoria (Fig. 1). In 2006 the region had a population of 227,200 people. Almost one quarter of residents (22.7%) lived in the two major regional cities (Warrnambool and Mt Gambier), and a further 25.2% in smaller regional cities with a population greater than 5000 such as Hamilton, Horsham, Portland and Colac (Australian Bureau of Statistics, 2006b). The remainder – just over half the population – lived on rural properties, or in small rural towns or settlements. The region is organised into 17 local government areas.

The region makes a significant and diverse contribution to national agricultural and forestry production. For example, while the study region includes 1.1% of Australia's agricultural land, in 2006 it had 20.1% of Australia's hardwood plantations and 18.2% of softwood plantations, 14.9% of Australia's dairy cows, 14.6% of the national area of pasture/hay crops, 13.6% of the national flock of sheep and lambs, 12.9% of the grapes grown in Australia, 9.0% of Australia's oilseed area, 5.9% of Australia's beef cattle, and 2.6% of Australia's cereal grain crops (Schirmer et al., 2009).

Socio-economic impacts of land use change were examined for 1991 to 2006, a period in which ongoing land use change occurred in the study region. This largely, although not always, involved a shift from the sheep grazing for wool production that had dominated much of the region through to the early 1990s, to increasing use of rural land for dairy farming, beef cattle grazing, dryland cropping of cereal grains and oilseeds, establishment of 'blue gum' plantations, and grape growing, as well as for rural residential purposes. All but the last three have typically involved farmers changing the types of produce grown on their land, and often some farm amalgamation, with farmers purchasing additional properties and expanding their enterprises over time. The latter three typically involve a change in land ownership: blue gum (*Eucalyptus globulus*) tree plantations grown for wood pulp over 10–15 years are largely established by private companies who lease or purchase land from farmers; viticulture has involved some new

corporate owners establishing areas of vines as well as some traditional farmers; while rural residential development may still involve some agricultural production from the land (often referred to as 'hobby farming'), but is distinguished from mainstream agricultural production as it involves new residents shifting onto and managing small rural properties for lifestyle, rather than rural production, purposes.

These various land use changes have been driven by a number of factors. A key trigger was a shift away from sheep grazing for wool triggered by price pressures in the wool industry, particularly the Australian government's withdrawal of a guaranteed floor price for wool in 1991 (Massy, 2011; Vanclay, 2003a). The region's sheep flock has since declined by over one-third, which has in turn created significant opportunity for land use change over time (Australian Bureau of Statistics, 2006a). Other factors triggering land use change include changing market conditions and climatic variability; for example, among other factors, a decline in rainfall in southern parts of the region has encouraged a shift from grazing to dryland cropping. In the case of blue gum plantations, plantation expansion was driven by a number of factors, including the establishment of legislation enabling new investment mechanisms that provided up-front tax deductions for establishment of plantations, and a commitment by both the Australian government and private forest industry to trebling the area of Australia's plantations between the 1990s and 2020 (Plantations, 2020, 1997). Meanwhile a desire for a different lifestyle has led increasing numbers of people to shift to rural areas for a 'seachange' (Osbaldiston, 2010).

While a diversity of land use changes have occurred in the region, in this paper we focus on four that are particularly significant for the region: increased plantation forestry, rural residential development, dairy farming and cropping (Schirmer et al., 2008b). We selected these as they were either topics of public debate (blue gum plantations, rural residential expansion), promoted as a method of revitalising rural communities (dairy farming), or widespread in terms of area (cropping). The expansion of blue gum plantations in particular has been the subject of widespread controversy in the region, with debate about its social and economic impacts common

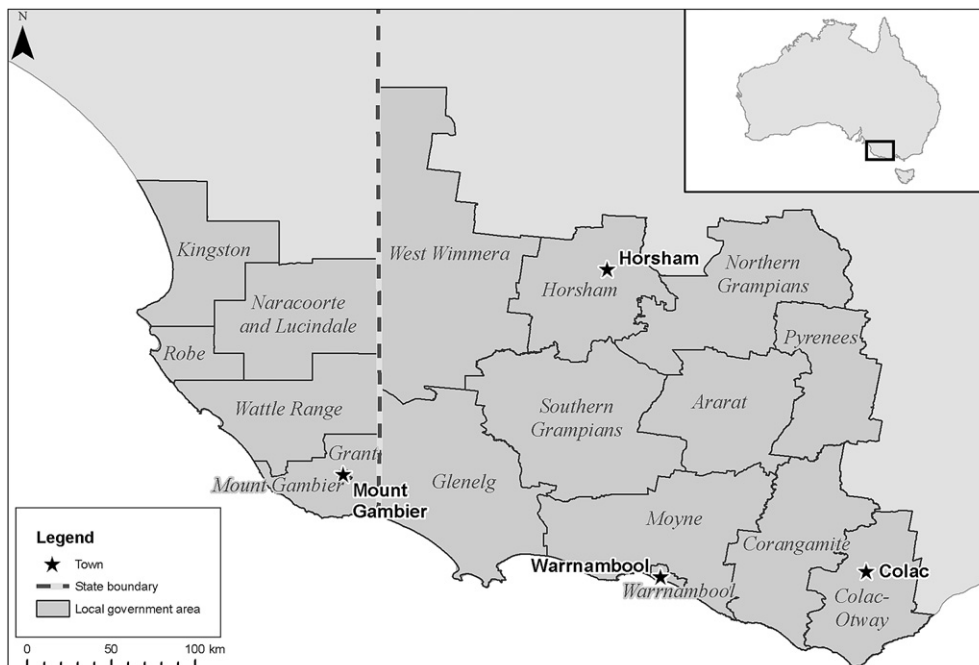


Fig. 1. Map of study region, Green Triangle and Central Victoria.

when plantations are established, while rural residential expansion has been less controversial but still commonly discussed as being associated with significant social change (Williams et al., 2003). Expansion of dairy farming is often presented in the local media as a positive economic development (O'Toole and Keneley, 2010; Schirmer, 2011a), while the large-scale expansion of cropping is rarely commented on publicly in the region.

