frontiers | Frontiers in Sustainable Cities

TYPE Original Research
PUBLISHED 12 June 2024
DOI 10.3389/frsc.2024.1391712

OPEN ACCESS

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RECEIVED 26 February 2024
ACCEPTED 27 May 2024
PUBLISHED 12 June 2024

CITATION
Butt A (2024) Sustainable, resilient, regenerative? The potential of Melbourne's peri-urban region.
Front. Sustain. Cities 6:1391712.
doi: 10.3389/frsc.2024.1391712

Sustainable, resilient, regenerative? The potential of Melbourne's peri-urban region

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Peri-urban regions offer significant contributions to city regions as landscapes of food production, resources for urban consumption, as well as for biodiversity and nature conservation – a key part of a city region as a socio-ecological, not simply a socioeconomic, space. Consequently, these roles have long been recognized as crucial to objectives of urban sustainability. They are also sites of socio-ecological tensions that relate to urbanization, as well as to the risk or hazard profile of locations undergoing social change. Whether sustainability, or resilience, in socio-ecological systems is a sufficient goal is increasingly under question. Seeking regenerative city regions, and in particular peri-urban landscapes requires reconsiderations of the relationships between policy, and the practices of communities and the state. Particularly with regard to planning policy this suggests consideration of the city and peri-urban region as connected, but also recognizing the specific qualities and vulnerabilities of peri-urban regions. Using the case of Narrm-Melbourne, Australia where several decades of planning policy have sought outcomes that reflect sustainability objectives this paper concludes that the peri-urban region has a strong potential to offer possibilities for a transformation to a sustainable, and potentially regenerative city region, but that current policy approaches are inadequate as they increase the vulnerabilities of communities, and neglect the potential of planning for multifunctionality and socio-ecological objectives.

KEYWORDS

Peri-urban, regenerative cities, Melbourne, planning policy, sustainable cities

Introduction

Peri-urban regions offer a contribution to the sustainability of entire city regions, and offer regenerative potential to urban systems. Typically, peri-urban regions offer access to nature, food production, resources including urban water supply amongst other contributions to the wider city. They are also places that, in their own right, face sustainability challenges that share common features with other rural areas, but within a context of landscape transition and population growth. Often, peri-urban regions are sites of increased exposure to risk and hazard as locations where the confluence of urban expansion and natural hazard, such as the intersection of natural or wilderness landscapes with urban, or urban influenced environments.

Notions of sustainability within peri-urban regions are likewise contingent on their connection to cities, and the urbanization processes that they generate, along with the relationships to land, landscape and natural systems. Consequently, planning for sustainable peri-urban regions, for their resilience in the face of change and for their potential roles as regenerative socio-ecological systems occurs within the context of urban influence, and the manifold expectation of these places with their respective city regions. This in turn tests the

policy and practices of land use planning which, for peri-urban areas, are often characterized by competing objectives and challenging categorizations of place and conceptions of purpose.

This paper utilizes several decades of the planning policy and practice in the peri-urban region surrounding Narrm-Melbourne, Australia to explore pathways and challenges to sustainability and resilience and consider prospects for the development of regenerative practices. In turn these are given consideration in the wider city region, and in particular how peri-urban Melbourne can contribute to a necessary transformation in land use and land management in the city region. Developing an agenda for regenerative peri-urban planning policy for this case study offers potential to a wider range of locations and city types, while recognizing context and the specific cultural and policy directions in Melbourne.

Placing peri-urban regions and policy in context

While varied conceptualizations and definitions exist for peri-urban regions – as liminal spaces between urban and rural, as future urban space, as a barrier to urban expansion, or as a city's natural asset – considering them as integral to the city region remains a useful policy approach. Despite historical perspectives of a rural–urban binary, such as in Williams (1973) description of the potency of 'city' and 'country' in a long-standing cultural and political discourse, increasingly peri-urban studies recognize these places as increasingly hybrid spaces of multi-functionality (Champion and Hugo, 2003; Holmes, 2008) perhaps as elements of the "urban phenomenon, taken as a whole" (Lefebvre, 2003: 53) or even as just another particular process of urbanization beyond the limited analytic potential offered by the 'city' alone (Rickards et al., 2016).

