A RESILIENCE APPROACH TO PERI-URBAN LANDSCAPE MANAGEMENT

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Introduction

Peri-urban areas are typically associated with high growth regions that have witnessed rapid landscape changes on the peripheries of metropolitan and urban areas with a particular focus on high amenity areas. These former rural lands adjacent to the edges of urban areas into which they would typically expands or influences have been described as peri-urban areas *('peri'*: around, about or beyond) (Buxton et al, 2006).

The distinctive landscape changes have been the result of a peri-urbanisation process which has been characterised as a dynamic urbanising process that can involve the closer subdivision, fragmentation and land use conversation of former rural lands. It involves high levels of non metropolitan growth and results in a blurred transitional zone comprised of temporary mixes of urban and rural activities and functions with no apparent order. The resulting peri-urban land use activities exhibit a high degree of heterogeneity, continual change and conflicting values Low Choy et al, 2007).

Using two case studies of recent and rapid peri-urbanisation (namely South East Queensland and greater Melbourne, the fastest growing metropolitan regions in Australia), this paper considers if this process can led to resilient landscapes capable of withstanding future potential environmental and socio-economic shocks and surprises – it asks the question: how resilient are peri-urban landscapes? In particular, it explores the planning and management initiatives that need to be considered to ensure that existing metropolitan peri-urban landscapes maintain their adaptive capacity and do not exceed their resilience thresholds. This includes consideration of the dynamic interactions between socio-economic and biophysical processes operating over multiple scales with respect to the resilience of urban ecosystems.

The Peri-Urbanisation Process in Action

The Peri-urbanisation Process

Current notions of the peri-urbanisation process present two opposing views. The first involves a perspective that acknowledges the needs of the city and regards the adjacent rural areas as the means to satisfy urban needs through the provision of land and resources. It holds that peri-urban areas can be defined as "the urbanized edges of cities plus the spaces into which they expand, both physically and functionally" (Burnley and Murphy, 1995: 245). This city orientation has resulted in peri-urban areas being defined in relation to an expanding city which "constantly absorbs its fringe area and creates a 'new' fringe further from the city centre" (Golledge, 1960: 243). This urban centric view is supported by Barr (2003, 2005) who argues that it is the close proximity of these amenity landscapes to an urban market seeking a non-urban residence that results in pressures for residential development. Hence, this model places 'land speculation' ahead of 'declining financial returns from agricultural production' as the principal driver of land use conversion through the peri-urbanisation process. Consequently, rural land owners on the edges of urban centre have taken advantage of their location, irrespective of their motives or declining agricultural returns.

By contrast, the alternate view considers a rural perspective where urban expansion is regarded primarily as a threat. This model holds that rural areas are resilient and urbanization is a weak force which can only move into the adjacent rural areas due to a vacuum created by an emptying countryside and through agricultural transformations (Bunce and Walker, 1992). They argue that this zone is not "a fragile shell just waiting for the impact of urban invasion" (Bunce and Walker, 1992: 54). Hence, the principal driver of peri-urban change is not the pressure exerted by the nearby urban centre but declining returns from agricultural activity.

Irrespective of these opposing views of the principle drivers of peri-urban landscape change, the resulting landscapes display a consistent set of distinguishing characteristics, namely:
- a dynamic area undergoing constant and rapid change;
- its growth is related to the growth of nearby metropolitan or urban centres;

- lying within the sphere of influence of adjacent metropolitan/urban areas (its growing population dependent on these centres for employment, cultural, social and recreational needs);
- displaying attributes of a transition area dominated by the temporary nature of land uses;
- an increasingly fragmented landscape;
- an increasingly illegible landscape character;
- low to ultra low housing densities;
- a heterogeneous population;
- an increasing diverse range of heterogeneous and conflicting rural and urban land uses;
- highly contested activities and values;
- questionable landscape management skills of the newer residents;
- natural resource values at threat;
- lack of planning and subdivision guidance (eg bushfires, biodiversity protection);
- to date - a poorly planned and managed landscape; and
- disjointed planning and policy approaches.

(Buxton et al, 2007 and Low Choy et al, 2007)

Peri-urban Landscape Management Challenges

The management of these highly transitional peri-urban areas is now dominated by the recent and at times rapidly growing and continually evolving new group of land owners who are largely from an urban background and who retain largely urban aspirations. This group of new landscape managers now has the responsibility for managing the peri-urban landscape from its previous traditional farm owners. With questionable land management skills, capacity and capabilities, the current peri-urban landscape owners (managers) face a range of landscape management challenges within a significantly changed community that is confronted with a range of socio-economic challenges. The principal landscape management challenges that previous research has identified has been summarised to include: weeds infestation; loss of biodiversity; pest animals; changes to the hydrological regime; water quality decline; loss of scenic amenity; bushfire prevalence; and limited landscape management capacity of the new residents (Low Choy & Harding, 2010; Low Choy et al, 2007).