3. Methods

In this paper we explore the links between land use change and its impacts by comparing (a) the actual and perceived extent of each of the four land uses studied, (b) the perceived and actual changes in population and employment associated with these land uses, and finally (c) felt experience, or impacts. We used a mixed-method approach to gather and analyse data. The methods used are summarised in Table 1, with further detail provided in several sources (Schirmer, 2011b, in press; Schirmer et al., 2009; Williams et al., 2008). This paper draws on results from this study already published in peer reviewed books and articles. It also draws on some previously unpublished data. Where methods used have been published elsewhere we provide the relevant reference and a brief summary of methods, rather than an in-depth description of methods.

First, the extent of growth in use of land for blue gum plantations, cropping, dairy farming and rural residential properties between 1991 and 2006 was examined, using the best available indicator for each form of change, for example area of land used or, where this was not feasible, flock/herd numbers.

Second, we identified likely associations between land use change and socio-economic change, using independent data on population and employment, together with a small survey of rural landholders identifying the employment generated by different land uses. To establish the likely relationship between land use change and changes in population and employment, we first examined whether there was a relationship at the scale of the individual farm enterprise, through gathering direct data identifying the change in employment generated per hectare, and population supported by the land, associated with land use change. This was followed by 'scaling up' the analysis to identify whether the influence of land use change on population or jobs at the individual property scale was large enough to be 'visible' against the many other factors simultaneously influencing these trends at a larger scale (Schirmer, 2011a, 2011b). This enabled identification of whether the trends observed at individual property scale were large enough to have an observable impact on population or

employment trends at larger scales, or whether the many other factors influencing these trends, such as the ongoing rural population decline occurring in many Australian rural inland areas due to increasing farm efficiency and exit of youth (Hugo, 2005), had a greater influence. This 'scaling up' involved comparative analysis of areas experiencing differing extents of land use change (for example, no expansion of plantations compared to low, medium or high rates of expansion over the period studied), to identify if they experienced observably different population or employment trends. The larger scale examined was that of the 'statistical local area' (SLA), with each local government area in the region split into between one and three SLAs in the reporting of many available statistics for the region.

Third, we examined residents' perceptions regarding land use change via a survey of local residents of the region (Williams et al., 2008). This Resident Survey included questions about whether key land uses had increased, decreased or remained unchanged (awareness), and about perceptions of the influence of land use change on population and employment (perceived socio-economic change). For the latter, participants were asked whether, in their view, an increase in each land use would result in 'fewer or more people living in smaller towns and rural areas?', and 'less or more employment in smaller towns and rural areas?' While responses were given on a 5-point scale, these were re-coded into three categories: increase, little or no change, or decrease in population or employment. Potential respondents were selected randomly from an electronic telephone directory for the area. Questionnaires were posted to the first named addressee. Up to three reminders, including a re-posted questionnaire, were distributed over a six-week period. The response rate was 31 percent. Older and male residents were over represented in the sample. Data were analysed primarily using simple descriptive statistics.

Finally, the felt experience, or impact, of land use change for local residents, was analysed. This drew partly on data from the Resident Survey, in which participants were asked to rate the overall impact of each of the four land use change using a 5-point scale where 1 = negative impact and 5 = positive impact. Impacts were also identified through group interviews conducted for the study. Group interviews identified the land use changes that residents of the region considered most significant, and explored the diversity of views held by local residents about the nature of social changes and impacts arising from those changes. Interview data were analysed thematically, with a focus on how participants experienced any socio-economic changes they associated with land use changes, rather than on quantifying the frequency of these experiences (Schirmer et al., 2008b).

Table 1
Summary of research methods.

Component	Participants/Data source	Approach	Purpose
Group Interviews	69 residents	Purposive sampling of participants through community groups. Semi-structured interviews (Schirmer et al., 2008b).	Identify significant land use change for residents; explore accounts of impacts of land use change
Resident Survey	899 residents	Postal survey with self-completed questionnaire. Systematic sampling through telephone directory (Williams et al., 2008).	Observe awareness of selected land use changes; quantify beliefs about impacts and causes
Landholder Survey	81 landholders	Purposive sampling by industry based on membership of industry associations (Schirmer et al., 2008a).	Identify employment patterns of key land use types
Analysis of Independent Data	Australian Bureau of Statistics; other government sources	Population level data (Schirmer, 2010a; Schirmer, 2010b, 2011a).	Identify (a) key socio-economic and land use changes occurring; and (b) associations between land use change and socio-economic change.
Focus Groups	66 people with in-depth knowledge of land use in area	Purposive sampling of people with particular regional knowledge of land use issues including local government councillors and planners, farmers and graziers, rural real estate and stock agents, members of local community groups and fire brigades, and local rural consultants and extension officers (Schirmer, in press).	Test patterns observed in analysis of independent data through identifying (a) any problems with the data, and (b) informants interpretations of how and why different changes had occurred, and the consequences of those changes.

The methods used were exploratory in nature: they enabled a qualitative identification of the links between land use change, perceptions of that change and experience of its impacts. We compared the results of analysis of independent data and of the Resident Survey to identify whether residents' perceptions were consistent with (i) the actual extent of land use change, and (ii) the changes in population and employment identified as being associated with that land use change. Based on the Resident Survey, perceptions of the social changes associated with each land use change were correlated with perceptions of overall impact, to identify whether perceived impact was closely linked to the nature of the social changes residents believed were associated with a land use change. Our data did not support statistical analysis beyond simple correlations, and we focus in our results on identifying potential relationships that can be explored in more depth in future in order to better establish the role of residents' perceptions in influencing their experience of the social impacts of land use change.

4. Results

The findings are described for each land use below.