Actual practices of living in and managing peri-urban regions are complex, both because of and despite attempts at understanding their part in a broader the city region, and the role of peri-urban regions in metropolitan futures. The tensions that exist between expectations of future visions of the peri-urban as an urban place, as its non-urban antidote, or something in between are evident in the politics and policy of the peri-urban for many cities. For example, Angelo (2017) describes ostensibly rural land being, although not explicitly, considered as *urban,* or more likely as 'urban in waiting' by communities and policy-makers alike. Similarly, the 'greensprawl' (Cadieux and Taylor, 2013) is offered to describe an area of transition where urbanization has occurred, yet remains seemingly concealed within an ostensibly non-urban landscape of *farmlets*, and 'leafy' exurbia – an accepted form of hidden urbanization. In other locations remnant rurality is expressed through landscapes of consumption; tourism and heritage being prominent (Ancuța and Jucu, 2023). Conversely, reaction to 'genuine' rural land uses such as the expansion of intensive, industrial farming are also evident (Butt and Taylor, 2018) in the self-identity of many peri-urban communities. Primarily, the peri-urban is where the expectations of land use futures are often ill-defined, and where contrasts between land (and landscapes) for *production* and *consumption* are often in evidence, although the actual mosaic of existing land uses in these regions may render these categories as too simplistic (Buxton and Butt, 2020: 19), and increasingly inadequate in guiding a necessary policy response to the changing morphology of cities, and of rapidly changing practices of work (and commuting) and many city regions (Gallent et al., 2023). Nonetheless, the role of the 'rural' peri-urban in shaping urbanization and contributing to the city remains significant, yet ill-defined, with examples of urbanising city regions retaining cultural imaginaries of the rural in shaping new urban relationships (Gillen, 2016) but perhaps less evident in longer-standing urban cultures.

However, what is missing from much of this discussion is that such categorization still matters greatly in forming social imaginaries and creating bureaucratic practices, as well as in symbolic representations and the formal representations of space, particular in policy-making and implementation. In considering the persistence of the rural as a category of definition and of inquiry, even in peri-urban regions this is evident in the ways that the perceptions and mobilization of categories combine within regulatory systems – what Roy (2016:5) describes as the 'governmental categories' of urban and rural. What planners and others (as agents of control and change in communities, investment and policy) *think* and *do* about categories of place and space still counts, despite an increasing theoretical interest in more fluid categorizations of place. Just as Beveridge and Koch (2017: 65) contend that "how we comprehend urban spaces can shape how urban actors develop strategies [and] shape objects of political action" so to do categories and imaginative discourses of rurality, and of its various forms, shape everyday practices, policy and politics, and there is often confluence in these categories in peri-urban regions.

Within this context, land use planning policy approach and practices to peri-urban regions typically seek to limit or manage urban growth, prevent farmland loss, protect assets such as urban water supply, significant landscapes or biodiversity. For many cities (including the case study here) these have a long history of policy formation and continuity, but exhibit an 'amazing consistency and lack of imagination' (Lapping, 2006: 118) in approaches to limiting the dilution of farming and the urbanization of peri-urban areas, and to the protection of habitat, the reduction of exposure to hazard and risk in key location and other policy goals, mirroring approaches from the early Twentieth Century (Cole and Crowe, 1937).