Likewise, this peri-urbanisation process involving this influx of new former urban residents which has in many cases been rapid and continues to evolve has led to a number of socio-economic management challenges. In summary, they can include: social conflicts (especially between in-migrants & traditional farmers); social disadvantage; an increasing social divide; a skewed population (notably a loss of young adults & an ageing population); an increasing economic divide; a loss of a 'sense of community' (especially outside of the townships); the intensification of agricultural activity; and the emergence of new local & regional economies which also has many positive aspects (Low Choy et al, 2007).

Emergence of a "New Settlement" concept

The traditional views of the peri-urbanisation process hold that most peri-urban areas lie within the sphere of influence of a nearby metropolitan or urban centre and display a variety of dependencies on those centres for economic, employment, social and cultural purposes (Bunce, 1998; Caffyn & Dahlstrom, 2005). As previously noted, the traditional views also hold that these peri-urban areas, regardless of the drivers of change influencing the process, will eventually be consumed by the advancing urban tidal wave and become urban.

However, an alternative view argues that peri-urban areas are a new and distinct form of settlement. For example, Nelson and Dueker (1990: 91), quoting Herbers (1986), state that "There is emerging across the continental United States a new form of urban development. It extends far into the rural countryside but within the limits of commuting range to urban and suburban employment opportunities". This conclusion has subsequently been confirmed by Davis et al (2002) with Clark et al (2009) providing further qualification of different exurban pattern types. Recent Australian research into the processes of peri-urbanisation, especially in the South East Queensland (SEQ) case study, supports this view and has highlighted the area's changing demographic nature to advance the notion of a 'maturing' peri-urban landscape leading to a possible new and distinct form of settlement (Low Choy & Sutherland, 2008; Low Choy et al, 2007).

The SEQ case study area is located to the west of the metropolitan area centred on Brisbane City. It lies astride the Brisbane to Toowoomba highway and comprised the (former) Local Government Areas of Ipswich, Esk, Gatton and Laidley. This area experienced its first wave of peri-urbanisation in the early 1980s and subsequent strong population growth has maintained that process to the present. Recent evidence also suggests that this continued growth has actually experienced an exponential increase from previous periods.

Hence, this nearly thirty years of continuous peri-urbanisation has led to some major demographic changes. Principal changes include the outflow of young adults who have moved to the larger urban and metropolitan centres and an increase in older people (i.e over 60 years). Whilst past in-migration was dominated by immigrants from Western European sources, recent trends have shown a gradual decline in these sources being replaced by increasing numbers from Asian and Middle Eastern sources.

Noticeably, a range of subtle trends have been associated with these overarching demographic changes (Low Choy et al, 2007). These trends suggest that the area's population and community is stabilising and include:

- a decline in the number of people moving residence and a corresponding increase in residents residing at the same address, especially in areas outside of the townships;
- a broadening of the employment base to include manufacturing and the retail trades alongside the area's traditionally high proportion of manual and labour intensive employment;
- a lessening of commuting to nearby metropolitan and regional centres for employment demonstrated by declining journey to work trips originating and ending in the case study area and the broadening of the employment base;
- demonstrated declining levels of social disadvantage over a twenty year period characterised by indicators such as marked improvements to income, greater car ownership, and declining crime rates; and
- improvements in housing and dwelling stock with a noticeable decline in the occupation of improvised and temporary dwellings over the last twenty years.

These demographic patterns and changes together with their associated socio-economic aspects provide a strong case to suggest that the community of the case study area has matured from its original peri-urban form. However, the peri-urban process continues, and whilst these maturity and stabilisation trends occurred prior to SEQs growth management initiative and declaration of its first statutory regional plan, they still remain outside of the region's declared "Urban Footprint" and the urban growth boundary for its metropolitan area (The State of Queensland, 2009). In this sense these areas will never emerge into an entire urban settlement and now exist as one that is neither urban nor rural in the traditional sense.

As these contemporary peri-urban areas are now inhabited by a broader range of residents and landscape managers than previous, the traditional approaches to community engagement for environmental and natural resource management and planning requires a rethink. This is also the case as peri-urbanisation has resulted in specialisation and changes in production and the intensification of production in traditional agricultural concerns. It has also seen the establishment of a number of non-traditional rural based industries such as lifestyle horticulture and the equine industry which are all closely associated with the nearby growth of urban markets in the region.

The management of this dynamic landscape depends heavily on the institutional arrangements delivering timely, appropriate, and integrated planning and management responses. However, if indeed we are dealing with a new form of settlement – one that is neither urban nor rural - then traditional urban and rural planning process, tools and instruments will need to be revisited to ensure that they can address the new sets of management challenges presented by these emergent landscapes. This may indeed require a different perspective to traditional landscape management.