4.1. Blue gum plantations

Blue gum plantations were primarily located in high rainfall parts of the study region, within 200 km of ports from which the woodchips they were established to produce could be exported. While the largest areas were established in southern and western parts of the region, blue gum plantations were established across a high proportion of the study region. There was a very high awareness of increase in these plantations, with 78% of Resident Survey respondents reporting having observed growth in this land use over the past 10–15 years, including residents living in areas of the region where few or no blue gum plantations were established (Table 2).

Analysis of independent data suggested that at the scale of the individual property, a shift from sheep or beef grazing to growing blue gum plantations is associated with decline in the number of people living on the property, and with change in the type of people living in a region, with previous residents often shifting away, and new residents shifting to live on rural properties established to plantations (Table 3). At the SLA scale, the association between increased plantations and population was mixed; it appears that in most cases, other factors have a greater influence on rural population trends than plantation expansion. In some areas, plantations replaced dairy farming; where this was the case an increase in plantations was associated with above average population decline and increased median age. However in most instances, plantations replaced grazing for beef or sheep. Here there was no clear pattern of association between increase in plantations and population; in some SLAs population changes were positive, in others negative or neutral. However there was a clear association between increased plantations and turnover in population. SLAs with a significant increase in plantations had a higher than average rate of in-migration of new residents compared to other SLAs.

There were very diverse beliefs about the influence of expansion of blue gum plantations on population, but the most common view, held by 46% of respondents to the Resident Survey, was that this land use change was associated with decline in population, with other respondents relatively evenly divided regarded whether population grew or declined in response to plantation expansion. While the most common view is consistent with the changes that occur at the individual farm scale, the question examined perceptions of community-scale impact; at this scale, the independent

Table 2

Extent of land use change, and residents' awareness of land use change.

New land use	Growth in land use in study region between 1991 and 2006 (hectares or herd size)	Awareness of increasing land use change (% respondents to Resident Survey who reported being aware of growth in this land use in the area near where they lived)
Blue gum plantations	148 105 ha ^c	78
Dairy farming	123 000 cows (approx. 120 000 to 150 000 ha) ^{a,d}	22
Cereal, oilseed and pasture/hay crops (sum of total area)	359 170 ha ^e	18
Rural residential development	The large majority of rural residential expansion occurred in southern parts of the study region, either near the coast, near aesthetically pleasing lakes or treed areas, or surrounding regional towns and cities; very little occurred in northern parts of the region. ^b	70

^a It was not possible to estimate the area of land used for dairy farming in 1991, as no data were available on average stocking rates, or area of land used. In 2006, data on average stocking rates were sourced from the Victorian Department of Primary Industries and combined with data from the Australian Bureau of Statistics (ABS) *Agricultural Census* to produce an area estimate, with approximately 398 550 ha used for dairy farming in this year by a total herd of 415 880 cows. Herd size is used as a proxy for land use change over time, with focus group participants reporting this to be a useful measure.

^b The exact area of rural residential development could not be measured, due to difficulty defining what type of properties should be considered 'rural residential' versus 'agricultural', and lack of accessible data on the area of land falling into each category if a definition were made. Instead, the areas where this land use expanded rapidly, somewhat, or very little were identified using a combination of expert informants in focus groups, and data from the ABS *Census of Population and Housing* on the proportion of rural properties onto which new residents shifted between 2001 and 2006.

^c Data source: Bureau of Rural Sciences (BRS) *National Plantation Inventory*; area grew from 675 ha to 148 780 ha between 1991 and 2005; note that the data range is from 1991 to 2005 as 2006 data were not available.

^d Data source: ABS *Agricultural Census* together with data supplied by the Victorian Department of Primary Industries.

^e Data source: ABS *Agricultural Census*; area cropped grew from 496 788 to 855 958 ha between 1991 and 2006.

evidence suggests that plantations are not associated with higher than average population loss when, as is usually the case, the plantations replace sheep or beef grazing or cropping activities. The most common view was consistent with the relatively less common occurrence of plantations replacing dairying farming.

Resident Survey respondents were significantly more likely to report blue gum plantations had overall negative impacts for the region if they believed plantation expansion was associated with population decline (Table 4).

In group interviews, participants described the growing use of land for blue gum plantations in the region as having a range of negative impacts for residents. In many cases, the social change of loss of population was described as the negative impact, without further detail of how loss of population leads to negative social experiences:

You are taking family farms out of production ... For every family that leaves it causes an adverse impact on four others, so there is already a downward spiral in so many of these communities and

Table 3

Comparison of independently observed trends in population with residents' perceptions of population change associated with four land use changes (increased blue gum plantation, cropping, dairy and rural residential development).

New land use	Previous land use	Analysis of independent data on influence of land use change on population trends ^a					Analysis of perceptions of residents in the study region ^b
		Change in population at individual property scale ^c		Change in population at 'community' scale (Statistical Local Area, 1991–2006) ^c			Beliefs about change in population arising from land use change (%)
		Pop'n decline	New residents	Pop'n Decline	Median age	New residents	
Blue gum plantations	Dairy Beef/sheep grazing	↑	↑ or –	↑	↑	↑ or –	Increase: 28 No change: 26 Decrease: 46
Cropping	Beef/sheep grazing	↑	–	↑	↑	–	Increase: 18 No change: 57 Decrease: 25
Dairy	Beef/sheep grazing	↓ or –	–	↓	↓	↑	Increase: 27 No change: 44 Decrease: 29
Rural residential development	Dairy/ Beef/sheep grazing	↓	↑	↓	–	↑	Increase: 58 No change: 21 Decrease: 21

^a Data sources: Australian Bureau of Statistics (2006a,b) *Census of Population and Housing, Agricultural Census*; BRS *National Plantation Inventory*.

^b Data source: Resident Survey.

^c ↓ lower than average population decline, decreased median age, lower than average proportion of new residents; ↑ higher than average population decline, increased median age or higher than average proportion of new residents; – no clear pattern of change.

if you are taking family farms out of the picture, you are going to exacerbate ... the decline in rural populations (Primary producer 1, Beaufort).