Intuitively, the peri-urban contribute roles in the socio-ecological framework of the city region, but they are often undervalued, or subject to complex and contradictory policy goals. Whether as the 'lungs of the city' (Caro-Borrero et al., 2015) and as a key contributor to nature-based solutions to urban and landscape management, or as the city's 'foodbowl' (Lawton and Morrison, 2022), or a preferred space for leisure and recreation (Žlender and Gemin, 2020) the peri-urban provides a role in the realities and the policy discourses of the sustainability of a city region. This in turn requires consideration the resilience of these locations and communities facing change and an adjacent city, as well as the capacity of these regions to contribute to regenerative practices that have benefit locally and in the wider city region.

Sustainable, resilient or regenerative city regions?

The socio-ecological transformation demanded by the evident crises related to climate change, diminished environments and exhausted natural resources requires deep structural change in policy, culture and economies. For city regions *sustainability* has been a common goal of policy and practice in this regard, whether as

structured models such as the UN *Sustainable Development Goals*, or more modest local application of investment and design to address negative impacts of urbanization in place. With origins in policy framings such as the *Brundtland Report* (WCED, 1987) sustainability is typically operationalized with a recognition of connected social, economic and environmental dimensions, which in turn have been argued as 'fuzzy' at best (Kuhlman and Farrington, 2010), or perhaps more critically as merely an empty signifier that, in practice, fails to recognize the future as a meaningful category in policy (Brown, 2016).

Nonetheless, sustainability has become a 'master signifier' (Davidson, 2010) or meta narrative around which to organize spatial planning and its practitioner and public discourses. This includes the ways in which *balanced* development may be sought, complementing objectives that may seem irreconcilable or contradictory within contemporary urban socio-economic systems. Certainly many cities have made significant transitions in urban greening, waste management, energy system and transport technologies and practices within a framework of sustainability. Likewise, a focus on sustainable communities through equity, environmental justice and urban livelihoods continues to reframe urban planning objectives.

Increasingly, urban transformation research considers pathways for radical change to contribute to sustainability and resilience from within the environments where most people now live. This includes the transformative potential of communities within cities, and also by urban experimentation with the city as acting as an agent of change (Hölscher and Frantzeskaki, 2021). However increasingly the sufficiency of sustainably as a transformative approach to urban regions has been questioned. Not only is sustainability policy and practice criticized as hollow, particularly given that planners are often seeking to 'get things done' (Metzger et al., 2021) but also as (perhaps intentionally) ill-defined, or as Gough (2015: 146) notes is "an elusive concept, which is simultaneously difficult to understand theoretically and even more challenging to operationalize and implement in practice." Likewise the capacity of policy actors, including planners, to create change revelas tensions between science-informed approaches and realities of available opportunities to make change happen in complex city systems (Patterson et al., 2021).

The adequacy of a goal to reduce harm to acceptable or balanced levels within existing socio-economic systems belies the scale of the task of rapidly reducing impacts and addressing long standing damage from urbanization, a carbon economy and a global food system to environments at a local and planetary scale. These demand a more radical transformation.

In seeking to address the limits to sustainability as a narrative or policy objective it is useful to explore how concepts including *resilience* and *regenerative* urbanism can instead become goals for the planning of city regions, and understanding the transformative approaches these may require. Notably these concepts themselves offer contradictions and challenges in conceptualization and operationalization. If the additional goals of considering what this means for peri-urban regions within the broader city region, these challenges are magnified.

Resilience

Planning for resilience in urban systems suggests political, social and ecological dimensions - creating more resilient communities, ecosystems and socio-political organizations in the face of the significant challenges of processes such as climate change and unsustainable urbanization. Resilience is an increasingly prevalent concept, and "whatever it is, [it] appears to be everywhere" (Anderson, 2015) and it offers a policy approach and a vision for place and community in response to short- and longer-term shocks. This appears an ideal goal, especially for decision-making under uncertainty and in building preparedness for environmental change, but it can also be viewed as problematic for its lack of empirical foundation (Brown, 2016) and given that notions of resilience may operate within structures of governance that pass responsibility from the state to communities in significant situations such as climate-led natural disasters (Ruszczyk, 2019). In turn this raises fundamental questions about policy, responsibilities, priorities and approaches to (peri)urban futures.