A Resilience Perspective

Contemporary theories on resilience approaches can provide a lens through which to view the robustness of these highly transitional and continually evolving peri-urban landscapes, albeit in some instances this has now slowed. This should be particularly the case for those peri-urbanised areas now displaying attributes of the "new settlement" form.

In its contemporary context, resilience has been defined as "the capacity of a system to absorb disturbance, undergo change and still retain essentially the same function, structure, identity, and feedbacks" (The Resilience Alliance, 2009). Earlier the Resilience Alliance (2007: 1) had described the evolving notion of resilience as "the ability of a system to absorb shocks, to avoid crossing a threshold into an alternate and possibly irreversible new state, and to regenerate after disturbance".

To these attributes Walker, Holling, Carpenter, & Kinzig, (2004: 10) added the notion of a system with the capacity to "reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks - in other words, stay in the same basin of attraction".

Hence the key elements of this concept centre on:
- the ability to absorb change and disturbance and avoid resilience thresholds;
- adaptive capacity, self-organisation and retaining the ability to reorganise;
- regeneration whilst retaining the same function, structure, identity, and feedbacks; and
- remaining in same domain of attraction with persistence of relationships.

In this sense the Resilience Alliance (2007: 5) argues that "Resource problems and management issues are not just ecological, social, or economic issues, but have multiple integrated elements. These systems, in which cultural, political, social, economic, ecological, technological, etc. components interact are referred to as social-ecological systems .... this is a system that focuses on the interactions between the (nonhuman) natural world and the human-constructed world".

As previously noted, the human induced peri-urbanisation process has resulted in a changed natural and social landscape that is now vastly different in its functions, appearances and management challenges than hitherto. These conditions raise serious concerns as to the long term viability and resilience of rapidly growing regions experiencing continued peri-urbanisation.

Fischer et al (2009) point out that "several resilience concepts are particularly relevant in the problem-framing stage, because they shed light on issues that might otherwise be glossed over or missed altogether". In addressing peri-urbanisation issues through the lens of emergent resilience theory, it is not certain if the current peri-urbanisation and desired regional planning outcomes are in fact within environmental limits. In other words, does the socio-ecological system of peri-urban areas have the capacity to absorb further disturbance and still retain essentially the same function, structure and feedbacks (Walker & Salt, 2006)? Or have these areas be pushed beyond their thresholds (tipping points) into undesirable and irreversible forms – forms that defy conventional urban planning and management approaches? This is a crucial consideration because as Folke et. al (2002) point out - complex non-linear relations between elements can lead to sudden irreversible and fundamental change that is difficult if not impossible to reverse.

The Resilience Alliance (2009) notes that the resilience of socio ecological systems depends largely on underlying, slowly changing variables such as climate, land use, nutrient stocks, human values and policies. Degradation of these systems can be occasioned by rapid and unexpected changes to these variables and include a range of biological and social features such as those tabulated below.

Table 1: Biophysical and social features that can decrease resilience

Biophysical features	Social features
• Loss of biodiversity • Pollution • Lack of functional redundancy • Changing disturbance regimes • Climate change	• Inflexible, closed institutions • Unsustainable resource use • Increased inefficiency/loss of redundancy • Lack of social capital • Lack of social memory • Poor social learning outcomes • Narrow world views • Lack of public participation and involvement

(adapted from The Resilience Alliance, 2009)

Many human activities can erode resilience, increasing the likelihood of regime shifts, such as overexploitation of resources, pollution, rapid and inappropriate land-use changes, removing whole functional groups of species, removing response diversity and the impacts of human-induced climate change (Folke et al., 2004).

As noted previously, these attributes along with the bulk of those listed in Table 1 have been shown to characterise the evolving peri-urban landscapes, and notably in areas displaying the "new settlement" attributes. Clearly peri-urbanisation has led to less resilient landscapes that have been moved beyond their resilience thresholds into a different regime that displays a lessening of capable to withstand potential environmental and socio-economic shocks and surprises. This conclusion goes to the very heart of recent events that have brought peri-urban areas from both case studies into the headlines of national and international news.

Response to Natural Hazards

In a business sense, Parker (2010) acknowledges that whilst traditional practices of defensive resilience provide a "healthy bottom line", they do not necessarily provide a competitive advantage or sufficient adaptive capacity to survive a major disruptive event. The 2009 Victorian bushfires in the peri-urban areas in the greater Melbourne region and the January 2011floods in peri-urban SEQ are two cases-in-point.