Where further detail on what factors made population loss a negative experience was given, the loss of friends, neighbours and school families when properties were sold to plantation companies were typically given as examples of negative social impacts associated with declining population. Loss of population was also described as triggering a chain of negative social change involving loss of membership in community, sporting and volunteer groups, loss of local services, and hence loss of social capital and a sense of community in rural areas. For example:

Blue gums have really knocked them [a small rural community] about both population wise, young people leaving and football clubs closing down. When you take a football or netball team out of the community, any community ... it's somewhere where people go at a weekend and towns like [names two small nearby towns] the only time they met was on Saturday when the girls played netball, the boys played football and met each other and it kept a few communities together (Farmer 1, Heywood).

Table 4

For four land uses (blue gum plantations, cropping, dairy and rural residential development) correlation between perceived overall impact and perceived impact of land use on population and employment. Data source: Resident Survey.

Land use	Perceived impact	Correlations (Spearman rho)	
Blue gum plantations	Population	N	<i>Overall impact of plantations</i>
	Employment	795	.391**
Cropping	Population	797	.465**
	Employment		<i>Overall impact of cropping</i>
Dairy	Population	796	.228**
	Employment	796	.262**
Rural residential development	Population		<i>Overall impact of dairy</i>
	Employment	773	.214**
Rural residential development	Population	769	.395**
	Employment		<i>Overall impact of rural residential development</i>
Rural residential development	Population	826	.085*
	Employment	825	.199*

** $p < .01$, * $p < .05$.

Some participants also described difficult experiences associated with adjusting to new types of people moving into housing on plantation properties after previous residents shifted away due to the land use change:

The houses are left empty. The people that come ... into those houses, you wouldn't want to know them. We have ... people that arrived the other day with five children ... they've got no money, they don't want any help they have got a sign up on the gate that nobody is permitted beyond this area' (Retired farmer 1, Mortlake).

When the employment generated by blue gum plantations was examined, at the individual property scale this land use generated median employment of .15 jobs per hectare during the time when plantations were growing, but before harvesting and processing occurred. This was less employment than that generated by other land uses (Table 5). The employment generated beyond the 'farm gate' by blue gum plantations was very low at the time of this study, largely because very few plantations have reached maturity for harvest and processing. Based on patterns of employment in other regions where plantation estates are more mature, blue gum plantations are likely to be associated with a relatively high level of downstream employment (.35–.50 jobs/100 ha). At the SLA scale, similar to results regarding population, there was no clear association between rate of plantation expansion and employment trends; in some areas experiencing high rates of plantation establishment employment increased, while in others it decreased or was unchanged.

There were very diverse beliefs about the influence of plantations on employment (Table 5), with views almost evenly split between those considering increased plantations lead to fewer jobs in rural areas and those believing plantations lead to more jobs. Described experiences of change (impact) were similarly diverse. Some described new opportunities and income sources associated with the land use change:

Places sometimes have earned some extra money from contracting to the blue gum companies, there'd be local contractors like the spraying contractors and some of the people who grow the seedlings for them so it's probably generated a bit of industry (Farmer 1, Coonawarra).

Table 5
Comparison of independently observed trends in employment with residents' perceptions of employment change associated with four land use changes (increased blue gum plantation, cropping, dairy and rural residential development).

New land use	Previous land use	Analysis of independent data on influence of land use change on employment trends ^a		Beliefs about impact on employment (%) ^b
		Change in employment at individual property scale ^c	Change in employment at 'community' scale (Statistical Local Area, 1991–2006)	
Blue gum plantations	Dairy	↓	–	Increase: 36
	Beef/sheep grazing	↑ once downstream processing included	–	No change: 29 Decrease: 38
Cropping	Beef/sheep grazing	↓	↓	Increase: 26 No change: 51
		↑	↑	Decrease: 33 Increase: 36 No change: 44
Rural residential development	Dairy/ Beef/sheep grazing	Not identified	–	Decrease: 20 Increase: 49 No change: 31 Decrease: 20

^a Data source: ABS Census of Population and Housing; ABS Agricultural Census; BRS National Plantation Inventory; direct survey of landholders.

^b Data source: Resident Survey.

^c ↓ decrease in employment; ↑ increase in employment; – no clear pattern of change.

Others described loss of employment and income for local families, and the interrelationship between employment and population:

There is no labour or group of labour, you plant them, the contractors come plant, it's all over within a couple of months, those are people who don't live in the community, so that then that area is not serviced by anyone who lives locally, and then they come back, harvest in another 10 years, or 15 whatever, so basically, [it] removes all the population (Farmer 1, Horsham).

Some participants described experiences that highlighted the negative impacts associated with changes in types and location of employment. For example:

Seems to me that a big operation like mining or blue gums run centralized operations ... the workers come from the major regional centres, and work out in the trees or out in the mines. Any operation like that takes away from the rural community and adds to the big community (Farmer 2, Horsham).

4.2. Cropping

The most widespread of the four land use changes studied was growth in cropping, which occurred across a large part of the study region, particularly in the northern, lower rainfall parts of the study region. While for the region as a whole increased cropping was the largest and most ubiquitous form of land use change, it was the least recognised, with only 18% of respondents having noticed an increase in this land use (Table 2).

The analysis of independent data suggested that at the scale of the individual property, a shift in land use from sheep or beef grazing to cropping is associated with decline in the number of people living on the property (Table 3). At the SLA scale, areas with higher rates of growth in use of land for cropping tended to have higher than average rates of population decline, and higher than average growth in median age, suggesting that the influence of this land use change on population is large enough to have a noticeable influence on population trends at this scale.

The dominant view on increased cropping was that it resulted in no change in population, with 57% of survey respondents reporting this perception. This again contrasts with the perspective from the independent data which suggests growth in cropping is associated

with higher than average population decline in rural communities. Resident Survey respondents were significantly more likely to report expansion of cropping had overall negative impacts for the region if they believed it was associated with population decline (Table 4).