Building resilient communities and places matters, but for peri-urban planning in particularly, the consequences of population and housing growth beyond the city's fringe reveal locations that are undergoing complex change, and where notions of shared understandings of community life are in flux. Particularly where resilience is seen as a policy approach to address hazards and shocks that include community self-preparedness, this appears as what Chandler (2016:27) describes as the *societalization* of security, whereby approaches to security are shifted from the state to individuals, (including through building increased 'resilience'). In peri-urban regions this exposes questions of what and who should be resilient (Beilin et al., 2015) and consequently prepared for shocks and change. It also demands consideration of the role of the state in managing urban futures that may, in turn, be actually reducing peri-urban resilience by increasing urban-generated population and housing growth, through impacts on the viability of food systems and diminishing other resources including peri-urban ecosystems.

Regenerative policy and planning practices

To move beyond an inadequate sustainable urbanization and urban policy, and beyond simply making communities and systems more resilient, suggests a role for transformation in how the current and future roles of urban socio-ecological and economic systems operate. Calls to move from sustainable to regenerative policy and practice are often radically transformative. Camrass (2020) focusses on lessons from ecological systems and seeking new ways of knowing as a basis of new ways of doing in areas as wide as community governance and farming, although while recognizing a continued role for procedural science and evidence in this process in any genuine futures thinking. For urban systems (and in particular whole city-regions) this might be seen through design as biomimicry or as ecological design and nature-based design solutions, as food systems that focus on land and place and with an intrinsic understanding of the value of ecosystem services, a concept that has been criticized as being too human-centered (Costanza et al., 2017). It also implies governance structures that operate at a community scale (Gibbons, 2020) that perhaps sits uncomfortably with the realities of growing metropolitan city regions, such as this case study.

Crucially, regenerative thinking and practice demands reconsideration of the role of places within cities and their regions, and the interplay between them. This interdependence also considers differing scales, form the health of individuals through to landscapes and beyond (Buckton et al., 2023). Traditional planning approaches consider the separation and categorization of land use, often focused on minimizing conflict between them. Beyond the fringe of urban

areas this has been more nuanced with the roles described (future urban, nature complementing the city or local food systems) often focused on roles *for* the city. Regenerative thinking extends this to complementary elements of systems, and for peri-urban regions this includes relocalising systems, including food production. Woods (2020) describes the risks of globalized food systems and offers scenarios for increasingly local and small-scale production, including in existing urban areas. Examples including Community Supported Agriculture (CSA), access to small-scale. Low-cost farming opportunities and urban intensive agriculture are examples of these.

More specifically, regenerative agricultural systems are also focused on place-based issues including bio-diversity and soil health, recognizing the externalities of high input farming (Buckton et al., 2023), alongside broader justice goals of food security. Rhodes (2017: 105-106) recognises that this requires fundamental system redesign, but that existing models including organic farming offer ready pathways to this aim. Another feature is the acceptance of multi-functionality, a characteristic that is often already present in peri-urban landscapes, but with potential to be explicit planned for to maximize opportunities for a range of social, economic cand environmental benefits to be realized (Selman, 2009). Morse et al. (2020) consider this to be part of an eco-system services approach that considers interactions between places and uses, but that this requires moving beyond an output-focused approach to accounting for specific ecosystems services as 'goods', and instead looking to measure and monitor this though "novel ways to track the economic, ecological, cultural and spatial dimensions of agricultural system in specific environments" (p. 377).

Buckton et al. (2023: 827-828) offer conceptual approach to regenerative practices that includes key qualities including an ecological worldview, mutualism, diversity, agency for humans and non-humans and reflexivity. They also offer applications of these in a range of fields or domains. Perhaps for peri-urban regions and their relationship to city regions, these most evidently include agriculture and food systems, nature conservation and economic opportunities including tourism. However, notions of regenerative governance and social organization, as well as potential regenerative urban development policy and practice are also relevant approaches to consider.