In all, 2,133 houses were destroyed in the 2009 Victorian bushfires (January–February 2009) with the Black Saturday bushfires (7 February 2009), resulting in the death of 173 people (2009 Victorian Bushfires Royal Commission, 2010). It has been estimated that Victoria has sustained around 50 per cent of the economic damage from bushfires - almost all in the peri-urban area of the greater Melbourne case study area (McGee & Russell 2003). The twin phenomena of increasing populations located in dispersed settlement patterns, and increasing bushfire threat, have clearly given rise to these disastrous outcomes.

In addressing the specific question of small rural lots within the broader subject of fragmented settlements in rural areas, the Commission noted that the large number of undeveloped small rural lots (the results of the peri-urbanisation process operating in a past poor planning system) posed a potentially significant threat from future bushfires (2009 Victorian Bushfires Royal Commission, 2010). To this end they have recommended that the State government implement a regional settlement policy that:

- takes account of the management of bushfire risk, including that associated with small, undeveloped rural lots
- includes a process for responding to bushfire risk at the planning stage for new urban developments in regional cities, the process being similar to that used for new developments in Melbourne's Urban Growth Zone (2009 Victorian Bushfires Royal Commission, 2010: 31).

The SEQ floods resulted in extensive loss of life and property with the majority of the 33 lives lost during those floods being associated with the SEQ peri-urban case study area. The Queensland Floods Commission of Inquiry's interim report noted that "Community awareness was lacking in some areas. Community members in many of the flooded areas indicated that they were not aware of, or had not understood: the risk of flooding in their local area; the meaning and significance of flood warnings; whom they should contact for assistance in a disaster situation; or when to evacuate and the location of evacuation centres" Queensland Floods Commission of Inquiry, 2011: 122).

The extensive loss of life and property suffered in these peri-urban areas as a consequence of these unpredicted shocks represent "wicked" examples of systems being pushed beyond their thresholds of resilience and coupled with a lack of adaptive capacity suggest that these communities are incapable of full recovery (in the sense of: *retaining the same function, structure, identity, and feedbacks* whilst *remaining in same domain of attraction with persistence of relationships*). Socio-ecological systems that are changed too much will cross their thresholds and begin to behave differently with different feedbacks between their components and different structures – ie they undergo a regime shift (Walker & Salt, 2006). They also note that traditional command and control systems are highly problematic under these circumstances as they fail to acknowledge the limits to predictability that are inherent in complex adaptive systems and that they tend to place humans outside of those system (Walker & Salt, 2006).

While the exact position of thresholds may be difficult or impossible to identify, understanding the factors that push a system beyond a threshold is key to resilience management. In the case of peri-urbanising landscapes, the drivers of that change that operate at all levels from the international through to the regional and local scales are reasonable well known and a case has been made to manage the peri-urbanisation process along a collaborative multi-scalar approach that draws on all three levels of government, non government organisations, industry and the private sector and the community (Low Choy et al, 2007 & 2008).

Conclusions

Alberti and Marzluff (2004) confirm that socio-ecological systems face increasingly vulnerability to shifts in system control and structure from a range of attributes which Low Choy et al (2007 & 2008) and Buxton (2007) have shown to characterise the peri-urban fringes of our metropolitan centres. To Alberti and Marzluff (2004), resilience in urban ecosystems is a function of the patterns of human activities and natural habitats that control and are controlled by both *socio-economic* and *biophysical processes* operating at various scales.

In the case where a system has already moved into an undesirable regime whose end-point, the notional equilibrium, is unacceptable and efforts to keep away from it are failing, there comes a point at which adaptation is no longer ecologically, socially, or economically feasible. When transformation is the only

option, the sooner it is recognized and acted on, the lower the transaction costs and the higher the likelihood of success (Anderies et al, 2006). This they conclude will require the making of timely strategic interventions involving the recognition of key points for intervention in the socio-ecological system that can avoid undesirable pathways and alternate regimes and with an investment in adaptive capacity.

In terms of managing for resilience in a business sense, it is possible to recognise from Parker (2010) a generic continuum of organisational resilience as follows:
1. Reactive (defensive) resilience – reflecting a very low level of resilience;
2. Proactive (offensive-strategic) resilience;
3. Adapted (combination of defensive and offensive) resilience.

Current attempts (or lack of attempts) to manage the peri-urbanisation process occurring on the fringes of our metropolitan centres, notable in the two case study areas, display very low levels of resilience and clearly do not extend beyond the reactive or defensive resilience stage.

In view of one of the emergent notion of the "new settlement" peri-urban form, it represents a move of the socio-ecological systems of those regions beyond their resilience threshold into a different regime. This clearly necessitates a resilience-based management approach embracing 'resilience', 'adaptive capacity' and 'vulnerability' concepts – ones at odds with the traditional command and control approaches of conventional urban planning practices.

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