In group interviews, participants tended not to discuss the population impacts of land use change to cropping, instead focusing on describing the negative impacts they believed were associated with other, more publicly contentious, land use changes, particularly expansion of blue gum plantations. However, some did describe population decline occurring as a result of amalgamation of farms into larger properties, a trend common in the cropping sector but also occurring on other types of agricultural property. The consequences of population decline were not typically described in as much detail as they were for blue gum plantations, with a sense that this change was 'inevitable' and more acceptable than that perceived to be associated with plantation expansion. Where they were described, the population loss was viewed as less severe than that believed to be caused by other changes:

Your population loss is nowhere near as great as it would be for blue gums ... but there is population lost (Primary producer 1, Beaufort).

I guess one of the other effects of the cropping and the increase in farm [size], is the fact that it's reduced the number of people. Many farmers now are working farms that might be [an] ... aggregation of you know five or six or even more farms which means that there's now ... one family there, you know, four members may be? Where in the past there were probably 25 other people there ... so who suffers from that, is that community numbers drop, fire brigade numbers drop, ah, people available to play sport, both senior and junior, drop and the numbers to keep [the] school open drops as well (Fire protection officer, Horsham).

At the individual property scale, the growing of broadacre crops within the study region generated median employment of .23 jobs/ha – lower than for other land uses (Table 5). Cropping was associated with little off-farm employment, with only .01–.03 jobs/ha generated in areas such as storage, transport and sales. At the SLA scale, increased use of land for cropping tended to be associated with lower than average employment growth and higher rates of unemployment. The dominant view of residents, however, was that

increased cropping would lead to no change in employment (51%). Group interview participants generally commented positively on the local nature of employment associated with cropping. For example:

Well, I mean you've got [a] farmer who lives there who'll employ a bloke, who'll employ a truck driver to drive, take his crop into town, every year, yeah, he lives there and he'll employ people, just to a lesser degree than what we used [to employ] (Farmer 2, Horsham).

4.3. Dairy farming

Dairy farming generally increased in southern, higher rainfall areas of the study region, and decreased in northern parts of the region, during the period studied (Table 2). Relatively few people (22%) were aware of growth in dairy farming, a finding that is not surprising given that this increase was focused in specific southern parts of the region.

Expansion of dairy farming led to growth in population on a farming property if it involved a shift from sheep or beef grazing to dairy farming; if dairy farming grew through intensification of existing dairy enterprises, it was typically associated with population decline (Schirmer, 2011b). At the SLA scale, dairy farming growth was associated with neutral or positive change in population, depending on the SLA and the extent to which expansion occurred through converting land from other uses, or intensifying existing dairy farms (Table 3).

While views on the changes associated with increased dairy farming were also diverse, the most common view, held by 44% of survey respondents was that it resulted in no change in population. This contrasts with the pattern of independent data indicating an association between increased dairy farming and reduced population decline in some SLAs, although it is consistent with the finding that in other SLAs there was no observed growth or decline in population. This may reflect low levels of experience of increased dairy farming, since it tends to be more concentrated in the southern parts of the region.

Similar to blue gum plantations and cropping, Resident Survey respondents were significantly more likely to report expansion of dairy farming had overall negative impacts for the region if they believed it was associated with population decline (Table 4).

In group interviews, relatively few people commented on the experience of population change in relation to dairy farming. Where comments were made they were generally positive in nature, with expansion of dairy farming believed to be associated with growth in population, and a range of positive experiences associated with this. Similar to blue gum plantations, when asked about social impacts, group interview participants tended to describe the social change (e.g. growth in population) and associate it as being in and of itself a positive or negative experienced impact.

Dairy farming generated a median of 1.4 jobs per 100 ha on farm, and .2–.3 downstream jobs per 100 ha through dairy product manufacturing – the highest employment of any of the four land uses (Table 5). At the SLA scale, regions with greater growth in dairy farming typically also experienced higher than average employment growth compared to the rest of the region. Respondents to the Resident Survey were most likely to perceive the employment changes associated with dairy farming as positive (36%) or neutral (44%).

In group interviews, some participant's comments associated growth in dairy farming with positive changes in employment. As with population, increased employment was often positioned as an inherent good with little reference to personal or community impact of this change:

There is a neighbour of mine ... used to have prime lambs. And his farm was probably one, may be one and a half full time equivalents, possibly two... [now] there is four, four or five full time equivalents from going from prime lambs to now a fairly intensive dairy operation (Farmer, Mortlake).

There were however several comments on negative impacts associated with employment in the dairy industry, for example the demanding nature of the work and consequent difficulty finding employees:

Looking at dairy farming in particular ... it is intense hours you know and long days ... You are constantly seeing at the moment people advertising for labourers and they are just too difficult to get. They either don't want to do that job or the young people ... move away because there are no actual secure jobs for them (Farmer, Colac).

4.4. Rural residential

Increase in rural residential development was harder to quantify than change in the other land uses, but was strongest in coastal areas and near some major regional centres in the region. This is consistent with observations made by Barr et al. (2005) and Barr (2008) regarding drivers of change in parts of this study region: he noted that 'amenity landscapes' in which use of rural land for lifestyle purposes has increased in recent decades, in some cases driving regeneration of small towns (Barr, 2003). Despite its relatively localised nature, there was a very high awareness of increase in rural residential development, with 70% of Resident Survey respondents having observed growth in this land use (Table 2).

The analysis of independent data suggested that at the scale of the individual property, growth in rural residential development was associated with an increase in population living on a property, as well as with change in the type of people living in a region, as it involved new residents shifting from other regions (often urban centres) to live on rural properties. At the SLA scale, growth in rural residential development was associated with lower than average rural population decline, and with a lower median age of the population compared to other areas (Table 3).