Of course, considering what these practices look like and how to categorize success is challenging. For example, Newton et al. (2020) report "wide variance in the definitions used may lead to uncertainty about what different actors mean when they talk about regenerative agriculture." In general, they observed a categorization of regenerative farming practices that included a division between 'process' (or farming/land management techniques) or outputs (e.g., soil health, habitat, carbon sequestration). Gosnell et al. (2019) offer three spheres of transformation (including for land management); practical, political and personal, and this resonates with actions in peri-urban regions where land management in particular reveals complex relationships between individuals, communities and the state. The implication for regenerative practice is that systemic transformation relate to attitudes at a personal or community level, as well as to policy and practice by state actors.

Transformation to regenerative peri-urban planning practices – planning with a 'regenerative lens' (Buckton et al., 2023) – includes consideration of governance models, multifunctionality, personal and community-level perspectives and attitudes, economic framings and research-informed solutions. In this context, land use planning systems have a role, but sit alongside a range of other areas of policy, social practice and economic transformation. Key goals of planning policy for peri-urban areas include a recognition of urban–rural relationships and their possibilities for a more sustainable or regenerative city region, but also those that focus directly on regional and landscape-scale transformations in the peri-urban.

Planning Melbourne's urbanization and it's Peri-urban region: policy and practice

Melbourne is a metropolis of around 5 million people in south-eastern Australia with population growth at around 1.5% per year (ABS, 2018), a comparatively high level of population growth amongst developed world cities. It has an extensive and multi-functional peri-urban region that includes considerable continuing local agricultural production ranging from extensive areas of animal grazing at various commercial scales, intensive animal farming, fresh vegetable production (including in small irrigation areas) and wine grape production. It also includes considerable areas of public land performing roles for nature conservation, recreation, urban water supply and, until recently, timber production. In recent decades the peri-urban region has experienced population and housing growth, most acutely through the suburban expansion of metropolitan Melbourne into new growth areas, but also through new and dispersed housing in surrounding small towns and rural landscapes.

This peri-urban region exhibits land use characteristics that contrast with the experiences of rural Australia more generally- it is a multi-functional farming area (Spataru et al., 2020) with emerging practices of regenerative farming, traditional commodity farming systems and activities between these scales and practices. While trends in rural land use include the emergence of fewer, larger farms and significant increases in productivity (Dibden et al., 2009), in Melbourne's peri-urban region (and those of other large Australian cities) a prevalence of smaller holdings and lower farm incomes reflects the sub-commercial nature of many farms and the emergence of rural residential (lifestyle) property markets within a wide commuter belt. Despite this, the region remains highly productive in key industries including vegetable production and wine grapes, particular at the immediate city fringe (Buxton and Butt, 2020).

The region is also prone to natural hazards, in particular wildfire on public and private land. Much of the region has been progressively cleared for agriculture, however areas of remnant vegetation (often public land) are characterized by various fire prone, and fire dependent, forest ecosystems. These fire events have had catastrophic consequences to life and property over many decades (Buxton et al., 2011) and are anticipated to increase in prevalence and intensity under climate change.

Planning a peri-urban region – accident and design

Land use planning in the Australian State of Victoria is typically undertaken by local governments through day-to-day planning assessment and approval roles, but strongly influenced by a centralized and strategy led approach developed by State Government. Key aspects of planning policy in Melbourne's peri-urban region have primarily emerged from longstanding attempts to manage urban