There is little surprise that most Resident Survey respondents (58%) associated rural residential development with increased population since this land use change involves in-migration of higher numbers of people to live on small rural properties. This perception is consistent with trends in independent data.

As for the other land use changes studied, Resident Survey respondents were significantly more likely to report rural residential growth had overall negative impacts for the region if they believed it led to population decline, however this relationship was only modest (Table 4).

Interestingly, described experiences of this change were very mixed. Some people described positive impacts of new residents in rural areas:

Positive ones, lots of positive ones. Like people coming in with real energy, with different education backgrounds, money helps with stuff as well. Knowledge, how to revitalise rural communities and so on (Business owner1, Warrnambool).

Others were concerned about the types of people moving into the area, and the consequences for environmental management and social cohesion:

What I don't like about them, a lot of them aren't aware of their responsibilities, or their community responsibilities with weeds and pests and just what they are expected of, what is expected of you (Farmer 2, Beaufort).

We were unable to estimate the employment generated by rural residential use of rural land at the individual property scale, due to lack of available data. At the SLA scale, areas with higher rates of rural residential development also had lower than average labour force participation, perhaps reflecting the large proportion of retirees moving into areas, and higher rates of growth in employment, primarily part-time employment.

While a large proportion of Resident Survey participants believed increased rural residential development would result in increased employment (49%), group interviews revealed that the experienced impact of change was often less positive. Participants described the negative aspects of the changing nature of employment, including a trend toward jobs in service industries and part-time work.

I saw rural residential development at [town] where they carved up the prime dairy country ... it had an ongoing effect through the whole community because dairying is a pretty intensive industry. You had the [town] cheese factory close, that's three people out of work, you had businesses which relied on farming, they were affected, so the effect on the community economy was considerable (Primary producer 1, Beaufort).

It does generate jobs over weekends for younger people with part-time jobs (Farmer1, Warrnambool).

5. Discussion

The findings suggest complex relationships between land use change, socio-economic change, awareness of change, experience of impact and attribution of impact to land use change. The contrast between cropping and plantations best illustrates this complexity. In terms of land area, cropping was one of the most significant land use changes for the region. It was also the land use change that analysis of independent data showed to be most consistently associated with negative socio-economic changes in relation to employment and population. Residents' experiences of these negative social changes were relatively limited: the dominant view of survey respondents was that increased cropping led to little socio-economic change, and when describing their experiences of this land use change group interview participants expressed little concern about social change. While some recognised population loss associated with increased cropping, this was often attributed to farm amalgamation and positioned as something inevitable rather than an issue of strong concern. In contrast, growth in plantations involved relatively small areas of land, and was not consistently associated with positive or negative changes in population and employment. Yet there was very high awareness of this land use change, and group interview participants were much more likely to report that they or others had experienced negative impacts as a result of this land use change. In this section we explore the complex relationship between land use change, social change and experienced impact, and implications of this complexity for rural land use policy and social impact assessment.

This study suggests the felt impact of land use change depends partly on social understanding of that change, including awareness of land use change and attribution of impacts of land use change. In the context of multiple land use changes and long term population decline in many rural parts of the study region, causal relationships are not easily determined even through in-depth and systematic research. In these circumstances it is not surprising that residents do not always agree on the impacts of land use changes, and a level of misattribution is to be expected. It is likely that misattribution in part results from the relative physical visibility and social prominence of different types of land use change, with people more likely

to attribute negative experienced impacts to prominent land use changes than to those that are less visible or dominant in local discourses. In this study, blue gum plantations stand out from other land uses both because they are a non-traditional rural land use introduced to the region relatively recently (largely emerging since the mid-1990s), because the dominant models of plantation develop do not readily fit with norms of rural activities, and because plantations are highly visible in the landscape (Barlow and Cocklin, 2003; Schirmer, 2007). As a traditional rural land use, cropping is less visible and provides a more comfortable fit with existing traditional rural ways of operating; its expansion has not attracted the widespread social commentary and debate triggered by the expansion of blue gum plantations in the region. These aspects of 'fit' with ideals of rurality help explain the differing awareness residents have of different types of land use change, which is then linked to attribution of negative impacts.

The individual experience of impact varies considerably. Our results suggest that experience of impact is linked to the perceived social changes attributed to a land use change, even where independent evidence indicates these social changes are not attributable to the land use change. Felt experience therefore depends on attributions made regarding the causes of social change, and perceptions of the nature of social change in a region. This is important, as residents are likely to take action to address felt impacts based on these perceived social changes. Personal experiences that do not align with observed trends at the community scale should not be simply dismissed as misunderstanding, since in part these reflect uneven distributions of change across the region, and at different scales. For example, the influence of blue gum plantation expansion on the number of people living in an area depends, for an individual property, on the nature of the previous land use and the number of people who used to live on the property before the land use change compared to afterwards. While on average slightly fewer people live on the property after establishment of a blue gum plantation than did previously, individual experiences will in reality vary considerably. In addition, where population decline occurs, the aggregate effect is not higher than that caused by other influences such as ongoing increases in farm production efficiency, as shown by the SLA scale analysis. However, a person observing decline in the number of people living on a plantation property would likely extrapolate this to a perception of wider spread population decline, while similar population declines caused by less prominent land use change go relatively unnoticed.

It is important to attend to the deeper meaning of impacts experienced at the individual scale. An impact described as 'population loss' may indeed be experienced through loss of even a small number of people from a community where these are valued friends and family, even if the numbers of people living in a region change little once in-migration of new residents is factored in. 'Loss of employment' may refer to the significant impact experienced when land use change means one's children must travel further to find appropriate work, even if there is evidence that, overall, the same number of jobs exist.

In this study, there was strong evidence that population change and change in employment are experienced as significant impacts for rural residents. While increased plantations and rural residential development may not lead to population loss, they are associated with significant population change over and this poses many challenges for rural communities; a person who loses friends or family who shift away from a property when it is sold to a plantation company or rural residential 'seachanger' loses social networks and a sense of community that are not and often cannot be 'replaced' by the new residents who subsequently shift onto these properties. Previous research has also identified 'culture clashes'

associated with this type of rural population change (Berry et al., 1990; Curry et al., 2001; Mahon, 2007; Smith and Krannich, 2000).

These findings have implications for practice and research in social impact assessment. The finding that awareness of change and attribution of impact shape felt impact of land use change suggests a need to critically examine why people hold particular perceptions, instead of uncritically accepting that expressed concerns accurately represent the types of social change occurring. This can help uncover the true impacts of change: in this study, plantation expansion is associated not with loss of population in terms of numbers, but with loss of familiar social networks, something interpreted and communicated by many people as a loss of population as it is, indeed, loss of the population they interact with on a daily basis. There is scope for further qualitative and quantitative exploration to enhance existing models of social impact (Vanclay, 2002). One step toward this would be to establish statistically whether awareness of change and attribution of impacts to land use change mediate experiences of impacts of land use change; our results strongly suggest that these relationships exist but further work could test this more robustly.

For policy makers and SIA practitioners, this study provides insights to and some guidance for responding to conflict over land use change. First, the outcomes of this study give reason to warn against basing policy responses primarily on common perceptions of impact. We have shown the links between land use change, social change and experienced social impacts are complex, and easily misunderstood or oversimplified. In the study region for this investigation, much of the public debate and policy response has focused on blue gum plantations, yet analysis of impact suggests at least equal attention should be given to issues associated with increased cropping. Second, this research demonstrates the importance of searching beneath simple public accounts of socio-economic impact to identify origins of concern. In the case of plantations, perceptions of population decline appeared to relate more strongly to loss of family, friends and social networks rather than absolute decline in population. With more accurate identification of impacts, decision makers will be more effective in targeting policy to address causal factors. Finally, the outcomes of the study reinforce the value of participatory processes to conflict resolution that focus on clarifying and agreeing on cause and effect relationships. Approaches such as participatory modelling, in which community members investigate and develop consensus views on cause and effect provide one useful example of such an approach (Leys and Vanclay, 2010). Such processes may help communities to develop more informed understandings of land use change and its impact, and so take actions better targeted at achieving positive change.

6. Conclusions

Based on extensive data from multiple sources, an important contribution of this work is to highlight opportunities for further development of frameworks for understanding social impacts. This has particular relevance to the work of Vanclay and others (Slootweg et al., 2001; Vanclay, 2002), with our results supporting a need to better specify the processes by which social change processes are experienced as human impacts, and suggesting avenues for future research that explores the factors influencing experience of impact. Previous research has highlighted that factors such as life stage, occupation, place attachment and adaptive responses may modify human experience of social change processes; this research highlights two other considerations, awareness of change and attributed cause of social change. The study provides some evidence that perceptions of the social changes associated with land use change

sometimes differ from independently observed social change, and that these perceptions influence how a person then experiences that change – in other words, how that person is impacted by the change. This has practical implications for policy and for social impact assessment, highlighting that effective response to impacts of land use change requires understanding both perceived and actual social change.

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References

- Alston, M., 2006. I'd like to just walk out of here: Australian women's experience of drought. *Sociologia Ruralis* 46, 154–170.
- Australian Bureau of Statistics, 2006a. Data Generated 30 August 2008 Using Data provided by the Australian Bureau of Statistics, from the Agricultural Census.
- Australian Bureau of Statistics, 2006b. File Generated 5th December 2010 Using Australian Bureau of Statistics Table Builder, 2006 Census of Population and Housing Data, Based on Place of Usual Residence.
- Barlow, K., Cocklin, C., 2003. Reconstructing rurality and community: plantation forestry in Victoria, Australia. *Journal of Rural Studies* 19, 503–519.
- Barr, N., Wilkinson, R., Karunaratne, K., 2005. The Changing Social Landscapes of Rural Victoria. Department of Primary Industries, Melbourne.
- Barr, N., 2000. Structural Change in Australian Agriculture: Implications for Natural Resource Management. Department of Natural Resources and Environment, Melbourne.
- Barr, N., 2003. Future agricultural landscapes. *Australian Planner* 40 (2), 123–128.
- Barr, N., 2008. The social landscapes of rural Victoria. In: Pettit, C., Cartwright, W., Bishop, I., Lowell, K., Pullar, D., Duncan, D. (Eds.), *Landscape Analysis and Visualisation. Spatial Models for Natural Resource Management and Planning*. Springer-Verlag, Berlin Heidelberg, pp. 305–325.
- Berry, E.H., Krannich, R.S., Greider, T., 1990. A longitudinal analysis of neighboring in rapidly changing rural places. *Journal of Rural Studies* 6, 175–186.
- Convery, I., Bailey, C., Mort, M., Baxter, J., 2005. Death in the wrong place? Emotional geographies of the UK 2001 foot and mouth disease epidemic. *Journal of Rural Studies* 21, 99–109.
- Curry, G.N., Koczberski, G., Selwood, J., 2001. Cashing out, cashing in: rural change on the south coast of Western Australia. *Australian Geographer* 32, 109–124.
- Devine-Wright, P., 2009. Rethinking NIMBYism: the role of place attachment and place identity in explaining place-protective action. *Journal of Community & Applied Social Psychology* 19, 426–441.
- Hugo, G., 2005. The state of rural population. In: Cocklin, C., Dibden, J. (Eds.), *Sustainability and Change in Rural Australia*. UNSW Press, Sydney, pp. 56–79.
- Kruger, L.E., 2005. Community and landscape change in southeast Alaska. *Landscape and Urban Planning* 72, 235–249.
- Leys, A.J., Vanclay, J.K., 2010. Land-use change conflict arising from plantation forestry expansion: views across Australian fence-lines. *International Forestry Review* 12, 256–269.
- Mahon, M., 2007. New populations; shifting expectations: the changing experience of Irish rural space and place. *Journal of Rural Studies* 23, 345–356.
- Massy, C., 2011. *Breaking the Sheep's Back*. University of Queensland Press, St Lucia.
- Miller, D., 2001. A method for estimating changes in the visibility of land cover. *Landscape and Urban Planning* 54, 93–106.
- Osbaldiston, N., 2010. Chasing the Idyll lifestyle: the seachange problem. *Social Alternatives* 29, 54–57.
- O'Toole, K., Keneley, M., 2010. Forgotten outcomes for rural areas in central policy-making: the case of blue gums in Australia. *Australian Journal of Public Administration* 69, 190–201.