expansion and to prevent the fragmentation of farmland. While arguably these approaches have had limited effect, there has been considerable continuity in policy objectives for over 50 years, led by the State Government of Victoria and implemented by State and Local Government planning agencies. During the 1960s this included the nomination of 'Green Wedges' and growth corridors for metropolitan expansion, an approach in common with many other cities. These policies remain, although the nominated 'Green Wedge' areas have been subject to incremental loss and changing land use during a period of significant metropolitan expansion. Similarly, designated areas of landscape significance were nominated in the early 1970s for three key locations surrounding Melbourne (MMBW, 1977). These remain, albeit in modified form, and have been successful in preventing demonstrable urban expansion into these regions, as well as the emergence of successful rural industries such as wine production and associated tourism, however they have been less successful in preventing rural property fragmentation and the proliferation of small, sub-commercial holdings in rural areas which has remained a key goal of rural planning. This latter policy objective is a key feature of rural land use planning in many areas in Australia where farmland 'protection' is equated with the maintenance of large, commercially focused land holdings, which in turn aligns with the *productivist* focus of agricultural policy more generally with its strong focus on commodity and export-orientated farming within a free-market framework. Australia has few, if any, agricultural subsidies (Anderson, 2020) and consequently small and potentially unviable farm businesses sit at odds with rural planning objectives. This is not simply a consequence of a shift to neo-liberal polices since the 1970s, but a longer-standing approach to commercial imperatives since the nineteenth century and into the modern era (RRC, 1944), or as Callaghan (1955: 12) identified, a 'psychological resistance to smaller types of production has been built up in Australia'. Nonetheless, small farms remain a key feature of peri-urban Melbourne (Butt, 2013), and increasingly these include enterprises with a multi-functional or regenerative focus.

What the peri-urban region offers a transformative agenda for Melbourne

Following the framework outlined in Hölscher and Frantzeskaki (2021) as perspectives for understanding urban transformations in, of and by cities, the role of peri-urban regions alone, and as an integral component of city regions is of critical concern to policy and place-based practices. The capacity of Melbourne's peri-urban region to offer transformational potential alone and within the broader city are arguably considerable, although so is the challenge of meaningful metropolitan transformation. The ways in which these transformation narratives and actions can occur are evident in the roles peri-urban place offers as a metropolitan resource, as an ecosystem and space for habitat complementing urban ecosystem transformations and as examples of transformation in food and energy production through multi-functional and regenerative activities, particularly in farming. Conversely, various trends in change in the region are evidently maladaptive, especially those that increase risk exposure and those that simply extend urban footprints and car dependence.

The Melbourne peri-urban region produces close to a quarter of agricultural output in the Australian State of Victoria (ABS, 2018). It does this through a significantly more intensive farming system and on smaller landholdings than other areas in the state (average yields of over AU$30,000/ha), yet in many localities farming is a mosaic of smaller, lifestyle and nascent regenerative farming activities with much lower yields and co-existing with residential activities and less disturbed ecosystems.

Critically the region has experienced a decline in the number of farms, yet agricultural output remains high. The bifurcation of farming between commercial-scale and smaller activities (including those with a focus on regenerative farming) has been apparent for several decades. Policy initiatives focusing on 'carbon farming' through soil sequestration and revegetation are evident policy initiatives such as the *Victorian Carbon Farming Program* (Agriculture Victoria, 2023) and similar initiatives. As Spataru et al. (2020) identify, the range of farming evident in the Melbourne peri-urban region creates opportunities for multi-functional agriculture at various scales which includes food production in addition to other activities, including deliberative regenerative actions.

This is turn reflects challenges in landscape-scale management of land as habitat and for biodiversity. The potential of this in Melbourne's peri-urban region is demonstrable, but challenged by issues of tenure and purpose – especially if multi-functional uses are considered desirable for their regenerative potential. As Garrard et al. (2018) identify there is a need for maintenance and curation for biodiversity in and around Melbourne where landscapes have often been radically modified. Moreover, these landscapes can have potentially conflicting purpose; farming, water catchment, habitat and urban-generated residential space. These spaces make changes *in* peri-urban regions, but also offer transformative outcomes for the city region as a whole – just as peri-urban regions have always offered resource contributions to cities. These contributions can adapt, and such adaptations permeate into cities like Melbourne (rather than simply 'off-setting' existing, maladaptive practices and policies in the urban area).

Planning policy and sustainable or regenerative peri-urban futures

In the case study region, at least from a land management perspective, results are mixed. The nineteenth century invasion of the region was led by pastoralism, land clearing and agricultural occupation (punctuated by mining and forestry) which in turn heavily modified landscapes to suit an export focused colonial agricultural system. Commencing in the mid-twentieth century, initiatives began to protect soil and water catchments, and these resulted in projects to strategically revegetate farming landscapes that had been systematically cleared for cropping and grazing in the nineteenth and early twentieth centuries, initially for soil and water quality benefits (Thompson, 1979). More recently revegetation has focused on habitat and ecosystem regeneration conservation, including through government initiatives such as a network of Catchment Management Authorities, and through community/landholder initiatives such as Landcare, which in turn create new dynamics of community-state relations (Lockie and Higgins, 2007), again suggesting a socialization of responsibilities. In contrast some under-valued ecosystems such as native grasslands continue to be diminished to facilitate farming and urban expansion, while fire control objectives are often in conflict with revegetation initiatives. The public-private land binary that is a feature of rural Australia largely remains. Even as private land takes on increasing roles to enhance ecosystem and bio-diversity, the

expectation that is largely a task for the considerable public land estate remains a feature of policy reflecting the 'land-sparing' (rather than 'land-sharing') approach (Marr et al., 2016) to the categorization of rural land and consequent protection of natural environments and habitat common in Australia. Likewise, the planning system in Victoria includes regulations to constrain native vegetation removal, however market mechanisms allow replanting and 'off-setting' elsewhere do not result in better habitat outcomes (Gordon et al., 2015).

At the immediate urban fringe impact has been more considerable. Despite some success over three decades in re-orienting housing development to existing urban areas, new 'greenfields' suburban housing remains a key market for affordable family housing in Melbourne. Policy approaches include the maintenance of an Urban Growth Boundary (UGB) as a legislated instrument to prevent incremental metropolitan expansion, while maintaining future land for housing within a framework plan for development (DSE, 2005). It has nonetheless been changed on several occasions, reflecting the widely shared political imperative for urban housing supply. The experience of metropolitan population growth in the last 20 years has resulted in urban expansion within this framework plan, yet well ahead of anticipated infrastructure provision in many locations. Many of these communities have developed a reliance on extensive commuting for employment, commercial services and social infrastructure. These new suburban areas typically feature a emphasis on green-blue infrastructure and nature-based solutions, particularly to water management and this is a feature of Melbourne generally (Hansen et al., 2023), however these areas are typically maladaptive to current and likely future climate impact especially in relation to the lack of urban greening (when compared to the city overall) and private car dependency.

A framework for regenerative peri-urban regions should consider two inter-related aspects; how the region and its landscapes perform as (more) regenerative socio-environmental systems, and how this might then contribute to the regenerative transformation of its whole city region. Without doubt this is challenging, particularly the latter goal, and the peri-urban system should not be considered as a sole contributor to metropolitan-wide ecosystems improvements, or as a sole counterweight to environmentally damaging urban systems.

The critical features of planning policy that contributes to this include the scope to consider how a peri-urban region can be conceptualized as a socio-ecological system and, in turn, one that can overcome unsustainable practices. Resilience to the impacts of climate change, multifunctional landscapes where both socio-economic systems and nature exist, and forms of governance that include engaged transformation in social practices are examples of policy goals that move to a more sustainable and potentially regenerative model of peri-urban futures.