- Petit, S., 2009. The dimensions of land use change in rural landscapes: lessons learnt from the GB Countryside Surveys. *Journal of Environmental Management* 90, 2851–2856.
- Plantations 2020, 1997. *Plantations for Australia: The 2020 Vision*. In: *Plantations 2020*. Canberra.
- Ross, H., McGee, T.K., 2006. Conceptual frameworks for SIA revisited: a cumulative effects study on lead contamination and economic change. *Impact Assessment & Project Appraisal* 24, 139–149.
- Rudel, T.K., 2009. Tree farms: driving forces and regional patterns in the global expansion of forest plantations. *Land Use Policy* 26, 545–550.
- Schirmer, J., Loxton, E., Campbell-Wilson, A., 2008a. Impacts of Land Use Change to Farm Forestry and Plantation Forestry: a Survey of Landholders. Cooperative Research Centre for Sustainable Production Forestry, Hobart.
- Schirmer, J., Williams, K.J.H., Borschmann, P., Dunn, C., 2008b. Living with Land Use Change: Different Views and Perspectives. Cooperative Research Centre for Sustainable Production Forestry, Hobart.
- Schirmer, J., Williams, K.J.H., Dunn, C., 2009. Socio-economic Impacts of Land Use Change in the Green Triangle and Central Victoria: Preliminary Summary of Findings. CRC Forestry, Hobart.
- Schirmer, J., 2000. Plantation Forestry Disputes: Case Studies on Concerns, Causes, Processes and Paths towards Resolution. Cooperative Research Centre for Sustainable Production Forestry, Hobart.
- Schirmer, J., 2007. Plantations and social conflict: exploring the differences between small-scale and large-scale plantation forestry. *Small-Scale Forestry* 6, 19–33.
- Schirmer, J., 2010a. Impacts of Land Use Change in the Green Triangle and Central Victoria: Analysis of Statistical Data: Part 1: Profile of Land Use, Social and Economic Change. Cooperative Research Centre for Sustainable Production Forestry, Hobart.
- Schirmer, J., 2010b. Impacts of Land Use Change in the Green Triangle and Central Victoria: Analysis of Statistical Data: Part 2: Analysis of Impacts of Land Use Change Using Statistical Data. Cooperative Research Centre for Sustainable Production Forestry, Hobart.
- Schirmer, J., 2011a. Scaling up: assessing social impacts at the macro-scale. *Environmental Impact Assessment Review* 31, 382–391.
- Schirmer, J., 2011b. Social impacts of land use change. In: Vanclay, F., Esteves, A.M. (Eds.), *New Directions in Social Impact Assessment: Conceptual and Methodological Advances*. Edward Elgar, Cheltenham, UK.
- Schirmer, J. The role of 'information' in community engagement about the environment: a case study of research into land use change. In: Lockie, S., Aslin, H. (Eds.), *Engaged Environmental Citizenship*. Charles Darwin University Press, Darwin, in press.
- Sevenant, M., Antrop, M., 2007. Settlement models, land use and visibility in rural landscapes: two case studies in Greece. *Landscape and Urban Planning* 80, 362–374.
- Slootweg, R., Vanclay, F., van Schooten, M., 2001. Function evaluation as a framework for the integration of social and environmental impact assessment. *Impact Assessment and Project Appraisal* 19, 19–28.
- Smith, M.D., Krannich, R.S., 2000. Culture Clash' revisited: newcomer and Longer-term residents' attitudes toward land use, development, and environmental issues in rural communities in the Rocky Mountain West. *Rural Sociology* 65, 396–421.
- Thomas, D.S.G., Sporton, D., 1997. Understanding the dynamics of social and environmental variability: the impacts of structural land use change on the environment and peoples of the Kalahari, Botswana. *Applied Geography* 17, 11–27.
- Vanclay, F., 2002. Conceptualising social impacts. *Environmental Impact Assessment Review* 22, 183–211.
- Vanclay, F., 2003a. The impacts of deregulation and agricultural restructuring for rural Australia. *Australian Journal of Social Issues* 38, 81–94.
- Vanclay, F., 2003b. International principles for social impact assessment. *Impact Assessment and Project Appraisal* 21, 5–11.
- Verburg, P.H., Eickhout, B., van Meijl, H., 2008. A multi-scale, multi-model approach for analyzing the future dynamics of European land use. *Annals of Regional Science* 42, 57–77.
- Wester-Herber, M., 2004. Underlying concerns in land-use conflicts – the role of place-identity in risk perception. *Environmental Science and Policy* 7, 109–116.
- Williams, K.J.H., Nettle, R., Petheram, J., 2003. Public response to plantation forestry on farms. *Australian Forestry* 66, 93–99.
- Williams, K.J.H., Dunn, C., Ford, R., Anderson, N., 2008. Understanding Resident Views of Land Use Change. CRC Forestry Technical Report 187. Cooperative Research Centre for Sustainable Production Forestry, Hobart.
- Williams, K.J.H., 2011. Relative acceptance of traditional and non-traditional rural land uses: views of residents in two regions, southern Australia. *Landscape and Urban Planning* 103, 55–63.
- Xu, W., Yin, Y., Zhou, S., 2007. Social and economic impacts of carbon sequestration and land use change on peasant households in rural China: a case study of Liping, Guizhou Province. *Journal of Environmental Management* 85, 736–745.