However, the prevailing rationalities of planning policy and practice in the case study region expose a tension between strategy and outcomes in relation to landscape and farmland protection. The area remains a location of agricultural output at large and small scale, but also (despite policy intent) a location of other emerging uses, particularly 'lifestyle' and commuting-led residential development – a trend apparent for over 50 years (TCPB, 1960; Boynton, 1979) – and between competing rationalities about the value of small-scale farming within a broader commodity and export focused national agricultural policy structure. The role of land stewardship, local food production and multi-functionality remain as under-valued features of planning policy in the Melbourne region, despite being increasingly evident aspects of the actually existing peri-urban. The region continues to be considered as future urban land in many locations, and a lack of strong barriers to urbanization, including in locations with high fire risk (Buxton and Butt, 2020).

Attempts at sustainability, challenges to resilience and prospects of regenerative approaches are evident in the case study region, although with limited success (Fastenrath and Coenen, 2021) in an era of rapid population growth. Initiatives for urban forests and urban greening have achieved outcomes for the metropolitan area (Coffey et al., 2020), however tree canopy loss within the urban and peri-urban region continues, particularly as a consequence of residential development. The success of Landcare and other community-led projects is considerable, but relies on forms of community identity and cohesion that are difficult to maintain in those parts of the peri-urban region with dynamic population and landscape change.

Efforts at conceptualizing and operationalizing the peri-urban with this city region are occurring. The most recent planning strategy and policy for the region have emerged from metropolitan plans that have included a clear recognition of the role of the peri-urban region – a positive development (DELWP, 2017). However recent strategic work focused on identifying and protecting *strategic agricultural land* has not been completed despite increasing growth pressures on the city. These pressures continue to challenge the viability of key agricultural areas including those providing local markets for fresh vegetables.

Overall, it is evident that land use planning policy and practice in the city region recognizes the role of peri-urban regions in delivering sustainable outcomes, but that successful implementation is challenged by priorities for housing and population growth, a continued focus on largely monofunctional farming landscapes (which despite this are diminishing), and political difficulties in preventing settlement (and re-settlement) in high fire hazard areas. The capacity of this policy and planning practice approach to deliver resilient peri-urban landscapes under climate change is challenging, although increasing public awareness and concern at critical issues such as urban heat, wildfire and urban water supply have led to positive policy initiatives. A transformation to a regenerative approach to conceptualizing peri-urban regions is evidently more difficult. While small-scale actions in habitat, soil and water management are occurring, as well as an increasing interest in food localization, much of this is marginal in impact compared with larger process of urbanization and peri-urban development which results in habitat loss, notwithstanding regulation to that seek protection and replacement.

Conclusions: the role of peri-urban regions in delivering sustainable and regenerative futures for city-regions

Peri-urban regions can contribute to the sustainability and resilience of city regions by offering green space, ecosystem services, natural resources and access to nature. Critically, peri-urban regions can play a role in developing a regenerative approach to practices of urbanization within wider city regions. The challenges of this are connected to the significant transformation required; socio-cultural, political, and economic.

For land use planning policy and practice this suggests approaches that seek transformation at the regional and landscape scale, but are also precautionary in relation to processes including climate change, hazard and disaster. It also implies supporting peri-urban regions to provide a role in the city region in agriculture and as natural systems.

In the case of Melbourne, longstanding policy positions provide, at least on the surface, a framework for effective planning that can contribute to this through supporting agriculture and its future adaptation, and through protecting habitat and landscapes. Presently there are key limitations to planning practice and implementation that work against achieving these outcomes. The pressure for continued housing growth on the fringe, and the car and commuting-dependent models of urbanization being created are a significant example of this. Likewise models of peri-urbanization that result in scattered, urban-generated housing, and policy positions that preference models of large scale agriculture, rather than the mosaic of land uses that is actually evident in the region, appear as insufficient approaches to a transformation to regenerative sustainability. Critically, political and public discourses regarding the peri-urban futures of the case study location should engage with the role this region can play as a crucial feature of the city-region, recognizing the value it provides and its future regenerative potential.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

AB: Writing – original draft, Writing – review & editing.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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